

Clinical Update

Research Review 2015 – Part One

We are publishing a special double-issue of *Clinical Update* to cover the research on chest drainage in 2015. We've grouped the information by topics: Trauma, Cardiac Surgery, Lung Resection, and Pleural Effusion.

Trauma

Surgeons in South Africa report a long tradition of selective conservative management of trauma, primarily due to a significant mismatch between the number of trauma patients and resources available to provide care.¹ As resources become more plentiful in 21st-century care, should conservative practice be abandoned? Of 1239 thoracic trauma patients treated between 2010 and 2013, 112 required emergency thoracotomy and were removed from the study group (9%). Of the remaining, 1002 (81%) had tube thoracotomy with 382 for pneumothorax, 300 for hemothorax, and 320 for hemopneumothorax. Patients with pneumothorax required no additional intervention after the tube thoracotomy. Of patients with hemothorax, 17 (5.6%) required repeat chest tube and 27 (9%) had VATS. Those with hemopneumothorax had 29 repeat chest tube placements (9%) and 22 VATS (6.9%)

Of 125 observed for small pneumothorax (all stab wounds), four ended up with tube thoracotomy. The authors believe the conservative strategy of initiating tube thoracotomy and monitoring the patients is still a valid strategy for high-volume trauma services in developing world settings.

Researchers in Wisconsin looked at the natural history of pneumothorax or effusion after chest tube removal.² Data from 2008 to 2013 were retrospectively reviewed from the administrative database and trauma registry for thoracic trauma patients who received thoracotomy tube(s) for hemopneumothorax. Researchers' focus was the presence of a post-pull pneumothorax (PPP) or a post-pull effusion (PPE).

Of 710 patients with thoracotomy tubes, 300 had PPP/PPE. These resolved without intervention in 149, leaving a study population of 151 with persistent PPP/PPE at discharge. Of these, 115 returned as scheduled for follow-up. Seven patients were re-admitted. Three had chest tubes reinserted for 1 to 6 days and were then discharged successfully. One fall and one stab patient required VATS to resolve effusion. One patient with a gunshot wound required a wedge resection 25 days after discharge and one involved in a motor vehicle crash had a thoracotomy and decortication. No asymptomatic individuals required further care. Therefore, imaging can be limited to patients with abnormal pulmonary findings, and most of them will return within seven days of discharge.

Trauma and emergency specialists in Japan examined the placement of chest tubes for routine trauma care

management.³ While guidelines suggest posterior chest wall placement, these tend to act as nonfunctional drains to evacuate pneumothorax. Researchers measured volume of fluid drained from hemothoraces from 78 chest tubes placed in 75 blunt trauma patients over six years. They defined massive acute hemothorax (MAH) as more than 500mL of bloody drainage or required intervention for hemostasis within 24 hours; these patients should have posteriorly placed tubes.

The overall incidence of MAH was 23%; independent predictors were multiple rib fractures, shock, pulmonary opacities on CXR, and endotracheal intubation. When these were absent, MAH did not occur; thus, the thoracotomy tube did not need to be placed posteriorly along the chest wall. Anterior placement in low-risk patients results in significantly lower rates of tube malposition.

In China, researchers did a systematic review and meta-analysis to compare outcomes of VATS with open thoracotomy in hemodynamically stable chest trauma patients.⁴ Twenty-six studies were analyzed. There was a significant reduction in postoperative complications, chest tube duration, volume of drainage, and length of hospital stay in patients treated with VATS. Surgeons used the procedure most commonly for hemostasis of bleeders, evacuation of clotted hemothorax, repair of lung and diaphragmatic lacerations, control of air leak, and wedge resections.

Another study from South Africa assessed whether PGY1 and PGY2 surgeons-in-training knew the correct anatomical location for intercostal chest drain placement at the lateral border of the pectoralis major, the anterior border of the latissimus dorsi and the fifth intercostal space. Of 152 junior doctors, 42 (28%) marked the correct site on a photograph. PGY2 level doctors and those who were Advanced Trauma Life Support (ATLS) providers were significantly more likely to identify the correct site.

