
HIM 1990-2015

2013

An investigation of the economic viability and ethical ramifications of video surveillance in the ICU

Laura Bagge
University of Central Florida



Part of the [Nursing Commons](#)

Find similar works at: <https://stars.library.ucf.edu/honorstheses1990-2015>

University of Central Florida Libraries <http://library.ucf.edu>

This Open Access is brought to you for free and open access by STARS. It has been accepted for inclusion in HIM 1990-2015 by an authorized administrator of STARS. For more information, please contact STARS@ucf.edu.

Recommended Citation

Bagge, Laura, "An investigation of the economic viability and ethical ramifications of video surveillance in the ICU" (2013). *HIM 1990-2015*. 1487.

<https://stars.library.ucf.edu/honorstheses1990-2015/1487>



University of
Central
Florida

Showcase of Text, Archives, Research & Scholarship

STARS

AN INVESTIGATION OF THE ECONOMIC
VIABILITY AND ETHICAL RAMIFICATIONS
OF VIDEO SURVEILLANCE IN THE ICU

by

LAURA BAGGE

A thesis submitted in partial fulfillment of the requirements for
the Honors in the Major Program in Nursing
in the College of Nursing
and in The Burnett Honors College at the
University of Central Florida
Orlando, Florida

Summer Term 2013

Thesis Chair: Dr. Stephen Heglund

ABSTRACT

The purpose of this review of literature is to investigate the various roles of video surveillance (VS) in the hospital's intensive care unit (ICU) as well as its legal and ethical implications. Today, hospitals spend more money on the ICU than on any other unit. By 2030, the population of those 65 and over is expected to double. 80% of older adults have at least one chronic diseases (Centers for Disease Control and Prevention, 2013). As a consequence, the demand for ICU services will likely increase, which may burden hospital with additional costs.. Because of increasing economic pressures, more hospitals are using video surveillance to enhance quality care and reduce ICU costs (Goran, 2012). Research shows that VS enhances positive outcomes among patients and best practice compliance among hospital staff. The results are fewer reports of patient complications and days spent in the ICU, and an increase in reported hospital savings. In addition, VS is becoming an important tool for the families of newborns in the neonatal ICU (NICU). The belief is that the VS can facilitate parent-baby bonding. In the United States of America, privacy rights impose legal restrictions on VS. These rights come from the U.S. Constitution, Statutory law, Regulatory law, and State law. HIPPA authorizes the patient to control the use and disclosure of his or her health information. Accordingly, hospitals are under obligation to inform patients on their right to protected health information. It is appropriate that hospitals use VS for diagnostic purposes as long as they have obtained patient consent According to modern day privacy experts Charles Fried and Alan Westin, a violation of a person's privacy equates a violation on their liberty and morality. However, if a physician suspects that a third party person is causing harm to the patient, than the use of covert VS is justifiable.

ACKNOWLEDGEMENTS

I wish to give my special thanks to my Thesis Chair Dr. Stephen Heglund for graciously guiding my efforts throughout the development of this thesis. I am incredibly grateful to my Committee Members Kimberly Dever and to Dr. Kendall Cortelyou-Ward for giving their time and counsel on my behalf. Finally, I would like to express my gratitude to my parents and Matthew Baker for their support and encouragement.

TABLE OF CONTENTS

INTRODUCTION	1
Problem	2
Purpose	2
Method	2
AN INVESTIGATION OF VIDEO SURVEILLANCE	4
Telemedicine	4
Patient outcomes.....	8
Financial outcomes	17
Remote bedside monitoring	24
Hospital use	24
Family use.....	28
LEGAL REQUIREMENTS.....	31
The United States Constitution	31
Statutory Law	32
Privacy Act of 1974.....	32
HIPAA.....	32
Regulatory Law	33
State Law: Florida Constitution	33
ETHICAL RAMIFICATIONS	35
COVERT SURVEILLANCE	38

RESULTS	41
CONCLUSION.....	45
REFERENCES	47

LIST OF FIGURES

Figure 1	3
Figure 2	5
Figure 3	7
Figure 4	8
Figure 5	19

LIST OF TABLES

Table 1 Published author(s) organized by study objective related to patient outcome	9
Table 2 Tele-ICU impact on patient outcome, length of stay, and best practice compliance	12
Table 3 Hospital-acquired complications no longer eligible for Medicare reimbursement	18
Table 4 Published author(s) organized by study objective related to financial outcome	19
Table 5 Tele-ICU impact on hospital costs.....	21
Table 6 Neuro acute rehab unit falls	27

INTRODUCTION

For hospitals across the United States, economic pressures challenge the delivery of quality care (Roth, 2012). The quality of patient care delivery is dependent on the ability for hospitals to recognize patient complications and provide appropriate and timely interventions (Shever, 2011). The intensive care unit (ICU), the gold standard of quality care among competent hospitals, is the most expensive unit to operate (Rivera, Dasta, & Ravon, 2009). Typically, the ICU accounts for 10% of total hospital beds, while associated costs are approximately 20% of the total hospital expenditure.

Changing U.S. demographics complicate a challenged healthcare system. As a result of a growing percentage of the population greater than 65 years old, increased demand for ICU services is likely to burden the hospitals with additional expenses (Centers for Disease Control and Prevention, 2013). Furthermore, the Centers for Medicare and Medicaid Services (CMS) no longer reimburse hospitals for a number of patient-hospital acquired complications such as falls (Buerhaus & Kurtman, 2008). Medicare covers over 44 million people, which makes it the largest provider of health insurance in the United States (United States Census Bureau, 2010). As a result of increasing economic pressures, hospitals are highly motivated to deliver the most cost effective care. As a result, a number of hospitals are using video surveillance (VS) in order to deliver quality care at potential cost savings, (Goran, 2012). VS is defined as a system of monitoring activity in an area or building using a television system in which signals are transmitted from a television camera to the receivers by cables or telephone links forming a closed circuit (Collins Dictionary, 2013).

Problem

A number of organizations have published favorable research on the benefits of VS related to improved patient outcomes. Of those researchers who have studied its economic viability, conclusions have been mixed. Fewer organizations yet have examined the legal and ethical ramifications related to VS. In the United States, people have an expectation to privacy. The problem is twofold. First, can hospitals legally video monitor their patients? Second, is it ethical to VS a patient and his family without their knowledge? To evaluate this question and its potential resolutions, we examine legal requirements and the ethical ramifications of VS.

Purpose

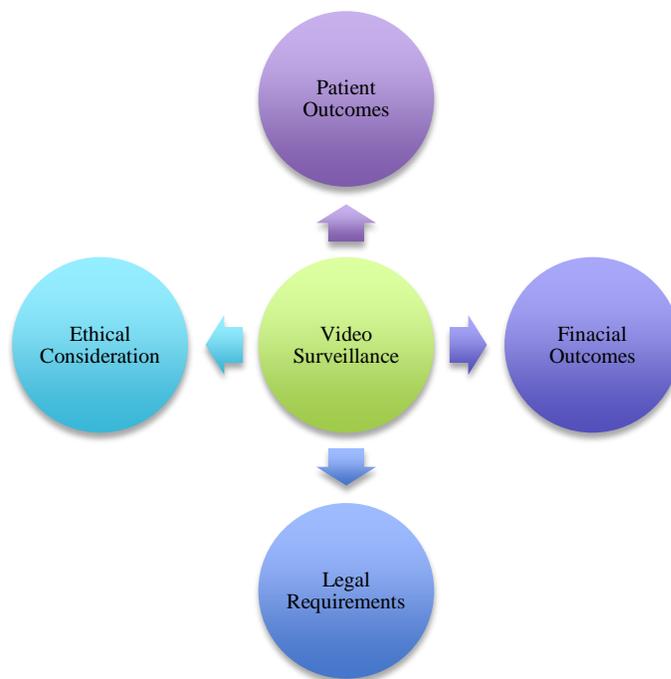
The purpose of this review of literature is to investigate published findings that examine the impact of VS in the ICU on (1) patient outcomes, (2) financial outcomes, (3) legal requirements and (4) ethical boundaries and ramifications. VS may be coupled with additional surveillance technology, which is known as telemedicine. As such, literature will be reviewed under telemedicine and VS, or remote bedside monitoring.

Method

To best explore the topic, a review of literature will be conducted using databases specialized in healthcare topics as well as legal and ethical matters. These databases include CINAHL Plus, MEDLINE – EBSCOhost, Cochrane, LexisNexis, and Philosopher’s Index. Inclusion criteria include case studies pertaining to the United States health care and legal systems. Further criteria include original research conducted in the United States and published in peer-reviewed journals as well as any supplemental information offered by literature reviews

published in peer-reviewed journals or newspaper/online articles. The U.S. Constitution, Federal and State Statutes, and court case studies are included. With regards to literature on ethical matters, anecdotal reports will be considered. Exclusion criteria include original case and academic studies conducted outside of the United States due to the cultural and legal differences of other countries.

Figure 1



AN INVESTIGATION OF VIDEO SURVEILLANCE

This thesis examines both VS coupled with two-way audio technology versus VS that transmits video only. Telemedicine is defined as VS coupled with technology that enables live communication. Because the purpose of this thesis is to investigate VS use in the ICU, telemedicine is synonymous with “tele-ICU” and “E-ICU”. In contrast to telemedicine, remote bedside monitoring refers to video surveillance without two-way audio communication capabilities. Remote bedside monitoring enables a healthcare worker to keep watch over a patient from a remote location.

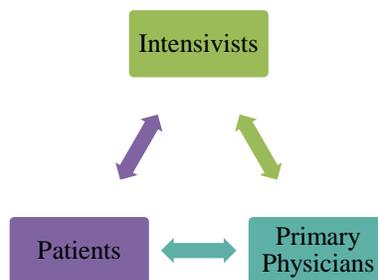
Telemedicine

Today, VS is an important component of telemedicine – ICU (tele-ICU). Tele-ICU facilitates the remote delivery of patient care services using interactive audio, video, and electronic links (Impact Advisors, LLC, 2010). Essentially, this technology connects patients, primary care, and specialty providers i.e. intensivists, and enables the collaboration and delivery of care. The Leapfrog Group (2008) defines intensivists as: (1) board-certified physicians who are additionally certified in the subspecialty of critical care medicine; (2) physicians board-certified in emergency medicine who have completed a critical care fellowship in the American College of Emergency Physicians program; or (3) physicians board-certified in Medicine, Anesthesiology, Pediatrics or Surgery who completed training prior to the availability of subspecialty certification in critical care and who have provided at least six weeks of full-time ICU care annually since 1987.

