

**Southern Adventist University**  
**KnowledgeExchange@Southern**

---

Graduate Research Projects

School of Nursing

---

3-2012

# Research Proposal -- Outpatient Chest Tube Management Following Thoracic Resection Improves Patient Length of Stay and Satisfaction Without Compromising Outcomes

Megan Fuller

Jeremy S. Smith

Follow this and additional works at: <https://knowledge.e.southern.edu/gradnursing>

 Part of the [Nursing Commons](#)

---

## Recommended Citation

Fuller, Megan and Smith, Jeremy S., "Research Proposal -- Outpatient Chest Tube Management Following Thoracic Resection Improves Patient Length of Stay and Satisfaction Without Compromising Outcomes" (2012). *Graduate Research Projects*. 13.  
<https://knowledge.e.southern.edu/gradnursing/13>

This Article is brought to you for free and open access by the School of Nursing at KnowledgeExchange@Southern. It has been accepted for inclusion in Graduate Research Projects by an authorized administrator of KnowledgeExchange@Southern. For more information, please contact [jspears@southern.edu](mailto:jspears@southern.edu).

Research proposal-Outpatient chest tube management following thoracic resection improves patient length of stay and satisfaction without compromising outcomes.

Megan Fuller and Jeremy S. Smith

March 10, 2012

A Paper Presented to Meet Partial Requirements for

NRSG 594  
Capstone  
Southern Adventist University

School of Nursing

**Title**

Outpatient chest tube management following thoracic resection improves patient length of stay and satisfaction without compromising outcomes.

**Introduction**

Chest tubes are a consistent part of the post operative treatment for thoracic surgery. Historically, chest tubes have not been removed until output is less than 150 ml in a 24 hour period and all air leaks are completely resolved. On many occasions, the only indication for continued hospitalization is the presence of a chest tube, which is often the result of a PAL. Such conservative management dramatically increases LOS.

The incidence of PAL after routine pulmonary resection is said to be 8%-26% (Cerfolio, 2002). Due to overwhelming surgeon skepticism regarding outpatient chest tube management, keeping patients in the hospital until the removal of chest tubes is still standard practice for the majority of thoracic surgeons. For those patients that require a chest tube for treatment of PAL, their LOS is reported to be increased by approximately six days (Varela, 2005) and by 7.9 days (Brunelli, 2005).

**Background**

Pulmonary resection has been an evolving practice in surgical medicine since the early 1900's when the first pulmonary surgery was performed. Historically, thoracic surgeons performed thoracotomies for a multitude of reasons including: empyema, tuberculosis, lung cancer, esophageal rupture repair, repair of bulle causing pneumothorax. In the 1990's, the development of video assisted thoroscopic surgery was developed allowing for these same surgery techniques to be done thru a minimally invasive approach. According to the American Cancer Society (ACS) in 2010, there will be an estimated 220,520 new cases of lung cancer in

the United States and approximately 157,300 deaths related to lung cancer (ACS, 2011). The National Lung Screening Trial study performed by the National Cancer Institute (NCI), found that high risk patients screened with low dose spiral chest CT scan had decreased deaths from cancer and cancer were caught at earlier stages (NCI, 2010). A renewed emphasis on early detection of lung cancers has developed and in turn an increased number of patients with surgically resectable lung cancer are expected.

With the emergence of thoroscopic technology, patients who previously would not be candidate for surgical resection or repair of other thoracic surgical problems are now becoming candidates for surgery. With higher volumes of diagnosed resectable lung cancer cases and an increase in patients who were previously considered non-surgical, there has been increased importance placed on post-operative reduction of morbidity and mortality. Standards of care in thoracic surgery patients have changed dramatically in the last decade, both in preoperative evaluation and preparation, as well as, postoperative management. Thoracic surgery patients are now being managed more aggressively postoperatively with direct admission to the medical surgical floor instead of traditional ICU care, early removal of suction from chest tubes, aggressive pain control, higher tolerance of drainage allowed from chest tubes, and early discharge from hospital. The changes in management of these patients have shown to greatly decrease mortality and morbidity in this population of surgical patients (Ferguson, Parma, Celauro, & Vigneswaran, 2009).