The same researchers reviewed 58 consecutive patients with open pneumothorax over four years to assess outcomes of ATLS-recommended management.⁵ Knife wounds caused 97% of the injuries.

The unit policy followed ATLS: initial treatment with an occlusive dressing, taped on three sides to create a "flutter valve;" followed by intercostal drain insertion; and then repair of the chest wall defect. There were no complications when doctors followed the protocol. Deviations occurred in six patients. Three had wounds sutured before being sent for CXR – they all developed subcutaneous emphysema and tension pneumothorax that required emergent needle decompression. Two patients' dressings were secured on all four sides, tension pneumothorax occurred, but was rapidly treated. The final deviation from policy was inserting the

In the Literature

What do the Patients Think About Fecal Transplants?

Every nurse should read the study reported in the *American Journal of Infection Control* about the patient experience with fecal microbiota transplants (FMT) for *C. difficile* infection. Researchers interviewed 17 patients. Before FMT, patients described profound physical symptoms, depression, fear of dying, fear of never getting better, and fear of infecting others. They worried about being a burden on their families, the cost of ongoing treatment, and loss of income. They were also frustrated by the resistance of physicians who had limited knowledge of this treatment option. When patients reached a tipping point, they actively sought FMT by self-referral. After treatment, they universally described the ease of the procedure, the lack of the “ick factor” and the frustration that there are so many barriers to this effective treatment. Since previous surveys of physicians revealed that physicians did not offer FMT because they believed patients would find it unappealing and they found it unappealing themselves, it is critically important to overcome these misconceptions and advocate for patients who feel hopeless that their condition will never improve.

Source: Pakyz AL, et al.: Fecal microbiota transplantation for recurrent *Clostridium difficile* infection: the patient experience. *American Journal of Infection Control* 2016;44(5):554-559. [PubMed Citation](#)

Ventilator Adverse Events: Tomayto or Tomahto?

Various organizations have developed reporting systems and databases to track adverse events. Unfortunately, there is no standard taxonomy to describe these events, nor an agreement on reporting the severity of harm (or near miss). A report in *Respiratory Care* describes how three incident reporting systems handle ventilator-related events. The authors analyzed the Pennsylvania Patient Safety Reporting System, the University HealthSystem Consortium Safety Intelligence Patient Safety Organization database, and the FDA MAUDE database. Each has a different focus. The top event type reported to PSA was human factor issues; to UHC, airway/breathing circuit issues; and to MAUDE, ventilator malfunction. This important article describes the challenges of analyzing data to develop solutions to improve patient care and safety. It offers recommendations for developing public-private partnerships that will allow clinicians to review the proprietary databases, facilitating a rapid transfer of knowledge and expertise to enhance the understanding of these safety risks.

Sources: Pham JC, et al.: Ventilator-related adverse events: a taxonomy and findings from 3 incident reporting systems. *Respiratory Care* 2016;61(5):621-631. [PubMed Citation](#)

Do Nurses Understand the \$ Impact of HCAHPS?

In *Orthopaedic Nursing*, nurse researchers report on an extensive study of the relationship between nurses' pain assessments and patient satisfaction reports. Researchers assessed nurse knowledge and HCAHPS scores before and after a targeted education program. After the program, HCAHPS scores relating to pain management improved by 5%. While the education intervention focused on meeting the needs of older patients undergoing joint replacement surgery, researchers discovered that while nurses were aware of the importance of meeting benchmarks, they were unaware of the linkage between HCAHPS scores and hospital reimbursement and of nursing's impact on patient satisfaction.