Jarrah and Van der Kloot (2010) write that since its introduction in the early 1980s, telemedicine has facilitated on-demand information exchange between hospitals in need and ICU

specialists, otherwise known as intensivists. In the past, health care providers who were separated by distance depended on this technology to transmit images such radiographs or labs results in order to diagnosis conditions and provide the best care. Today, tele-ICU has developed into a third party provider of patient care. The standard tele-ICU model is a surveillance center where tele-ICU intensivists care for patients using technology that enables real time information exchange with both on-site intensivists and their patients. Tele-ICU intensivists make rounds via monitoring equipment and microphones through which live data is fed. The monitors aim to create a well-rounded picture of the patient via transmitted electronic medical data such as audio-visual surveillance, patient physiologic parameters, radiographic images, physician notes, etc. Coupled with bedside care, Tele-ICU intensivists can asses the patients, monitor for patient complications, and collaborate with an on-site health care team to help determine the best patient care.

Figure 2



According to Society of Critical Care Medicine (2012), more than 5 million U.S. residents are admitted into the ICU every year. For most hospitals, the estimated ICU mortality rate is between 10% and 20% (The Leapfrog Group, 2008). On average, the ICU patient receives about 50% of prescribed treatments and suffers from 1.7 preventable health complications. Failure to resuscitate contributes to nearly 55,000 patient deaths per year (Gorman, 2011).

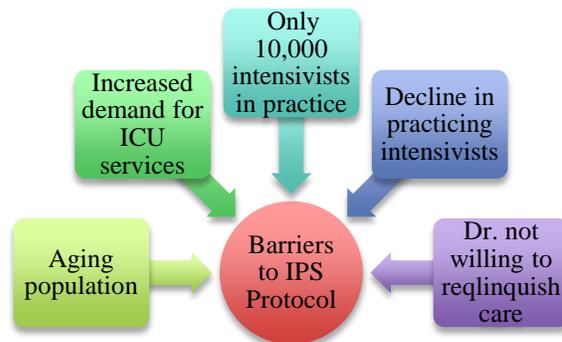
The Leapfrog Group (2008) cites research by ICU specialist Dr. Peter Pronovost, who compared the outcome of high intensity staffing (aka closed model) i.e. when intensivists manage or co-manage all patients versus low intensity staffing (aka open model) i.e. when intensivists manage or co-manage some or none of the patients. The closed model is associated with a 30% reduction in hospital mortality and a 40% reduction in ICU mortality. These findings serve as the basis for their ICU Physician Staffing (IPS) Protocol. Hospitals fulfilling the IPS Standard operate adult or pediatric general medical, surgical and neuro ICUs that are managed or co-managed by intensivists who are present during daytime hours and provide clinical care exclusively in the ICU and when not present on site or via telemedicine, returns pages at least 95% of the time, (i) within five minutes and (ii) arranges for a Fundamental Critical Care Support certified physician or physician extender to reach ICU patients within five minutes.

A 2007 survey by the Leapfrog Group found that of those hospitals questioned, 30% fully met the IPS Standard. For participating hospitals, a number of factors create challenges for meeting this objective. For example, physicians may be unwilling to relinquish any primary care duties to intensivists, of which there are currently 10,000 in active practice in the U.S. (Jarrah & Van der Kloot, 2010). The number of intensivists is estimated to decrease by 35% over the next 20 years (DeGaspari, 2012). It is reported that between 2000 and 2030, the U.S. population 65 and over old will double to represent about 20% of the total population (Sapirstein, Lone, Lati, Fackler, & Pronovost, 2009).

According to the Centers for Disease Control and Prevention (2013), 80% of older adults have one chronic condition, and 50% have at least two chronic conditions. As such, as the older

adult population doubles, ICUs will likely experience an increase in demand age related services. While all organizations are likely to feel the impact, those most at are risk are “underserved rural areas, small hospitals without access to intensivists, and large hospitals with low-intensity physician-staffing models or nocturnal physician shortages” (Wilcox & Adhikari, 2012, Introduction section para. 2). Even so, many small hospitals lack the resources to compensate for full-time intensivists coverage.

Figure 3



In order to provide quality care within affordable means, a number of hospitals have integrated telemedicine into their ICUs (Goran, 2012). Sapirstein et al. (2009) refer to previous research to illustrate telemedicine advantages, such as (1) providing intensivists to ICUs in need, (2) prolonging ICU physician oversight, (3) augmenting compliance with evidence-based guidelines, and (4) facilitating earlier recognition and preventative actions.

More than 1 million ICU patients have received telemedicine intervention. Currently Philips-VISICU, the first and largest supplier of the technology, provides infrastructure to over 5,900 beds across 42 health care networks. This translates to 10% of ICU bedside care in the United States (Jarrah & Van der Kloot, 2010). Analysts project continued growth for the tele-ICU market.

Patient outcomes

A review of literature was conducted using nursing databases CINAHL, MEDLINE-EBSCOhost, and Cochrane and the following keywords: implementation, telemedicine, outcome, and ICU. Inclusion criteria consisted of original studies on the effect of tele-ICU on patient outcomes published after 2008. The search produced 12 original case studies. These articles were further divided into five study objectives. These objectives examine the impact of tele-ICU on 1) ICU length of stay and mortality, 2) in-hospital length of stay and mortality, 3) best practice compliance, 4) mortality and length of stay in ICUs that previously used 24/7 intensivist staffing, and 5) regional and tertiary ICU length of stay and regional and tertiary ICU mortality. Table 1 organizes published authors by study objective.

Figure 4

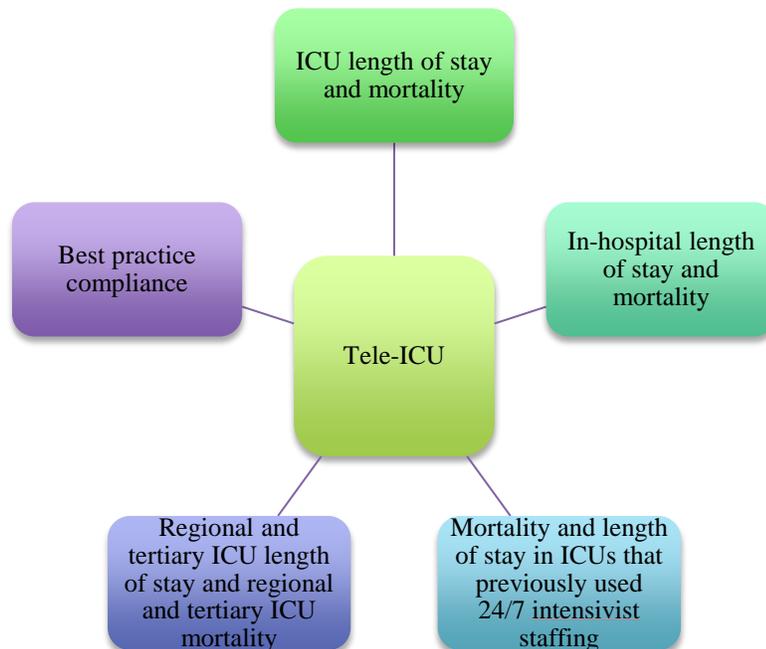


Table 1

Published author(s) organized by study objective related to patient outcomes	
Study objective	Author (year)
To examine the impact of tele-ICU intervention on ICU length of stay and mortality.	Kohl et al. (2012) Willmitch et al. (2012) Young et al. (2011) Morrison et al. (2010) Howell et al. (2008) Lilly et al. (2011) McCambridge et al. (2010) Thomas et al. (2009)
To examine the impact of tele-ICU intervention on in-hospital length of stay and mortality.	Kohl et al. (2012) Willmitch et al. (2012) Young et al. (2011) Morrison et al. (2010) Howell et al. (2008) Lilly et al. (2011) McCambridge et al. (2010)
To examine the impact of tele-ICU intervention on best practice compliance.	Armellino et al. (2012) Lilly et al. (2011) McCambridge et al. (2010) Cowboy et al. (2009)
To examine the impact of tele-ICU intervention on mortality and length of stay in ICUs that previously used closed staffing model, i.e. 24/7 intensivist staffing.	Wood et al. (2011) McCambridge et al. (2010)
To examine the impact of tele-ICU intervention on regional and tertiary ICU length of stay and regional and tertiary ICU mortality.	Zawada et al. (2009)

Table 2 displays original publications about tele-ICU impact on patient outcomes. Each study used a before-and-after design in order to correlate tele-ICU intervention and patient outcome, as defined by mortality and length of stay. All authors but Thomas, Lucke, Wueste, Weavind, and Patel, (2009); and Morrison et al. (2010) reported improved patient outcomes with tele-ICU intervention. The complexity of the telemedicine models hinders comparison between research findings. For example, Lilly et al. (2011); Kohl et al. (2012); and Willmitch, Golembeski, Kim, Nelson, and Gidel, (2012) found improved patient outcomes with tele-ICU intervention in both ICU and hospital populations. In contrast, Young et al. (2011) found that

tele-ICU intervention did not significantly improve patient outcomes in the hospital population. However, it is suggested that an inadequate sample size hindered statistical accuracy.

Research supports reduced patient complications related to increased compliance to best practices. Lilly et al. (2011) found that tele-ICU intervention decreased incidence of deep vein thrombosis, stress ulcers, and ventilator-associated pneumonia and increased cardiovascular protection. Research by Armellino et al. (2012) suggests that video auditing combined with real-time feedback facilitates improved hand hygiene practice. Cowboy, Simmons, Miller, Donelan, and Silkey (2009) demonstrated that education via tele-ICU helped to prevent incidence of air embolism in ICU patients.

Despite any differences among the ICUs staffing model, Willmitch et al. (2012) denotes one common finding among published data. Greater tele-ICU participation leads to improved patient outcome. Franzini, Sail, Thomas, and Wueste (2011) points out that although Thomas et al. (2009) and Morrison et al. (2010) did not find significant correlation between patient outcomes and tele-ICU intervention, tele-ICU coverage was minimal in both studies. Only one third of the attending physicians delegated to the tele-ICU team full authority, i.e. the tele-ICU could give routine orders, change treatment plans, and intervene for life-threatening situations, while two thirds of the physicians delegated to the tele-ICU team minimal authority i.e. the tele-ICU could intervene in life-threatening situations only. The lack of tele-ICU coverage serves to explain lack of correlation between tele-ICU intervention and patient mortality. Because outcomes related to tele-ICU intervention is more favorable, bedside physicians should willing to collaborate with the tele-ICU (Jarrah & Van der Kloot, 2010). Additional studies are needed in

order to better understand the learning curve related to telemedicine implementation, including the rate at which intensivists are comfortable integrating this technology into their patient care.