Despite the many changes that have taken place in thoracic surgery over the last couple of decades, chest tubes remain a constant after thoracic surgery. Chest tubes have several functions. Primarily, chest tubes are imperative for the removal of various types of fluid from the chest cavity. Serous fluid, the result of inflammatory reactions within the pleura, chyle,

lymphatic drainage, and purulent drainage, produced during an infection, are all able to drain from the chest cavity through a chest tube. Another vital function of chest tubes is the removal of air from the chest which helps in preventing subcutaneous emphysema as well as the development of post-operative pneumothorax (Bertholet, Joosten, Keemers-Gels, van den Wildenberg, & Barendregt, 2011). Historically, chest tubes have not been removed until output is less than 150 ml in a 24 hour period and all air leaks are completely resolved. On many occasions, the only indication for continued hospitalization is the presence of a chest tube, which is often the result of a PAL. Such conservative management dramatically increases LOS.

### **Research Objective**

The purpose of this study is to determine how early discharge with a chest tube in place for patients who have undergone elective thoracic surgery, affects their outcomes in regards to readmission rates, their overall satisfaction, and perceptions of care.

### **Research Questions**

1. Did patients feel like they received the appropriate level of care at home with chest tube in place?
2. What is the 30 day readmission rate for patients who are sent home with chest tubes?

### **Research hypothesis**

Although there have been significant advances in surgical techniques and changes in postoperative management of thoracic surgery patients, the presence of air leaks in the postoperative phase will continue. The management of patients with an air leak following an elective pulmonary resection can be completed at home with a chest tube without an increase in readmission rates, with increased patient satisfaction and healthcare savings.

**Theoretical Framework**

Florence Nightingale's environmental theory of nursing was used as a theoretical framework for this study. Since the times of Florence Nightingale, the nursing profession has been encouraged to provide care for patients founded upon evidence. Nightingale's theory emphasized changing the environment, both physically and psychologically, in order to promote healing and improve patient outcomes. By enacting Nightingale's basic concept of changing the environment for patients after pulmonary resection by allowing patient's to recover in the comfort of their own home, despite the continued need for chest tubes due to PAL, patients will benefit physically and mentally(Alligood, 2010).

**Assumptions**

In reviewing the data on chest tubes in the literature and the proposed research multiple underlying assumptions can be identified. First, it is assumed that discharging patients home with air leaks and indwelling chest tubes will not show a statistically significant change in 30 day readmission rates. It is assumed that environment, both physical and psychological, are important in the recovery of patients after pulmonary resection and that all of these factors cannot be explained in this study. It is assumed that a dramatic decrease in average length of hospital stay will be noted when compared to national benchmarks among peers. Lastly, it is assumed that in the research process no bias was present and data was collected measured accurately.

**Limitations**

Given the retrospective nature of this study, there is a limitation of knowledge on how patients would do if they were hospitalized with chest tubes until their air leak resolved. There is no blinding or random selection with a control group, which could lead to selection bias. This

study was also limited to one surgeon's experience in one institution. No other data from similar surgeries performed by other surgeons is available for statistical comparison. There may also be a compromise in data since any data gathered from charts may be inaccurate. Participant response to quality of life questionnaire could be subject to psychological repression due to the fact that, for some, it has been more than five years since the initial experience. Although the proposed sample size for this study should be adequate, a larger sample within multiple settings may yield more beneficial data. Also, the variable of education level is only documented subjectively in this study and could, when put in the context of the situation, explain adverse outcomes.

### **Review of Literature**

The scarcity of published literature regarding discharging patients home with chest tubes due to PAL was known to the researchers prior to the initiation of this study. Such scarcity of literature reinforced the importance of this study and the potential effects these findings will have on standards of care in the postoperative phase for patients with PAL. A thorough review of literature was conducted and revealed few publications which state that decreasing LOS by discharging patient's home with chest tubes does not compromise patient safety; however, to date, no publications address patient perception and satisfaction in regards to this topic.

Mercier and colleagues (1976) enrolled 226 patients who presented to the emergency department for spontaneous pneumothorax. Of the 226 patients enrolled, 167 were treated on an outpatient basis. Those with minimal lung collapse (n=45) were managed successfully without intervention and were sent home after a short period of observation. The remaining 122 patients were treated with a chest tube, and were observed for one to twelve hours and if the lung was adequately re-expanded on chest radiography, the patient was discharged home. Forty-two of

the 59 patients did not experience adequate lung re-expansion in the observation period and were subsequently hospitalized until lung re-expansion occurred. Those managed on an outpatient basis followed-up in clinic three to four days later. When lung re-expansion was complete, and air leak resolved, the chest tube was removed. Even without the use of antibiotics, of the 122 patients sent home with chest tube, only one patient developed superficial wound infection. Complication or readmission rates for those not amenable to outpatient treatment were not mentioned in this study.