Sources: Schroeder DL, et al.: Enhancing nurses' pain assessment to improve patient satisfaction. *Orthopaedic Nursing* 2016;35(2):108-117. [PubMed Citation](#)

Making Interdisciplinary Rounds More Effective

Military nurses report on developing a tool to facilitate communication during morning rounds, citing the Joint Commission focus on the key role effective communication plays in patient safety. Nurses were not always available to round with physicians, so they designed a tool with prompts for the nurse's primary concerns for the patient in areas such as diet, activity, pain, IVs, labs, procedures, wounds/drains, and discharge plans. The physicians were to address these concerns and provide goals and/or a plan of care for the day. Since this is a teaching hospital, the physician pager for the day was also noted. Nurses' perceived understanding of the plan for the patient increased from 38% to 72% after using the tool. The authors candidly discuss real-world challenges in implementing this quality improvement tool that apply to any practice setting.

Source: Perry V, et al.: A daily goals tool to facilitate communication during morning rounds on a medical-surgical unit. *MEDSURG Nursing* 2016;25(2):83-87.

Is Night-Shift Napping Forbidden or Key to Safe Practice?

This article reports the results of a study of night shift napping for nurses working between midnight and 6 am in two hospitals: a community hospital and a children's hospital. Researchers explored the study after an ANA position statement noted that allowing naps by workplace policy was one of several evidence-based fatigue countermeasures. The principal investigator met with nurse managers and designated staff on six units to share information about risks of sleepiness on the night shift and evidence

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supporting napping. Each unit was encouraged to develop its own evidence-based method to implement napping.

On three units, nurse managers declined participation in the study without presenting it to staff or attempting implementation. A fourth unit began the process but did not follow through. A fifth unit got as far as having ten nurses try napping, but none tried a second nap. There was a hospital-wide staffing change that altered the unit's climate, and with increased pressure on resources, there was a perceived stigma on napping. The sixth, a med-surg unit, successfully implemented napping with 153 30-min-

ute naps during the three months of the study. Several nurses had positive experiences with napping in other settings and acted as advocates. Those who took naps voluntarily reported that they were better able to drive home safely after their shift. This article provides detailed information about barriers to implementation and how to overcome them.

Source: Geiger-Brown J, et al.: Napping on the night shift: a two-hospital implementation project. *American Journal of Nursing* 2016;116(5):26-33. [PubMed Citation](#)

On the World Wide Web

The incident reporting systems used in the research on ventilator-related adverse events are:

Pennsylvania Safety Authority

<http://patientsafetyauthority.org/PA-PSRS/Pages/PAPSRs.aspx>

University HealthSystem Consortium

<https://www.uhc.edu/55432.htm>

FDA MAUDE (Manufacturer and User-Facility Device Experience) Reporting

<https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfmaude/search.cfm>

With Memorial Day coming, here are sites dedicated to nurses we should remember:

The Nurse's Memorial at Arlington National Cemetery

<http://www.arlingtoncemetery.net/nurse-memorial.htm>

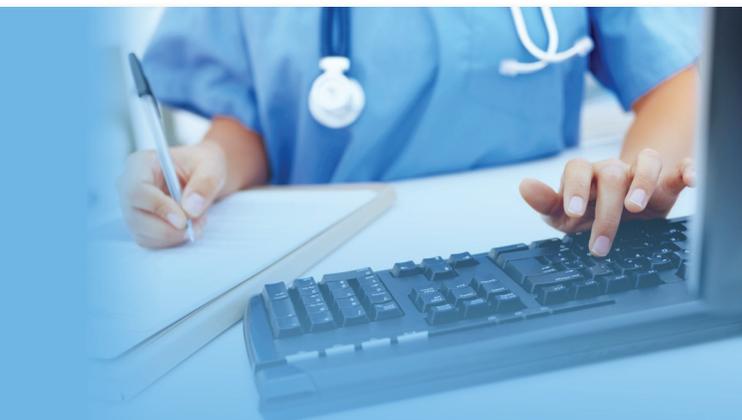
<http://www.arlingtoncemetery.mil/Explore/Monuments-and-Memorials/Nurses-Memorial>

The nurse sculpture is in Section 21, where many military nurses have been laid to rest.