Table 2

Tele-ICU impact on patient outcome, length of stay, and best practice compliance		
Author (date)	Study description	Findings/Conclusion
Armellino et al. (2012)	An observational study in a 17-bed intensive care unit from June 2008 through June 2010.	<p><u>Best practice compliance</u> 16-week pre-feedback period: hand hygiene rates = less than 10% 16-week post-feedback period hand hygiene rates = 81.6%</p> <p>The increase was maintained through 75 weeks at 87.9%</p> <p><u>Conclusion</u> Intervention is associated with sustained improvement in hand hygiene.</p>
Kohl et al. (2012)	An observational study of patient outcomes in two intensive care units in the same hospital. The surgical ICU (SICU) implemented telemedicine and electronic medical records, while the medical ICU (MICU) did not. In the SICU, records were obtained for 246 patients before and 1499 patients after implementation; in the MICU, records were obtained for 220 patients and 285 patients in the same periods.	<p><u>ICU length of stay severity-adjusted mean</u> MICU 0.84 day increase (5.27 days to 6.09 days) SICU 2.39 days increase (6.25 days to 3.86 days)</p> <p><u>ICU mortality severity-adjusted mean</u> MICU 0.12% decrease (0.54% to 0.42%) SICU 0.08% decrease (0.09% to 0.01%)</p> <p><u>Hospital length of stay severity-adjusted mean</u> MICU 1.6 days decrease (12.5 days to 10.9 days) SICU 2.3 days decrease (19 days to 16.7 days)</p> <p><u>Hospital mortality severity-adjusted mean</u> MICU 0.18% decrease (0.74% to 0.56%) SICU 0.09% decrease (0.13% to 0.04%)</p> <p><u>Conclusion</u> Intervention is associated with decreased ICU length of stay, ICU mortality, and hospital mortality for the SICU patients.</p>
Willmitch et	Observational study. The post periods are	<u>Length of stay severity adjusted</u>

al. (2012)	1, 2, and 3 years after telemedicine intensive care unit program implementation at each hospital Ten adult intensive care units (114 beds) in five community hospitals in south Florida	Hospital: 1.7 days decrease (11.86 days to 10.16 days) ICU: 0.55 day decrease (4.35 days to 3.8 days) <u>Patient mortality risk severity adjusted</u> 0.77% decrease <u>Conclusion</u> Intervention is associate with decreased hospital length of stay, ICU length of stay, and patient mortality.
Lilly et al. (2011)	Prospective stepped-wedge clinical practice study of 6290 adults admitted to any of 7 ICUs (3 medical, 3 surgical, and 1 mixed cardiovascular) on 2 campuses of an 834-bed academic medical center that was performed from April 26, 2005, through September 30, 2007.	<u>ICU Length of stay:</u> 3.5 days decrease (13.3 days to 9.8 days) <u>ICU Patient mortality (% of total population):</u> 1.8% decrease (13.6 to 11.8%) <u>Best practice compliance (% of total population)</u> Prophylaxis for deep vein thrombosis: 14.5% increase (85% to 99.5%) Prophylaxis intervention for stress ulcers: 13% increase (83% to 96%) Cardiovascular protection: 19% increase (80% to 99%) Prevention of ventilator-associated pneumonia: 19% increase (33% to 52%) <u>Patient complications (% of total population)</u> <u>Ventilator associated pneumonia</u> 11.4% decrease (13% to 1.6%) <u>Catheter-related blood stream infection</u> 0.4% decrease (1% to 0.6%) <u>Acute Kidney Injury</u> No change (12%) <u>Conclusion</u> Intervention is associated with ICU mortality, ICU length of stay. and patient complications. VS intervention is associated with in increased adherence to best practice compliance.
Wood et al. (2011)	Random selection of 200 pre-intervention patient charts from the Adult ICU from year 2009.	<u>ICU Length of stay</u> 1.83 days decrease (6.79 days to 4.96 days) <u>ICU Patient mortality</u> Expected mortality: 280

		<p>Actual mortality: 198 Lives saved: 82 in the first 10 months of operations.</p> <p><u>Conclusion</u> Intervention is associated with decreased patient mortality and length of stay.</p>
Young et al. (2011)	<p>Systematic review of 13 studies published from January 1950 through September 2010; before-and-after treatment comparison; 41,374 patients (15,667 pre–tele-ICU and 25,707 post–tele-ICU patients).</p>	<p><u>Length of stay</u> ICU: 1.25 days decrease Hospital: 0.64 day decrease</p> <p><u>Patient mortality rate</u> ICU: reduction in ICU mortality (pooled odds ratio, 0.80) Hospital (pooled odds ratio, 0.82)</p> <p><u>Conclusion</u> Intervention is associated with decreased ICU mortality, ICU length of stay, and hospital length of stay. Intervention is not associated with decreased hospital mortality.</p>
McCambridge et al. (2010)	<p>Observational study of actual practice in a 727–licensed bed community teaching hospital. The Pre-implementation group consisted of 954 control patient over 16 months; post-implementation group consisted of 959 patients over 10 months.</p>	<p><u>Length of stay</u> ICU: 0.29 day decrease (4.06 days to 3.77 days) Hospital: No change: (9.2 days)</p> <p><u>Patient mortality rate</u> ICU: 4.3% decrease (15.8% to 11.5%) Hospital: 6.7% decrease (21.4% to 14.7%)</p> <p><u>Best practice compliance</u> Ventilator use rate: 4.6% decrease (36.1% to 31.5%)</p> <p><u>Conclusion</u> Intervention is associated with decreased patient mortality, length of stay, and less ventilator use in critically ill patients.</p>
Morrison et al. (2010)	<p>Observational study with one baseline period and two comparison periods (eICU wave one and eICU wave two). Each time period was 4 months in duration. Four ICU from two community hospitals in the metropolitan Chicago</p>	<p><u>Length of stay:</u> Hospital: 0.88 day increase (7.72 days to 8.6 days) ICU: 1.89 days increase (2.6 days to 4.49 days)</p> <p><u>Patient mortality rate</u> Hospital mortality: 0.6% decrease (3.5% to 2.9%)</p>

	area. Hospital one is a 610-bed teaching hospital with three adult ICU (ten-bed medical ICU, ten-bed cardiac ICU, and 14-bed surgical ICU). Hospital two is a 185-bed nonteaching hospital with a ten-bed mixed medical/surgical ICU.	<p>ICU mortality: 0.8% increase (6.6% to 7.4%) Total mortality: No change</p> <p><u>Conclusion</u> Intervention is not associated with a decrease in ICU length of stay, hospital length of stay, hospital mortality, and ICU mortality.</p>
Cowboy et al. (2009)	Tele-medicine coaching and documentation of Trendelenburg position for removal of a central venous line from intubated patients.	<p><u>Best practice compliance</u> Intervention associated with 3 potential cases of air embolism prevention during the first 2 months of use.</p>
Thomas et al. (2009)	Observational study conducted in 6 ICUs of 5 hospitals in a large US health care system to assess the use of tele-ICU. The study included 2034 patients in the pre-intervention period (January 2003 to August 2005) and 2108 patients in the post-intervention period (July 2004 to July 2006).	<p><u>Length of stay</u> ICU: 0.3 day increase (4.3 days to 4.6 days) Hospital: 1.9 days increase (9.8 days to 10.7 days)</p> <p><u>Patient mortality rate</u> ICU: 1.4% decrease (9.2% to 7.8%) Hospital: 2.1% decrease (12% to 9.9%)</p> <p><u>Conclusion:</u> Intervention is associated with decreased ICU mortality and decreased hospital mortality. Intervention is not associated with decreased ICU length of stay and hospital length of stay.</p>
Zawada et al. (2008)	Pre-implementation (2004) and post-implementation (2005–2007) comparisons in regional and tertiary hospital observations: 2793 patient observations in the three regional hospitals; 2633 patient observations for the tertiary hospital.	<p><u>Length of stay rate</u> Regional hospitals: facilities (actual to predicted ratio): Pre-intervention group: 0.67, 0.79, 0.79; Tele-ICU group: 0.64, 0.65, 0.74. Tertiary hospital – 1 facility (actual to predicted ratio): Pre-intervention group: 0.92; Tele-ICU group: 0.75</p> <p><u>Patient mortality rate</u> Regional hospital mortality – 3 facilities: Pre-intervention group: 4.7%, 4.8%, 9.6%; Tele ICU group: 4.4%, 6.1%, 5.9%. Tertiary hospital mortality – 1 facility (actual-to-predicted ratio): Pre-intervention group: 0.62; Tele ICU group: 0.56</p> <p><u>Conclusion:</u> Intervention is associated with decreased length of stay and patient mortality</p>

<p>Howell et al. (2008)</p>	<p>A before-and-after comparison of outcomes 1 year prior to remote telemonitoring implementation to two years after implementation in three tertiary hospital ICUs. Data were available on 700 patients in 2004 (pre), and 1672 patients in 2006, and 2920 patients in 2007 (post)</p>	<p><u>Length of stay</u> ICI: 0.84 in 2004 to 0.56 in 2006 to -0.03 in 2007. Hospital: 0.97 to 0.32 to -0.64</p> <p>Decreased length of stay resulted in 4772 saved ICU days and 6091 saved floor days</p> <p><u>Patient mortality rate</u> Improved ICU mortality (p=0.159) and improved hospital mortality (p=0.214).</p> <p><u>Conclusion</u> Intervention is associated with decreased patient mortality, hospital length of stay and ICU length of stay.</p>
-----------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Financial outcomes

The Society of Critical Care Medicine (2012) illustrates the increasing economic burden of critical care services on hospitals in the US:

Between 2000 and 2005, annual critical care medicine costs increased from \$56.6 to \$81.7 billion, representing 13.4% of hospital costs, 4.1% of national health expenditures, and 0.66% of gross domestic product. Cost savings up to \$1 billion per quality-adjusted life year can be attained with critical care management of severe sepsis, acute respiratory failure, and general critical care interventions. Twenty-four-hour intensivist staffing reduces ICU costs and length of stay. Up to \$13 million in annual hospital cost savings can be realized when care is delivered by an intensivist-directed multiprofessional team. (Cost Savings section, para. 1)

Medicare covers more than 44 million people and is, by far, the largest provider of health care insurance (United States Census Bureau, 2010). In 2008, the Centers for Medicare and Medicaid Services (CMS) announced it would no longer reimburse a number of patient-hospital acquired complications, thus saving \$20 million in direct payments per year (Buerhaus & Kurtzman, 2008). Table 3 shows hospital-acquired complications that are no longer eligible for Medicare reimbursement. Further impacting hospital spending is the Hospital Readmission Reduction Program per the Affordable Care Act. Effective since 2012, if a patient is readmitted within 30 days of discharge, CMS no longer reimburse hospital costs for that patient (Centers for Medicare and Medicaid, 2013).