In 1997, Ponn, Howard, Silverman, and Federico published their findings of a seven year prospective study in which patients were discharged home with chest tubes. A total of 240 patients who required a chest tube, were managed on an outpatient basis for: occasions for treatment of: pneumothorax (176 cases), prolonged post-resection air leak (45 cases) and outpatient thoroscopic pulmonary wedge excision (19 cases). Of the 45 patients with postresection air leaks, only one patient (2%) required readmission and was treated for pneumonia and parapneumonic effusion, two weeks after discharge.

Lodi and Stefani (2000) reported that in a one year prospective study, 18 patients were successfully managed at home with a chest tube following thoracic surgery. PAL was the only indication for continued chest tube placement in 16 of the 18 patients. On average, chest tubes were removed 11.5 days after discharge. Lodi and Stefani reported no complications or patient readmissions.

Rieger and colleagues (2007) performed a retrospective review of 36 patients sent home with an outpatient chest tube device. Thirty-two were post-operative pulmonary, esophageal, or mediastinal resection; the remaining four patients had undergone treatment for refractory pleural or pericardial effusions. Four patients experienced minor complications. One developed



pneumothorax after inadvertent tube disconnection, one developed localized empyema, one readmitted for pain control, and one required outpatient treatment for localized cellulitis around the chest tube insertion site. Overall, 32 patients (89%) were successfully managed on an outpatient basis. Of the four that required further intervention, all recovered uneventfully.

Cerfolio, Minnich, and Bryant, 2009 add validity to sending patients home with chest tubes. One hundred and ninety-nine patients with CT and PAL were discharged home. Patients returned to the office 3 weeks post-op or an average of 16.5 days after discharge. All patients were sent home on oral antibiotics. Five patients were unable to return to surgeon's office due to distance and were removed from the study (n=194). Five patients were readmitted to the hospital prior to the three week follow-up visit: two for nausea, vomiting, and dehydration, one for pain control, one for pneumonia, and one for transient ischemic attack. "In this study, we have shown that patients can be sent home with a chest tube with an air leak, and the tube can be removed in the clinic approximately 2 to 3 weeks postoperatively, even if the air leak or pneumothorax are still present, with few or no sequelae."

### **Research design**

A retrospective cohort design will be utilized to determine how early discharge with a chest tube in place for patients who have undergone elective thoracic surgery, affects their outcomes in regards to readmission rates, their overall satisfaction, and perceptions of care

All patients of one general thoracic surgeon who underwent elective pulmonary resection and were sent home with chest tubes due PAL were included in this study. A prospective database was created using data from the last five years and multiple patient variables extrapolated (Appendix C). The major downfall of a retrospective study is that data collection is based on recollection, which can prove to be inaccurate as time passes by. Participant responses

to the questionnaire are subject to inaccurate reporting of answers secondary to elapsed time. However, this study was not founded solely upon the retrospection of each participant, and relied on factual information as it is recorded in medical records. Developing a prospective database and applying a prospective algorithm will increase the strength and validity of the study, despite it being founded upon retrospective data.

### **Ethics**

Given that the proposed study would describe the clinical management of human subjects, approval by the Institutional Review Board at Southern Adventist University and Memorial Hospital was obtained prior to the initiation of the study to assure that all of the patients in the sample are protected. Informed consent was obtained from each participant, for study participation and completion of the questionnaire. All data collected will be disseminated in an aggregate form after final collection to assure all participants remain anonymous.

### **Sample and Setting**

The study sample consisted of all thoracic surgery patients, including both thoracotomy and thorascopic, who underwent resection for pulmonary mass and were discharged home with indwelling chest tube due to air leak. The sample all underwent resection by the same surgeon in the same institution using standard operating techniques. The sample was not randomly selected and all patients found using retrospective chart review without any direct patient contact. All patients discharged with chest tubes were included in the sample without selection for education level, age, gender, race, or side of resection.

### **Instrumentation**

Due to the need for a highly specific assessment tool, the researchers were unable to implement an existing instrument for assessment. Therefore, a six question questionnaire,

developed by the researchers, will be completed by each study participant (Appendix B). Each question has a simple yes/no answer. Unfortunately, by not using a pre-existing assessment instrument, the researchers may be subject to skepticism regarding the validity and reliability of the tool. The researchers are well aware of this possibility, but feel that it is necessary in order to extrapolate patient perception, specifically in regards to outpatient care with chest tube due to PAL, which is an integral aspect of this study.

#### **Procedures for data collection**

Since the study is retrospective in nature, data will be collected through thorough chart reviews. Chart review was completed to identify patients who underwent elective pulmonary resection and were sent home with chest tube due to air leak within the established time frame. Memorial Hospital records as well as surgeon's office records, Alliance of Cardiac Thoracic and Vascular Surgeons, will be utilized in order to gather variables required for each study participant (Appendix A). Data will be cataloged into the prospective database as it is collected.

#### **Plan for data analysis**

Through the use of an Excel file, the prospective database will be created and will be used for data storage. Analysis of whether patients felt like they received quality care while at home with chest tube in place will be accomplished through discussion of responses to each item in the questionnaire. Readmission rate will be stated as a percentage. A chi-square analysis will then be used to compare the readmission rate from this study to Memorial hospital's average rate of readmission of patients sent home without a chest tube. The number of patient variables collected from chart review allows for detailed analysis and comparison in relation to patient experience data.

**Plan for dissemination of findings**

Upon completion of data analysis, results will be written up and submitted for publication in the Journal of Thoracic Surgery. It is likely that information will also be presented at national thoracic surgery conferences.

**Results**

Home health care (HHC) was offered to each patient prior to discharge from the hospital. Of the 15 patients sent home with a chest tube, 11(73%) utilized HHC from various HHC agencies around the area, and four (27%) declined the use of HHC. According to seven (47%) of the study participants, the services provided by HHC were perceived as not helpful or as services that could be completed by someone inside the home. All but one participant felt that his/her pain was well controlled in the home setting (93% pain controlled, 7% not controlled). In regards to mobility, all 15 participants felt that they were more mobile at home than in the hospital setting. Four, 27%, of the participants found it difficult to return to the office for follow-up with chest tube in place. When asked the question regarding being happier going home or rather have stayed in the hospital, 14 (93%) participants were happier going home than staying in the hospital.

Of the 15 study participants sent home with a chest tube, only one (7%) required readmission within 30 days of hospital discharge. A chi- square goodness of fit was calculated comparing the readmission rate of study participants, to Memorial hospital's reported rate of readmission for patients not sent home with chest tube, which is 5%. The researchers hypothesized that there would be no statistically significant difference in readmission rates between the study group and those not sent home with chest tube. No significant difference in

readmission rates was found ( $\chi^2(1) = .088, p > .05$ ). Sending patient's home with a chest tube does not result in a statistically significant higher readmission rate.

### Summary

The purpose of this capstone project was to determine how early discharge with a chest tube in place for patients who have undergone elective thoracic surgery, affects their outcomes in regards to readmission rates, their overall satisfaction, and perceptions of care. Chest tubes remain a consistent part of the post operative treatment for thoracic surgery. On many occasions, the only indication for continued hospitalization is the presence of a chest tube, which is often the result of a PAL. Such conservative management dramatically increases LOS. In regards to readmission rates, there was no significant difference found. Overall, patients were satisfied being discharged home with a chest tube and prefer recovering in their own home for the duration of chest tube treatment. Perceptions of care were not compromised by discharging patients with CT. Patients achieved adequate pain control and were more ambulatory in the outpatient setting. Perceptions of home health care were mixed. Some felt as though HHC did not provide any meaningful assistance or security, while others thought it helpful. Outpatient chest tube management is safe and effective and patients reported that they would rather CT management in the outpatient setting.

**Comment [FJ1]:** This is my attempt a closure for this paper. Feel free to edit.

## References

- Alligood, M. R. (2010). *Nursing theory: Utilization & application (4<sup>th</sup> ed.)*. Maryland Heights, MO: Mosby.
- American Cancer Society. (n.d.). *How many people get lung cancer?* Retrieved June 3, 2011, from <http://www.cancer.org/Cancer/LungCancer-Non-SmallCell/OverviewGuide/lung-cancer-non-small-cell-overview-key-statistics>
- Bertholet, J., Joosten, J., Keemers-Gels, M., van den Wildenberg, F., & Barendregt, W. (2011). Chest tube management following pulmonary lobectomy: Change of protocol results in fewer air leaks. *Interactive Cardiovascular and Thoracic Surgery, 12*, 28-31. doi: 10.1510/icvts.2010.248716
- Brunelli, A. et al. (2005). Alternate suction reduces prolonged air leak after pulmonary lobectomy: A randomized comparison versus water seal. *Annals of Thoracic Surgery, 80*, 1052-1055.
- Cerfolio, R. J., Minnich, D. J., & Bryant, A. S. (2009). The removal of chest tubes despite an air leak or a pneumothorax. *Annals of Thoracic Surgery, 87*, 1690-1696. doi: 10.1016/j.athoracsur.2009.01.077
- Cerfolio, R. J., Pickens, A., Bass, C., & Katholi, C. (2001, August). Fast-tracking pulmonary resections. *The Journal of Thoracic and Cardiovascular Surgery, 122*(2), 318-324.
- Ferguson, M., Parma, C., Celauro, A., & Vigneswaran, W. (2009). Quality of life and mood in older patients after major lung resection. *Annals of Thoracic Surgery, 87*, 1007-1013. doi: 10.1016/j.athoracsur.2008.12.084