A review of literature by Buerhaus and Kurtzman (2008) reports that every year medical errors account for 2.4 million additional hospital days and \$9.3 billion in extra charges, but that

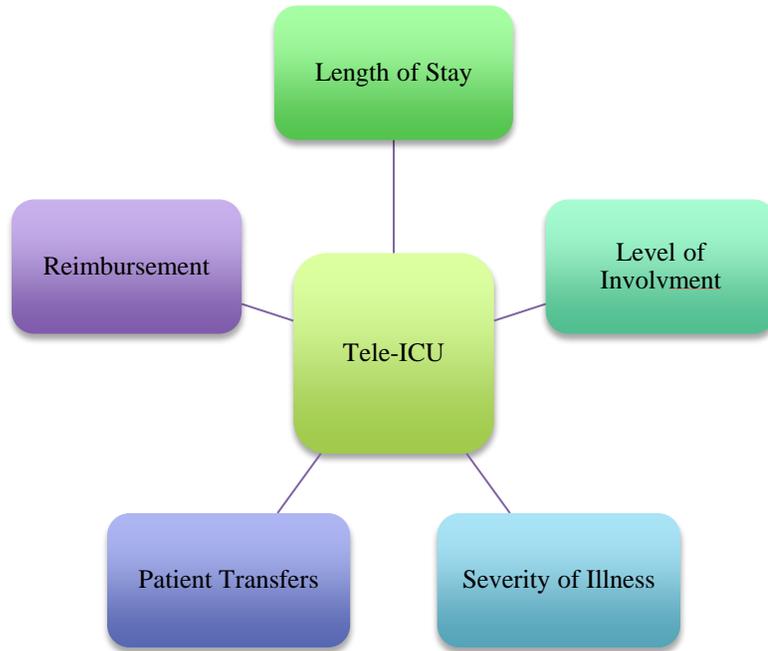
early risk assessment, surveillance, diagnosis, treatment, and education is able to reduce the incidence of pressure ulcers, falls, and infections.

Table 3

Hospital-acquired complications no longer eligible for Medicare reimbursement			
Hospital-acquired complication	Number of cases in 2007	Average costs per case in 2007	Total Estimate
pressure ulcers	257,412 (stage III & IV)	\$43,180	\$11,115,050,160
preventable injuries such as fractures, dislocations, and burns	193,566	\$33,894	\$6,560,726,004
vascular catheter-associated infections	29,536	\$103,027	\$3,043,005,472
catheter-associated UTI's	12,185	\$44,043	\$536,663,955
objects mistakenly left inside surgical patients	750	\$63,631	\$47,723,250
Certain surgical site infections	69	\$299,237	\$20,647,353
air emboli	57	\$71,636	\$4,083,252
blood incompatibility reactions	24	\$50,455	\$1,210,920

To further understand the economic impact related to tele-ICU intervention, a review of literature was conducted using these keywords: telemedicine, tele-ICU, ICU, cost, and economics. Inclusion criteria were original research about the impact of telemedicine on hospital costs reduction published from 2004 to current. The search produced seven research articles, which were further divided into five study objectives. These study objectives measure variable cost savings related to tele-ICU impact on 1) length of stay, 2) reimbursements, 3) patient transfers, 4) level of tele-ICU involvement, and 5) severity of illness. Table 4 organizes published authors by study cost objective.

Figure 5



As the majority of research continues to support supplemental tele-ICU care as an alternative to twenty-four-hour intensivists staffing, the economic viability of the tele-ICU model remains compelling. Hospitals may only realize cost savings through improved ICU efficiency; tele-ICU services are unbillable (Sapirstein et al., 2009).

Table 4

Published author(s) organized by study objective related to financial outcomes	
Study objective	Author (date)
To measure cost savings related to tele-ICU impact on length of stay	Rufo (2009) Kohl, et al. (2007) Breslow, et al. (2004)
To measure cost savings related to tele-ICU impact on reimbursements	Rincon, et al. (2007) Hine (2006)
To measure cost savings related to tele-ICU impact on patient transfers	Zawada, et al. (2008)
To measure cost savings related to tele-ICU impact on tele-ICU involvement	Morrison, et al. (2010)
To measure cost savings related to tele-ICU impact on severity of illness	Franzini, et al. (2011)

Improved patient outcomes as evidence by reduced mortality and length of stay implies potential cost savings. Goran (2012) refers to length of stay as the key determinate of ICU variable cost. In addition to length of stay, other influential cost factors include patient transfers, reimbursements, tele-ICU involvement, and severity of illness.

Because most hospitals' accounting systems measure billing and reimbursement rates rather than actual costs, measuring the impact of tele-ICU intervention related to ICU variable costs is an ambitious task. Even with a shortened length of stay, variables like patient illness and reimbursement rate hinder correlation between tele-ICU and economic viability. The installation and overhead costs, “unlike other new technologies, the installation cost per bed of tele-ICU systems has not changed much in the last 10 years but we assume that manpower costs will continue to rise with scarcity of supply” (Saperstein et al. 2009, Cost-Benefit, para. 1). Based on the VISICU tele-ICU model, the cost to install a tele-ICU system for the average sized ICU (although exact size is undefined) is estimated to be more than \$2 million, which includes the \$30,000-50,000 cost in equipment and licensing fees per bed and the establishment of a third party control center. Manpower accounts for the largest component of costs, recently estimated to be between \$ 1-2 million dollars. Saperstein et al. further comments, “The Lehigh Valley Health System tele-ICU has determined that it requires between 5-7 full time intensivists to adequately staff each tele-intensivist position; this is roughly the same number of intensivists that it takes to staff a physical ICU” (2009, Cost-Benefit, para. 1). Table 5 details primary research that depicts costs saving with tele-ICU intervention. Due to complexity of the tele-ICU model, in order to better comprehend the economic viability of this technology, more research is needed.

Table 5

Tele-ICU impact on hospital costs		
Author (date)	Study description	Findings/Conclusion
Franzini et al. (2011)	<p>Observational study with ICU patients cared for during the pre–tele-ICU period and ICU patients cared for during the post–tele-ICU period in 6 ICUs at 5 hospitals that are part of a large nonprofit health care system in the Gulf Coast region. Data from a sample of 4142 ICU patients: 2034 in the pre–tele-ICU period and 2108 in the post–tele-ICU period.</p> <p>Type of costs savings: Hospital costs and costs of operating the tele-ICU.</p>	<p><u>Findings</u> Hospital daily cost increased from \$4302 to \$5340 (24%) Hospital cost per case increased from \$21,967 to \$31,318 (43%) Cost per patient increased from \$20,231 to \$25,846 (28%).</p> <p>Most of these increases in costs are because of increases in ICU costs (77% for average daily costs; 67%, costs per case; and 50%, patient costs)</p> <p><u>Conclusion</u> For the sickest patients, costs per patient increased by \$2985, which was not statistically significant, and hospital mortality decreased significantly by 11.4%. The tele-ICU intervention is cost-effective for the sickest patients.</p>
Morrison et al. (2010)	<p>Observational study with one baseline period and two comparison periods (eICU wave one and eICU wave two). Each time period was 4 months in duration. Four ICU from two community hospitals in the metropolitan Chicago area. Hospital one is a 610-bed teaching hospital with three adult ICU (ten-bed medical ICU, ten-bed cardiac ICU, and 14-bed surgical ICU). Hospital two is a 185-bed nonteaching hospital with a ten-bed mixed medical/surgical ICU.</p> <p>Type of costs savings Direct variable, direct fixed, and indirect fixed costs incurred during each patient's entire hospitalization were summed.</p>	<p><u>Findings</u> Costs for patients experiencing the low-level tele-ICU involvement increased by \$1400. Costs for patients experience high-level tele-ICU involvement increased by \$710.</p> <p><u>Conclusion</u> Tele-ICU implementation resulted in increased expenditure; the rate of increase was steeper for those patients whose physicians only permitted a low level of eICU involvement for their patients.</p>

Rufo (2009)	<p>Resurrection HealthCare (RHC), Chicago, Ill., integrated 182 monitored critical care beds with virtual ICU technology over a 15-month period.</p> <p>Type of cost savings: Demonstrated ROI related to decreased length of stay.</p>	<p><u>Findings</u> Decreased LOS by 38% equated \$ 3 million savings Decreased blood transfusion by 7% equated \$11,200 Improved quality with avoidance of potentially paid settlement claims was approximated at \$5–6 million savings</p> <p><u>Conclusion</u> Tele-ICU implementation resulted in cost savings.</p>
Zawada et al. (2008)	<p>This study evaluates the impact of a critical care telemedicine program based in Sioux Falls SD to 3 small (<100 beds) and 8 critical access hospitals (<25 beds) across a four-state region. The survey was sent to 11 networked hospital administrators and lead clinical staff. These hospitals had been receiving remote critical care services for 3-20 months.</p> <p>Type of cost savings: Cost of patient transport to the closest tertiary facility.</p>	<p><u>Findings</u> In the first 2.5 years, decrease in 160 (37.7%) patient transfers to tertiary hospitals by 37.7%. Savings of over \$1.2 million given estimated patient transfer costs of \$5,800 – \$10,800</p> <p><u>Conclusion</u> Tele-ICU implementation resulted in cost savings.</p>
Kohl et al. (2007)	<p>Retrospective comparison of a random sample of 189 patients pre-eICU to 2,622 patients 3 years post eICU using a multiplier of 13.87 to normalize populations.</p> <p>Type of cost savings: The present study demonstrated cost savings from LOS reduction. Assumptions based upon published literature include an average surgical ICU cost per day of \$1,500-\$2,000 and an average daily cost on a general floor of \$500-\$600.</p>	<p><u>Findings</u> ICU savings between \$706,272 and \$941,697 Hospital savings between \$2,134,339 and \$2,842,940</p> <p><u>Conclusions</u> Implementation resulted in cost savings</p>

<p>Rincon et al. (2007)</p>	<p>Education of physicians and nurses in documentation and screening process of severe sepsis and septic shock and mortality began in January 2009. Two complete years of before-data were compared to one-half year of post-data Jan-June 2009. Statistical analysis using variant of the chi square test was used.</p> <p>Type of costs savings: Reimbursements related to rates of documentation (coded ICU discharges per interval) of severe sepsis and septic shock and mortality</p>	<p><u>Findings</u> Sepsis bundle implementation showed the following changes over the 11 months: Antibiotics within 2 hours went from 51% to 79% (p<.001), blood cultures drawn before antibiotics from 63% to 74% (p<.001), lactate measurement from 49% to 55% (p=.07), and baseline labs from 78% to 84% (p=.003).</p> <p><u>Conclusion</u> Implementation increases the documentation of severe sepsis and septic shock and reduces reported mortality rates. It is likely that DRG-based reimbursement will increase.</p>
<p>Breslow et al. (2004)</p>	<p>The supplemental remote care program initiated over a 3-month period from July through September of 2000. Average daily ICU and floor costs were determined for each ICU during the two study periods from individual patient charge data.</p> <p>Type of cost savings: The present study demonstrated cost savings from both LOS reduction and a decrease in daily costs. Cost savings were calculated based on individual departmental cost to charge ratios of the study hospital and national estimates of departmental variable cost ratios.</p>	<p><u>Findings</u> Variable costs per case: decreased by \$2,556 or 26.4%. ICU length of stay decreased by 30%.</p> <p><u>Conclusion</u> Implementation resulted in increased cost savings.</p>

Remote bedside monitoring

Remote bedside monitoring utilizes video to keep surveillance of patients via cameras placed in the their room. Video is transmitted into monitors, which may be located on-site or off-site. To maintain patient privacy, video is not stored. A review of literature demonstrates that a number of hospitals are using remote bedside monitoring to help prevent patient falls. The newest use of VS has emerged in the Neonatal Intensive Care Unit (NICU). Because the sickest newborns will spend the first months of their lives in the NICU, hospitals across the country are using web cameras in order to give parents a view of their infant from a computer. Hospitals may promote web cameras in the NICU as an incentive for expecting parents to use their services. This thesis will review the use of remote bedside VS under hospital and family use.

Hospital use

The American Academy of Orthopaedic Surgeons (AAOS) states, “each year, more than 11 million people older than 65 years of age fall - one in three senior citizens; in hospitals, approximately 3 to 20 percent of inpatients fall at least once during their stay” (2011, para. 2). According to the CMS, although falls account for the leading cause of in-hospital injury, they are preventable (AAOS, 2011). Therefore, hospital costs associated with falls are not eligible for reimbursement. Fitzpatrick (2011) reports “the average hospital stay for patients who fall is 12.3 days longer, and injuries from falls lead to a 61% increase in patient-care costs” (“Introduction to Supplement,” para. 3). The economic costs are astounding. It is estimated the United States spends \$20.2 billion annually to treat fall injuries and complications related to fall injuries (AAOS, 2011). Jorgenson (2011) points out that according to the Centers for Disease Control and Prevention “medical costs related to falls totaled more than \$19 billion in 2007–\$179 million

for fatal falls and \$19 billion for nonfatal fall-related injuries. By 2020, the annual direct and indirect cost of fall injuries is expected to reach \$54.9 billion” (“Reducing Patient Falls,” para. 4). In addition, Glower (2013) writes that the most common fall related fracture is the hip fracture, accounting for 44% of direct medical costs with hospital costs at about \$18,000 (2013). Alarming, “one out of five hip fracture patients die within a year of their injury” (para. 4).

Staffing is the primary factor associated with limiting patient falls during hospital stays (Tzeng, Yin, & Grunawalt, 2008). Research demonstrates increased fall rates are associated with fewer nursing hours per patient day (Goodlett, Robinson, Carson, & Landry 2009). However, many hospitals may not be willing or able to hire additional nursing staff. Traditionally, the primary solution has been to use patient sitters - personnel hired to observe the patient and notify staff when he or she is at risk i.e. getting out of bed without assistance or pulling on catheters. A number of organizations have since questioned the effectiveness of patient sitters. Harding (2010) found that the “actual productive sitter hours” had no correlation to patient fall rate and suggests that there is “no rationale to provide the sitter service without a definitive positive relationship of the sitter use and patient outcome” (p. 335). Boswell, Ramsey, Smith, and Wagers (2001) examined the cost effectiveness of patient sitters and found that patient sitters marginally impact patient falls and satisfaction as revenue increases by only \$3.76 per shift. In comparison, the cost totaled \$160.00 per shift, resulting a net expense of \$156.24 per shift. Because third party providers do not typically reimburse for sitter costs, each year hospitals spend about \$1.3 million for sitters (Spiva et al., 2012). As an alternative to hiring a sitter, some hospitals ask families to provide a sitter, which shifts both increasing responsibility and burden to the family.

Mounting concerns related to the impact of patient sitters on patient falls and economic outcomes means that patient surveillance in the United States is at the forefront of change. Hospitals are turning to remote bedside VS to enhance patient outcomes at increased cost-effectiveness (Goodlett et al., 2009). Healthcare systems that have already incorporated remote bedside surveillance into their bedside care include Physicians Regional Healthcare System in Naples, FL, Ochsner Medical Center in New Orleans, LA, the Nebraska Medical Center, and the University of Utah Health Care. While a number of organizations, such as Physicians Regional Healthcare System and the Nebraska Medical Center report an increase in patient safety and decrease in overhead costs, the novelty of the system means that they lack sufficient data for an analysis. Nonetheless, a few organizations have studied the effect of remote bedside surveillance on patient falls and/or hospital expenses across the ICU and other units. These organizations include Goodlett et al. (2009) the University of Utah Health Care (2011), and Memorial Community Hospital (2013) in California.

Goodlett, et al. (2009) evaluated the effects of remote bedside surveillance in the internal medicine unit (34-beds) at Ochsner Medical Center in New Orleans, La. Researchers analyzed the fall rate for the entire unit before and after the VS project began and tracked number of falls that occurred in the camera rooms. High-risk fall patients were placed in one of the four camera rooms. Goodell, et al. “trained unlicensed assistive personnel (UAPs) on fall reduction interventions and video surveillance equipment use” which includes 24-hour monitor surveillance, shift report, and patient fall intervention – “going to the bedside, speaking to the patient through the call system, or alerting other staff by using SpectraLink wireless phone systems or intercom messages” (2009, “Developing and Implementing,” para. 4). After the unit

implemented remote bedside surveillance, the annual fall rate decreased by 6%. One fall occurred across a 12-month period. This fall “was related to failure of the monitoring staff to respond because the patient's behavior was misinterpreted” (Evaluating Outcomes, para. 3). In addition to decreased falls, a cost analysis further supports VS. For this project, acquisition and installation fees for surveillance and monitoring equipment totals \$3,000. Patient sitters cost \$240 per patient per day. Because VS requires only one monitoring person shift, sitter costs decreased from \$960 to \$240 for four patients per day. Therefore, VS may be an effective solution to reduce patient falls, costs associated with patient falls, and costs associated with patient sitters.

In January 2011, the University of Utah Health Care implemented remote bedside surveillance into the Neuro Acute Care unit. A trained health care assistant monitored six patient rooms via VS. The unit experienced a sharp decrease in falls. Table 6 depicts the number of falls over a five-month period. The two falls with video is attributed to staff still orientating to remote bedside surveillance.

Table 6

Neuro acute rehab unit falls	
Date	Number of falls
1/11	All falls: 12 With video: 2
2/11	All falls: 3 With video: 0
3/11	All falls: 5 With video: 0
4/11	All falls: 6 With video: 0
5/11	All falls: 4 With video: 0

The University of Utah Health Care saved \$282,000 associated with reduced patient sitter costs. Furthermore, patients reported feeling safer, and hospital staff reported a positive perception related to VS. Since the initial pilot program, all acute care units adopted VS.

In July 2011, the Community Memorial Hospital in Ventura, CA implemented remote bedside surveillance, which, like the above, hired a technician to watch the patient via video cameras and monitors. The program reports, “Throughout the year, as a result of implementing our fall reduction strategies, falls have decreased by 70 percent. The program is cost-effective and equally supported by staff and management” (Community Memorial Hospital, 2013, para. 7).

In regards to the aforementioned studies, limitations include a limited ability to generalize and a potential for the ‘Hawthorne effect,’ that is the phenomena where the act of being observed results in improved patient vigilance (Lopez, Gerling, Cary, & Kanak, 2010) and, therefore, outcomes. Furthermore, although “increased video surveillance of patients may alert nurses to an impending fall, the knowledge often occurs too late to prevent it ” (Study Limitations, para. 1). More research is needed to better demonstrate the impact of VS on patient falls and hospital finances.

Family use

VS is becoming the newest addition to benefit families of newborns in the NICU. In 2006 the University of Arkansas for Medical Sciences (UAMS) pioneered a NICU web camera system Angel Eye that allowed families to view their newborn via a computer. The UAMS hospital system integrated NICU web cameras into 21 private rooms. The cameras have both video and speaker capacity (Rhoads, Green, Lewis, & Rakes, 2012). With the speaker, the

mother can talk and sing to her newborn child. NICU nurses are considered the “super-users” of Angel Eye. In the medication room is a copy of the user guide, which provides detailed instruction on registering and discharging a family along with basic troubleshooting advice for camera and audio feed. To access the video, individuals can log into the Angel Eye website via the Internet. The parents can invite an unlimited number of users to access the system. The parents may also block uninvited users that log in to view their child. At any one time, up to 20 users can view the baby. Access to the live stream is continuous – 24 hours a day, 7 days a week.

Rhoads, Green, Lewis, and Rakes (2012) evaluated a “second-generation Angel Eye” over an 11-month period. Invited users were asked to rate the system. The survey contained 3 Likert scale questions that identified overall satisfaction as well as two open-ended questions. The survey user population consisted of 65 NICU family users and 239 individual users across 15 different states. According to the survey, “the number of times a user accessed a view of the neonate ranged from 1 time to 940 times. Thirty people only accessed the view 1 time, but 62 people accessed the video more than 50 times during their neonate’s hospitalization. Twenty users were selected to complete a satisfaction survey. The average satisfaction score was 4.75 out of 5, with 5 being ‘most satisfied’ (pp. 226-227). For now, the UAMS gives web camera priority to the families of the sickest babies.

According to Dr. Curtis Lowery, chairman of the OB-GYN department of UAMS, premature babies are likely to be irritable and cry more often than healthy babies. Consequently, it is these babies that are more likely to be shaken, i.e. victims of Shaken Baby Syndrome (Mcconnaughey, 2012). The hope is that Angel Eye can facilitate parent-baby bonding to

prevent these types of occurrences. In order to evaluate the effectiveness of web cameras to facilitate the parent-baby bond, research is currently being conducted at UAMS.

In addition to UAMS, Oschner Health System (OHS) near New Orleans, LA uses web cameras (without audio capacity) in their NICU. (Mcconnaughey, 2012). Blake Rutherford owner of HealthCare Observations Systems LLC equipped OHS with 53 web cameras. Users of the system can benefit from live feed, but video is never stored. However, parents are able to take screenshots of the video. According to Rutherford, his organization has installed 6 additional systems across hospital NICUs and has trial setups in 40 additional hospitals. The cost per camera is \$9,000, though; “a more basic version would cost a couple thousand or less” (Mcconnaughey, 2012, para. 20). A hospital that acquires a system may benefit by promoting the service to potential patients. Enthusiasm for this system coupled with favorable outcomes means that web cameras will likely become an additional service offered by NICUs across the country.