- Gonzalo, V., Jimenez, M. F., & Novoa, N. (2010). Portable chest drainage systems and outpatient chest tube management. *Thoracic Surgery Clinics*, 20, 421-426. doi: 10.1016/j.thorsurg.2010.03.006
- Hassan, M., Tuckman, H., Patrick, R., Kountz, D., & Kohn, J. (2010). Cost of hospital-acquired infection. *Hospital Topics*, 88 (3), 82-89. doi: 10.1080/00185868.2010.507124
- Lodi, R., & Stefani, A. (2000). A new portable chest drainage device. *Annals of Thoracic Surgery*, 69, 998-1001.
- Mercier, C., et al. (1976). Outpatient management of intercostals tube drainage in spontaneous pneumothorax. *Annals of Thoracic Surgery*, 22, 163-165. doi: 10.1016/S0003-4975(10)63979-3
- National Cancer Institute. (2010). *National lung screening trial*. Retrieved November 4, 2010, from <http://www.cancer.gov/newscenter/pressreleases/2010/NLSTresultsRelease>
- Ponn, R. B., Silverman, H. J., & Federico, J. A. (1997). Outpatient chest tube management. *Annals of Thoracic Surgery*, 64(5), 1437-1440.
- Rieger, K. M., Wroblewski, H. H., Brooks, J. A., Hammoud, Z. T., & Kesler, K. A. (2007). Postoperative outpatient chest tube management: Initial experience with a new portable system. *Annals of Thoracic Surgery*, 84, 630-632. doi: 10.1016/j.athoracsur.2007.02.059

**Appendix A: Patient Participation Request****Patient Participation Request Letter**

**Dear Patient,**

**I am writing you to ask for your participation in a study regarding patients who were discharged home with a chest tube and portable drainage device following lung surgery. The study is being conducted to improve care after thoracic surgery. All data collected will remain confidential and no information identifying you will be made public. There is no charge for participation and your involvement will be strictly voluntary. You will be asked to fill out a consent form and study questionnaire. Once the study questionnaire is complete you will not be contacted again. Thank you in advance for considering participation in this study. Please contact me if you are willing to participate or have questions. You can contact me at any point by phone at (423)624-5200, in writing at 2108 East Third Street, Suite 300, Chattanooga, TN 37404, or email at [jsmith@actvsurgeons.com](mailto:jsmith@actvsurgeons.com).**

**Thank you,**

**Jeremy Smith, RN, Student ACNP for Dr. James R. Headrick Jr.**

**Alliance of Cardiac Thoracic and Vascular Surgeons**



Appendix B: Assessment Instrument

Outpatient Chest Tube Quality of Life Questionnaire

1. Did home health care check on you after discharge?

\_\_\_\_\_ Yes (if Yes go to #2)      \_\_\_\_\_ No (if No go to #3)

2. Did home health care provide meaningful assistance to you?

(Providing services you couldn't do on your own or made you feel more secure)

\_\_\_\_\_ Yes                                      \_\_\_\_\_ No

3. Was your pain adequately controlled at home with a chest tube in place?

\_\_\_\_\_ Yes                                      \_\_\_\_\_ No

4. Were you more mobile at home or in the hospital with the chest tube in place?

\_\_\_\_\_ Home                                      \_\_\_\_\_ Hospital

5. Was it difficult to return to the office for follow up/check up with the chest tube in place?

\_\_\_\_\_ Yes                                      \_\_\_\_\_ No

6. Were you happier going home with a chest tube or would you rather have stayed in the hospital until it was removed?

\_\_\_\_\_ Yes (Home)                              \_\_\_\_\_ No (Stay in hospital)

**Appendix C: Patient Variables**

Age  
Gender  
Race  
Type of surgery  
LOS  
Side affected  
FeV1  
DLCO  
MVV  
Readmission  
Reason for re-admission  
Chest tube site infection  
Smoking pack years  
Quit < or > 30 days pre-op  
Antibiotics used  
Home health agency used  
Duration of outpatient use