LEGAL REQUIREMENTS

Video surveillance, including telemedicine, is effective at delivering patient care in the ICU (Ashley, 2002). However, in the United States, people have a certain expectation to privacy. This expectation extends to a patient's medical record, which includes data collected from VS. As a result, certain legal barriers exist in regards to telemedicine integration into healthcare (Ashley, 2002). The legal restrictions on surveillance may come from at least four places: the U.S. Constitution, Statutory law, Regulatory law, and State law (Grosso, 2012).

The United States Constitution

While the United States Constitution may not expressly guarantee one's right to privacy, in *Griswold v. Connecticut*, 381 U.S. 479 (1965), the Supreme Court opined that the Bill of Rights does indeed guarantee a zone of privacy. The Supreme Court's decision mandated a reversal of Connecticut state law that banned "a crime for any person to use any drug or article to prevent conception". Delivering his opinion to the court, Justice Douglas stated "specific guarantees in the Bill of Rights have penumbras, formed by emanations from those guarantees that help give them life and substance. Various guarantees create zones of privacy. The Fourth and Fifth Amendments were described in *Boyd v. United States*, 116 U.S. 616, 630, as protection against all governmental invasions 'of the sanctity of a man's home and the privacies of life.'" Just like a person has a reasonable expectation of privacy in their home, a patient is entitled to certain privacy rights in regards to their healthcare.

Statutory Law

Within statutory law, privacy is protected under the Privacy Act of 1974 and the Health Insurance Portability and Accountability Act (HIPAA).

Privacy Act of 1974

The Privacy Act of 1974 mandates that federal agencies are prohibited from disclosing “any record which is contained in a system of records by any means of communication to any person, or to another agency, except pursuant to a written request by, or with the prior written consent of, the individual to whom the record pertains.” The Privacy Act is an important component of safeguarding patient health information for those admitted to the Veterans Affairs (VA) hospitals.

HIPAA

In 1996, the federal government passed HIPAA into law. Per HIPAA requirements, the Standards for Privacy of Individually Identifiable Health Information (“Privacy Rule”) became effective in 2000. According to the U.S. Department of Health and Human Services (HHS), the agency responsible for enforcing HIPAA, “Privacy Rule standards defines the use and disclosure of individuals’ health information—called ‘protected health information’ by organizations subject to the Privacy Rule — called ‘covered entities,’ as well as standards for individuals’ privacy rights to understand and control how their health information is used. A major goal of the Privacy Rule is to assure that individuals’ health information is properly protected while allowing the flow of health information needed to provide and promote high quality health care and to protect the public's health and well being.” Because telemedicine combines an on-site

medical team with a third party provider of care, an increasing number of people have access to a patient's medical record. In addition to these concerns, telemedicine communication transmission lends itself to unauthorized access. In order for telemedicine to comply with HIPAA, Watcher (2001) asserts:

Protocols must be scrupulously followed to ensure that patients are informed about all participants in a telemedicine consultation and that the privacy and confidentiality of the patient are maintained, as well as ensuring the integrity of any data images transmitted... fears about the reliability of the technology... would cause leave some wary of telemedicine. However, these concerns over the technology can be addressed through a combination of legal, technical and administrative security measures and patient education" ("How Does HIPAA Rule," para 2 - 3).

Regulatory Law

HHS is the federal agency responsible for enforcing HIPAA within the public and private sector. If a person's private medical records are violated, that person must contact HHS. HHS will then pursue the claims and follow through on one of two avenues: criminal prosecution or administrative penalties.

State Law: Florida Constitution

Found within the Florida Constitution is Florida Statute 381.026 - Florida Patient's Bill of Rights and Responsibilities, which mandates the following:

Each health care facility or provider shall observe the following standards:

Individual dignity

1. The individual dignity of a patient must be respected at all times and upon all occasions.
2. Every patient who is provided health care services retains certain rights to privacy, which must be respected without regard to the patient's economic status or source of payment for his or her care. The patient's rights to privacy must be respected to the extent consistent with providing adequate medical care to the patient and with the efficient administration of the health care facility or provider's office. However, this subparagraph does not preclude necessary and discreet discussion of a patient's case or examination by appropriate medical personnel.

Thus, Florida hospitals are authorized under state law to protect patient health information.

ETHICAL RAMIFICATIONS

Persons seeking to follow the law ask, “Can this be done?” Persons seeking to follow ethics ask, “Should this be done?” Ethics is an accepted understanding of what is right and wrong. Immanuel Kant, a central figure in modern philosophy, believed that morality is a man’s ability to live his life according to his own values and judgments (Johnson, 2012), given that he is both rational and free (Fried, 1981). For each person, morality is a singular concept, and for that person, it is fully realized when he is acting autonomously. An important voice to this argument is attorney Charles Fried, an expert in constitutional law who has published important political and moral works on privacy, liberty, and morality. His lecture titled “Is Liberty Possible?” (1981), opines on the relationship between man, liberty, and morality:

I know of nothing about man more valuable than his capacity to reflect about how his life should be lived, and to act on the conclusion of those reflections. This is a simple rendering of what Kant meant when he called man a moral being and defined moral nature as free and rational. (p. 94)

According to Fried, if an individual’s “efforts to live his life according to his judgment and choices” (p. 95) is impeded upon by the actions of others, his liberty has been violated. Liberty is “just the recognition of this moral status of flesh and blood men and women” (p. 95). Fried argued that privacy and liberty are connected, and a threat to one’s privacy is an assault on his liberty and thus, morality. Therefore, the ethics of privacy includes a conversation about liberty and morality.

Alan Westin (2003), an expert scholar in consumer data protection, defined privacy as the “the claim of an individual to determine what information about himself or herself should be

known to others...this, also, involves when such information will be obtained and what uses will be made of it by others” (p. 431). Privacy is an integral component of privileged communication, which enables a secure disclosure of information and “involves an organization’s ability to keep its promises of confidentiality” (Westin, 1976, p. 6).

In *The Ethics of Privacy Protection* (1990), John Moor points out “philosophers, like everyone, have been struck by the broad dissemination and the forceful impact of information technology (IT) during the last few decades. Therefore, it is not surprising that most contemporary philosophical accounts of privacy tie it closely to the concept of information” (p. 74). In *Social and Political Dimensions of Privacy* (2003), Westin illustrated this impact. Specifically, he cited how the passage of HIPAA into law in 1996, which mandated a nationwide shift of patient health information from a paper system to an IT system, reignited and heightened public concerns over privacy rights.

Video surveillance encroaches on the privacy of a patient. Furthermore, this technology impinges upon the privacy rights of the patient’s visiting loved ones. As such, it is the hospital’s duty to protect confidentiality and privacy for both patient and family. In order to comply, the hospital is required to inform, educate, and obtain consent from the patient regarding the implications of VS (Bharucha et al., 2006). According to *Healthcare Risk Management*, (2007), “patients and family members should be reminded in admission and consent forms ‘that they don’t enjoy the same privacy in a hospital setting that they might at home, that there are times when the diagnostic process might involve videotaping’” (p. 15). As well, signs informing of video surveillance should be posted over the entrance of the hospital and the patient’s room.

While hospital employees are obligated to protect patient privacy, the employees themselves may have little right to privacy. Bharucha et al. (2006) argue that employees who are made aware of VS and continue their employment imply consent. Nonetheless, “the duty to honor an expectation of a particular right, such as privacy, is determined not only by the person’s role and responsibility within the institution, but also quite profoundly by the moral or legal basis upon which that right is asserted” (p. 613). Therefore, a physician is justified in his request for privacy before performing an invasive procedure on a patient.

With regards to patient health information exchange among health insurance providers, Bharucha et al. (2006) recognize that:

The level of access to digitally captured health information that should be provided to state and federal oversight agencies and payors is more problematic, but may be addressed by developing mechanisms that offer person-specific data with the “minimum necessary” private information as defined by HIPAA, while offering greater access to de-identified group level data. (p. 613)

Due to the complexity of the topic, the ethical ramifications of VS on the privacy of hospital employees, their patients, as well as third party provider services warrant further examination.

COVERT SURVEILLANCE

Is it ethical to monitor a patient without their knowledge and consent? What happens if there are additional concerns such as the patient being mentally incompetent and therefore at increased risk for self-injury? What if there is a third actor in play – a non-patient (a relative, friend, facility employee, etc.) who is suspected of injuring one or more patients?

In July of 2012, the Tampa Bay Times reported the use of a video surveillance camera disguised as a smoke detector in a patient's room at the Haley Veteran's Administration (VA) Hospital. The issue became a matter of a Congressional investigation. In the report titled *Alleged Inappropriate Surveillance, James A. Haley Veterans' Hospital, Tampa, Florida (2013)*, the VA Office of Inspector General communicated the following:

The state of affairs came to a head in June 2012. A nurse documented in a Report of Contact that was dated June 13, 2012:

The patient's family became aware of a video camera in a smoke-detector-like cover that had been placed in the patient's hospital room that same day by staff. The patient lacked sufficient mental capacity to give permission for installation of this VSC [video surveillance camera] and it had been placed without the permission of the patient's family. Two days later, on June 15, the VSC was activated despite the patient's family's objections (Inspection Overview, para. 2).

The events leading up to the video camera installation are well documented. On June 8, 2012, the unit Nurse Manager wrote a formal memorandum to the Acute Care Chief Nurse with the subject line "Patient Safety Concern". The Nurse manager outlined a number of events that occurred over a 13-day period:

My primary concern is that on several occasions, nurses have reported supplies missing and settings changed to tube feeding, bed settings, suctioning/oxygen settings which they believe were done by the family. I think the patient should be on 24 [hour] surveillance monitoring to ensure patient safety. (p. 13)

After a thorough investigation into the matter the VA Office of Inspector General “concluded that given the documented evidence, these were reasonable [hospital] concerns” (p. 21). In accordance with the VA Inspector General’s conclusions, Mary Anne Hilliard (2007), chief risk counsel at Children’s National Medical Center in Washington, DC, believes “risk managers should use covert video surveillance (CVS) when criminal activity or patient abuse is suspected” (Covert Video Surveillance section). Normally, hospitals use covert surveillance in suspected cases of Munchausen Syndrome by Proxy (MSBP). Typically, as Hall, Eubanks, Meyyazhagan, Kenney, & Johnson (2000) point out:

It is extremely difficult to prove that a caretaker is fabricating or inducing an illness.

Usually, the evidence is circumstantial. When actual proof is available, is often out of serendipity or carelessness on the caretaker’s part, such as when a nurse catches a mother smothering her child. (p. 1305)

Accordingly, CVS is sometimes necessary to diagnose MSBP. Hall et al. (2000) studied 41 cases of covert surveillance that took place within Children’s Health Care of Atlanta that occurred between 1993 and 1997. Out of 41 cases, 23 patients were diagnosed with MSBP. CVS “was required to make the diagnosis in 13 of these 23, and supportive of the diagnosis in five. In four cases, this surveillance was instrumental in establishing innocence of the parents” (Abstract,

p.1305). The findings of this study coupled with the physician's duty to keep his patient safe merit the use of covert surveillance when MSBP is suspected.

RESULTS

All 12 research articles support tele-ICU as an effective tool to improve patient outcomes and enhance delivery of care. Lilly et al. (2011) demonstrated that tele-ICU intervention increased patient prophylaxis treatment related to deep vein thrombosis (14.5%), stress ulcers (13%), and cardiovascular protection (19%). As a result, ventilator associated pneumonia fell by 12.4%, and urinary catheter infections fell by 0.4%. Over a 2-month period, tele-ICU intervened on three separate air embolism cases and delivered preventative care (Cowboy et al., 2009). Improved patient care interventions have led to a decrease in patient mortality. Some hospitals have experienced a decrease in their patient mortality rate by as much as 6.7% (McCambridge et al., 2010). In addition, because patients are healing quicker, their time in the ICU is shortening by one day (Young et al., 2011) to three days (Lilly et al., 2011).

The economic viability of VS remains controversial due to the complexity of the tele-ICU model. Morrison et al. (2010) did not conclude telemedicine to be economically viable. However, the study did find that level of tele-ICU involvement affected hospital spending. The rate of spending was steeper per patient under a low level of tele-ICU surveillance compared to high-level surveillance (a \$1400 increase and a \$700 increase, respectively).

In the largest study to day, Frazini et al. (2011) found that severity of illness determined economic viability of tele-ICU:

The main positive clinical outcome was a reduction in ICU and hospital mortality in the sickest patients...because it decreased hospital mortality without increasing costs significantly. In the patients who were less sick...the tele-ICU intervention was not cost-effective because it increased per patient costs without improving hospital mortality.
(p. 329e5)

The authors concluded that telemedicine intervention to be valuable for only the sickest patients.

The majority (5) of the research articles support tele-ICU as a cost effective tool. Rufo (2009) found that over a 15-month period, tele-ICU intervention caused a decreased in length of stay by 38% and fewer blood transfusions by 7% to save the hospital over \$3 million. Zawada et al. (2008) found that tele-ICU care effectively facilitated acute care to remote areas. After first 2.5 years of implementation, the number of patients who needed air lift services decreased by 160 patients (37%). As a result, given the estimated transfer costs between \$5,800 and \$10,800, annual cost savings amounted to \$1.25 million. Kohl et al (2007) concluded that tele-ICU intervention could significantly reduce hospital costs due to a 10% reduction in ICU stay and 20% reduction in floor stay. The savings ranged from \$700,000 to \$940,000 and \$2.1 million to \$2.8 million, respectively.

Rincon et al. (2007) reported that tele-ICU “implementation increases the documentation of severe sepsis and septic shock and reduces reported mortality rates. It is likely that DRG-based reimbursement will increase” (Abstract). Breslow et al. (2004) associated telemedicine

with improved hospital savings. Findings include decreased variable cost per patient by 24.6% and increased hospital revenue by 16%. Furthermore, the number of ICU cases per month increased by 7% due to more patient leaving the ICU in less time.

While the economic viability of tele-ICU is open to question, remote bedside monitoring seems to be a cost effective method for replacing bedside patient sitters. After 4 months of use in the Neuro Acute Unit at the University of Utah Healthcare, no patients under VS experienced a fall, compared to 20 falls experienced by patients not under VS. Furthermore, the University of Utah Health Care saved \$282,000 associated with reduced patient sitter costs. Patients who were under VS reported feeling safer and better cared for. Likewise, Community Memorial Hospital reported that falls decreased by 70% and after one year of implementation, saving the hospital money.

The families of newborns in the NICU have experienced positive outcomes associated with web-camera technology. In fact, the average satisfaction scored was 4.75 out of 5, with 5 being the most satisfied. The families are not charged an additional fee for access to the web-cameras, which means that the full costs of the cameras falls on the hospital. However, hospitals may advertise this system as an incentive for expecting mothers to use their services. As such, it is likely that more U.S. hospitals will integrate web cameras in to their own NICUs.

In the United States of America, privacy rights impose legal restrictions on VS. These rights come from the U.S. Constitution, Statutory law, Regulatory law, and State law. HIPPA authorizes the patient to control the use and disclosure of his or her health information. Accordingly, hospitals are under obligation to inform patients on their right to protected health information. It is appropriate that hospitals use VS for diagnostic purposes as long as they have

obtained patient consent. As such, hospitals are legally required to inform employees and visitors of the use of cameras.

According to Charles Fried (1981), a man's privacy is an intrinsic part of his liberty, and therefore his morality. To impede on one's privacy is to violate his morality. Alan Westin (1976) argued that if a hospital cannot keep its promise of patient confidentiality, then that hospital is acting unethically. However, if a physician suspects that a third party person is causing harm to the patient as described in MSBP, the use of covert VS is justifiable.

CONCLUSION

When hospitals implement VS into the ICU, both patients and hospitals benefit. VS coupled with telemedicine permits remotely located acute care experts to assess the patients, monitor for patient complications, and collaborate with an on-site health care team to help determine the best patient care. Because this technology improves best practices among healthcare workers, patients experience fewer complications and less time spent in the ICU. Although research related to the impact of tele-ICU on financial outcomes remains mixed, it is likely that telemedicine is worth implementing for patients located in hospitals without intensivist staffing as well as patients who are severely ill. Hospitals that have used VS to replace bedside sitters have reported a reduction in patient falls and hospital savings. Units that experience patient falls would likely benefit from VS. In addition, VS in NICUs may facilitate parent-baby bonding and prevent related complications such as Shaken Baby Syndrome. However, research is needed to measure the benefits related to this technology.

While information exchange is necessary to deliver the best care possible, patients are guaranteed a right to privacy. As such, HIPAA requires hospitals to protect patient health information from public domain. Accordingly, if hospitals use VS for diagnostic purposes, they should obtain patient consent. Nonetheless, covert VS is justifiable if a physician suspects that a third party person is causing harm to the patient, as in the case of Munchausen by Proxy.

This thesis serves as a foundation for better understanding of the impact of VS in the ICU. Tele-ICU offers an innovative approach that enables offsite ICU specialists to collaborate with onsite health providers. In addendum, this justifies an investigation into the attitudes of onsite professionals regarding tele-ICU collaboration. Furthermore, this technology offers a

unique opportunity for healthcare providers to practice their profession without regard to physical locations. This warrants an examination into laws regarding limitations about practicing tele-ICU medicine across state lines.

REFERENCES

- American Academy of Orthopaedic Surgeons (2011, July 6). Can in-hospital falls really be prevented? Study shows that current prevention strategies may not be very effective. *Science Daily*. Retrieved from <http://www.sciencedaily.com/releases/2011/07/110706144618.htm>
- Armellino, D., Hussain, E., Schilling, M., Senicola, W., Eichorn, A., Dlugacz, Y., & Farber, B. F. (2012). Using high-technology to enforce low-technology safety measures: The use of third-party remote video auditing and real-time feedback in healthcare. *Clinical Infectious Diseases*, 54(1), 1-7. doi:10.1093/cid/cir773
- Bharucha, A., London, A., Barnard, D., Wactlar, H., Dew, M., & Reynolds, C. (2006). Ethical considerations in the conduct of electronic surveillance research. *Journal Of Law, Medicine & Ethics*, 34(3), 611.
- Boswell, D., Ramsey, J., Smith, M., & Wagers, B. (2001). The cost-effectiveness of a patient-sitter program in an acute care hospital: A test of the impact of sitters on the incidence of falls and patient satisfaction. *Quality Management In Health Care*, 10(1), 10.
- Breslow, M. J., Rosenfeld, B. A., Doerfler, M., Burke, G., Yates, G., Stone, D. J., & ...Plocher, D. (2004). Effect of a multiple-site intensive care unit telemedicine program on clinical and economic outcomes: An alternative paradigm for intensivist staffing. *Critical Care Medicine*, 32(1), 31-38.
- Buerhaus, P., and Kurtzman, E. (2008). New Medicare payment rules: Danger or opportunity for nursing? *American Journal of Nursing*, 108(6), 30-35.

Centers for Disease Control and Prevention. (2013). Health aging. Chronic Disease Prevention and Health Promotion. Retrieved from <http://www.cdc.gov/chronicdisease/resources/publications/AAG/aging.htm>

Centers for Medicare and Medicaid Services. (2013). *Readmissions Reduction Program*. Retrieved from <http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Readmissions-Reduction-Program.html>

Community Memorial Hospital. (2013). Community Memorial Hospital, Ventura, CA, telemetry/progressive care unit ensures patients are safe from falls. *Advance For Nurses*. Retrieved from <http://nursing.advanceweb.com/Web-Extras/Onlinn-Articles/Community-Memorial-Hospital.aspx>

Collins Dictionary. (2013). *Video Surveillance*. Retrieved from <http://www.collinsdictionary.com/dictionary/english/video-surveillance>

Covert video surveillance can be useful in abuse cases, but some reason for caution: policies and right equipment are keys to success. (2007). *Healthcare Risk Management*, 29(2), 13-16.

Cowboy, E., Simmons, R., Miller, S., Donelan, C., Silkey, B. (2009) Preventing air embolisms with tele-icu collaborative. Presentation: *CHEST 2009: American College of Chest Physicians Annual Meeting Oct 31–Nov 5, 2009, San Diego*. Retrieved from <http://www.medscape.com/viewcollection/30543>

DeGaspari, J. (2012). An alternative approach to 24/7 ICU coverage. *Healthcare Informatics*. Retrieved from <http://www.healthcareinformatics.com/article/alternative-approach-247-icu-coverage>

- Fitzpatrick, M. (2011). Introduction to supplement - Meeting the challenge of falls reduction. *American Nurse Today*. Retrieved from <http://www.americannursetoday.com/article.aspx?id=9572&fid=9534>
- Franzini, L., Sail, K., Thomas, E.J., & Wueste, L. (2011). Costs and cost-effectiveness of a telemedicine intensive care unit program in 6 intensive care units in a large health care system. *Journal Of Critical Care*, 26(3), 329e1 – 329e6.
- Freeman, L. (2012). Cameras, sensors to help monitor patients' well-being at Physicians Regional hospitals. *Naplesnews.com*. Retrieved from <http://www.naplesnews.com/news/2012/mar/23/careview-camera-sensor-monitor-physicians-regional/?print=1>
- Fried, C. (1981, May). *Is liberty possible?* (The Tanner Lectures on Human Values) Presented at Stanford University. Retrieved from <http://tannerlectures.utah.edu/lectures/documents/fried82.pdf>
- Glower, M. (2013). Videos, bells and whistles: Fall risk or injury prevention? *RN Journal*. Retrieved from http://rnjournal.com/journal_of_nursing/videos-bells-and-whistles-fall-risk-or-injury-prevention
- Goodlett, D., Robinson, C., Carson, P., & Landry, L. (2009). Patient safety. Focusing on video surveillance to reduce falls. *Nursing*, 39(2), 20-21. doi:10.1097/01.NURSE.0000345233.09590.79
- Goran, S.F. (2012). Measuring tele-ICU impact: Does it optimize quality outcomes for the critically ill patient? *Journal Of Nursing Management*, 20(3), 414-428. doi:10.1111/j.1365-2834.2012.01414.x

- Gorman, M.J. (2011). The future of tele-ICUs: An insider's perspective. *MedGadget*. Retrieved from www.medgadget.com/2011/06/the-future-of-tele-icus-an-insidersperspective.html
- Hall, D. E., Eubanks, L., Meyyazhagan, S., Kenney, R. D., & Johnson, S. (2000). Evaluation of covert video surveillance in the diagnosis of Munchausen Syndrome by Proxy: Lessons from 41 cases. *Pediatrics*, *105*(6), 1305 - 1312.
- Harding, A. (2010). Observation assistants: Sitter effectiveness and industry measures. *Nursing Economics*, *28*(5), 330-336.
- Howell, G., Ardilles, T., & Bonham, A.J. (2008). Implementation of a remote intensive care unit monitoring system correlates with improvements in patient outcomes. *Chest*, *134*(4), Abstract
- Impact Advisors, LLC. (2010). *Telemedicine trends and technology*. Retrieved from <http://www.impactadvisors.com/UserFiles/file/IA%20Telemedicine%20Overview%2020100208.pdf>
- Jarrah, S. & Van der Kloot, T. (2010) Tele-ICU: Remote critical care telemedicine. *American College of Chest Physicians*. Retrieved from <http://www.chestnet.org/accp/PCCSU/tele-icu-remote-critical-care-telemedicine?page=0.3>
- Johnson, R. (2012). Kant's moral philosophy. In *The Stanford Encyclopedia of Philosophy*, 12 Retrieved from <http://plato.stanford.edu/archives/sum2012/entries/kant-moral/>.
- Jorgensne, J. (2011). Reducing patient falls: A call to action. *American Nurse Today*. Retrieved from <http://www.americannursetoday.com/article.aspx?id=9572&fid=9534>
- Kahn, J. M. (2011). The use and misuse of ICU telemedicine. *JAMA: Journal of the American Medical Association*, *305*(21), 2227-2228. doi:10.1001/jama.2011.716

- Kohl, B., Fortino-Mullen, M., Praestgaard, A., Hanson, Dimartino, J., & Ochroch. (2012) The effect of ICU telemedicine on mortality and length of stay. *Journal Of Telemedicine & Telecare*, 18(5), 282-286. doi:10.1258/jtt.2012.120208
- Kohl, B., Sites, F., Gutsche, J., & Kim, P. (2007). Economic impact of E-ICU implementation in an academic surgical-ICU. *Critical Care Medicine*, 35(12), Abstract
- Levesque, W. (2012, July 9). Family discovers ‘covert camera’ in Haley VA patient’s room. *Tampa Bay Times*. Retrieved from <http://www.tampabay.com/news/military/veterans/family-discovers-covert-camera-in-haley-va-patients-room/1239524>
- Lilly, C., Cody, S., Zhao, H., Landry, K., Baker, S., McIlwaine, J., & ... Irwin, R. (2011). Hospital mortality, length of stay, and preventable complications among critically ill patients before and after tele-ICU reengineering of critical care processes. *Journal of the American Medical Association*, 305(21), 2175–2183. doi:10.1001/jama.2011.697
- Lopez, K., Gerling, G., Cary, M., & Kanak, M. (2010). Cognitive work analysis to evaluate the problem of patient falls in an inpatient setting. *Journal Of The American Medical Informatics Association*, 17(3), 313-32. doi:10.1136/jamia.2009.000422
- McCambridge, M., Jones, K., & Paxton H. (2010). Association of health information technology and teleintensivist coverage with decreased mortality and ventilator use in critically ill patients. *Archives of Internal Medicine*, 170(7), 648–653. doi:10.1186/1472-6963-13-35
- Mcconnaughey, J. (2012). Webcams in newborn ICUs a growing business. *USA Today*. Retrieved from <http://usatoday30.usatoday.com/news/health/wellness/story/2012-08-23/newborn-icu-webcams/57254376/1>

- Milestone. (2012). The Nebraska Medical Center improves patient safety while cutting costs with Milestone IP Video. *Milestone*. Retrieved from <http://www.milestonesys.com/SharePoint/Communications/Customer%20Stories/Healthcare/Nebraska-Medical-Center.pdf>
- Moor, J. (1990). The ethics of privacy protection. *Library Trends*, 39(1), 69-82. Retrieved from https://www.ideals.illinois.edu/bitstream/handle/2142/7714/librarytrendsv39i1-2h_opt.pdf?se
- Morrison, J., Cai, Q., Davis, N., Yan, Y., Berbaum, M., Ries, M., & Solomon, G. (2010). Clinical and economic outcomes of the electronic intensive care unit: results from two community hospitals. *Critical Care Medicine*, 38(1), 2-8. doi:10.1097/CCM.0b013e3181b78fa8
- Rhoads, S., Green, A., Lewis, S., & Rakes, L. (2012). Challenges of implementation of a web-camera system in the neonatal intensive care unit. *Neonatal Network*, 31(4), 223-228.
- Rincon, T., Bourke, G., & Ikeda, D. (2007). Centralized remote care improves sepsis identification, bundle compliance and outcomes. *Chest*, 132(4), Abstract
- Rivera, A., Dasta, J., & Varon, J. (2009). Critical care economics. *Critical Care and Shock*, 12, 124-129. Retrieved from <http://www.criticalcareshock.org/files/Review%20-%20Critical%20Care%20Economics.pdf>
- Rosensweig, R., & Carroll, D. (2012). Lights, camera, action: Decreasing patient falls through video surveillance. *Ochsner Academics*. Retrieved from http://academics.ochsner.org/uploadedFiles/Research/Nursing/EBP%20Light%20Camera%20Action%20poster_2.pdf
- Roth, A. (2012). Diagnosis: Merger. Area hospitals look to save money. UTICAOD.com. Retrieved from <http://www.uticaod.com/news/x1481610996/Diagnosis-Merger-Area-hospitals-look-to-save-money>
- Rufo, R. (2009). Virtual ICU: Innovation and integration. *Nursing Management*, 40(10), 41-44

- Sapirstein, A., Lone, N., Latif, A., Fackler, J., & Pronovost, P. (2009). Tele ICU: Paradox or panacea? *Best Practice & Research. Clinical Anaesthesiology*, 23(1), 115-126.
- Shever, L. (2011). The impact of nursing surveillance on failure to rescue. *Research & Theory For Nursing Practice*, 25(2), 107-126. doi:10.1891/1541-6577.25.2.107
- Society of Critical Care Medicine. (2012). *Critical Care Statistics*. Retrieved from <http://www.sccm.org/Communications/Pages/CriticalCareStats.aspx>
- Spiva, L., Feiner, T., Jones, D., Hunter, D., Petefish, J., & Vanbrackle, L. (2012). An evaluation of a sitter reduction program intervention. *Journal Of Nursing Care Quality*, 27(4), 341-345.
- The Leapfrog Group. (2008). *Factsheet: ICU physician staffing*. Retrieved from http://www.leapfroggroup.org/media/file/Leapfrog-ICU_Physician_Staffing_Fact_Sheet.pdf
- Thomas, E., Lucke, J., Wueste, L., Weavind, L., & Patel, B. (2009). Association of telemedicine for remote monitoring of intensive care patients with mortality, complications, and length of stay. *JAMA: Journal Of The American Medical Association*, 302(24), 2671-2678. doi:10.1001/jama.2009.1902
- Tzeng, H., Yin, C., & Grunawalt, J. (2008). Effective assessment of use of sitters by nurses in inpatient care settings. *Journal Of Advanced Nursing*, 64(2), 176-183. doi:10.1111/j.1365-2648.2008.04779.x
- United States Census Bureau. (2010). *Health Insurance: Highlights: 2010*. Retrieved from <http://www.census.gov/hhes/www/hlthins/data/incpovhlth/2010/highlightts.html>
- University of Utah Health Care. (2011). Use more video cameras and fewer patient sitters. *Nursing Innovations*. Retrieved from <http://healthcare.utah.edu/nursinginnovation/10ideas/seven.php>

- VA Office of Inspector General. (2013). *Alleged Inappropriate Surveillance, James A. Haley Veterans' Hospital, Tampa, Florida* (Report No. 12-03939-175). Retrieved from <http://www.va.gov/oig/pubs/VAOIG-12-03939-175.pdf>
- Watcher, G. (2001). HIPAA's privacy rule summarized: What does it mean for telemedicine? *Telehealth Resource Centers*. Retrieved from <http://www.telehealthresourcecenter.org/toolbox-module/privacy-confidentiality-and-security>
- Westin, A. (1976). Computers, health records, and citizen rights. National Bureau of Standards [Monograph]. *National Bureau of Standards, 157*. Retrieved from <http://digicollfrom.manoa.hawaii.edu/techreports/PDF/NBS157.pdf>
- Westin, A. (2003). Social and political dimensions of privacy. *Journal of Social Issues, 59*(2), 431 – 453
- Wilcox, E. M. & Adhikari, N. (2012). The effect of telemedicine in critically ill patients. *Critical Care*. Retrieved from <http://ccforum.com/content/16/4/R127>
- Willmitch, B., Golembeski, S., Kim, S. S., Nelson, L. D., & Gidel, L. (2012). Clinical outcomes after telemedicine intensive care unit implementation. *Critical Care Medicine, 40*(2), 450-454.
- Wood, K., Fetterman, S., & Venditti, A. (2011). *Assess of the difference (if any) in mortality and length of stay when the on site, bedside intensivist is moved to a virtual setting, providing care remotely*. Poster Session: 54th Congress on Healthcare Leadership, March 21–24. Chicago, Illinois.
- Young, L.B., Chan, P.S., Lu, X., Nallamotheu, B.K., Sasson, C., & Cram, P. (2011). Impact of telemedicine intensive care unit coverage on patient outcomes: A systematic review and meta-analysis. *Archives Of Internal Medicine, 171*(6), 498-506.

Zawada, E., & Herr, P. (2008). ICU telemedicine improves care to rural hospitals reducing costly transports. *Critical Care Medicine*, 36(12), Abstract.

Zawada, E., Herr, P., Larson, D., Fromm, R., Kapaska, D., & Erickson, D. (2009). Impact of an intensive care unit telemedicine program on a rural health care system. *Postgraduate Medicine*, 121(3), 160–170.