More on Section 21

Billion Graves is a project to archive photographs of headstones with GPS coordinates for historic cemeteries. If you visit Section 21 and are willing to take some photos while you are there, you can contribute to this important project to memorialize nurses who gave their lives in service to our country.

<https://billiongraves.com/cemetery/Arlington-National-Cemetery-Section-21/259363#>



The Vietnam Women's Memorial

This bronze memorial, dedicated in November 1993 as part of the Vietnam Veteran's Memorial is on the Mall in Washington, D.C. Every Veteran's Day and Memorial Day, nurses gather and share their stories with visitors.

<http://www.vietnamwomensmemorial.org/stories.php>

The Women In Military Service For America Memorial

This is another memorial in the nation's capital, located at the ceremonial entrance to the Arlington National Cemetery in Arlington, VA. While the memorial and museum are dedicated to all women who served, there are special collections, exhibits, and features about nurses. Simply search 'nurse' on this page:

<http://www.womensmemorial.org/H&C/h&cwelcome.html>

If you are a veteran and need assistance, check the Military Order of the Purple Heart at <http://www.purpleheart.org/Links>

The Air Medical Memorial

The Air Medical Memorial currently lists 400 air medical flight crew members who have lost their lives in the line of duty at:

<http://www.airmedicalmemorial.com/honorees.html>

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chest tube through the initial stab wound. No patients treated according to protocol had life-threatening complications.

Cardiac Surgery

Canadian surgeons compared patients undergoing cardiac surgery who had a single mediastinal chest tube with those who had multiple mediastinal tubes. Over five years, 3045 had one tube and 2653 had multiple tubes (decision by physician preference). There was no statistically significant difference in return to the operating room for bleeding or tamponade, ICU stay >48 hours, hospital LOS >9 days, or mortality between the groups. However, the researchers were able to identify predictors of return to the OR: urgent procedures, complex surgery, renal dysfunction, age \geq 80 years, and the operating surgeon.

UK surgeons reviewed cardiothoracic and blood bank databases to compare blood transfusions in patients with vein grafts with those in patients who had total arterial revascularization (TAR) by left or bilateral internal thoracic arteries.⁶ Over five years and 2506 patients, 30% had TAR; they were generally younger with less complex CAD and fewer grafts. There was no difference in re-sternotomy rates for bleeding or tamponade; mean postoperative chest tube drainage was less in TAR patients. Rates of transfusions of PRBC, platelets, and fresh frozen plasma were “remarkably lower” in TAR patients. TAR was an independent factor for reduced transfusions.

Researchers in Belgium reported on a study in which they compared transfusion requirements in patients when the team used balanced hydroxyethyl starches (HES) for pump prime and intraoperative fluid therapy with those who had balanced crystalloids instead.⁷ HES had been standard until concerns about safety issues. A retrospective review compared the two protocols using the newest generation of HES.

HES patients had lower hemoglobin levels (related to hemodilution), higher chest tube output, and were more coagulopathic than the crystalloid patients. Forty percent required blood products versus 23% of the crystalloid group.

Lung Resection

European surgeons conducted a study to develop an aggregate risk score to identify patients at risk of developing large pleural effusion (>400mL/day) on POD2 after pulmonary lobectomy.⁸ (These researchers use the term ‘pleural effusion’ to describe chest tube drainage, which would be retained in the pleural space without the chest tube.) All patients had lobectomy for cancer via thoracotomy or VATS. Patients with drainage >400mL/day (23%) had longer chest tube duration, and longer LOS compared with those with smaller effusions (less drainage). Independent risk factors were age >70, lower lobectomy, and moderate to severe COPD. With no risk factors, the incidence was 7.5%; one risk factor, 22%; and more than one risk factor, 39%.

The researchers suggest these data can be used to determine when it is safe to remove the chest tube when drainage is 400 to 500mL/day postoperatively.

Chinese surgeons reported on early chest tube removal after VATS lobectomy.⁹ They compared VATS (n=97) with traditional surgery (n=57) and then in the VATS group, 51 patients had the chest tube removed on POD 2 and 46

patients had the tube removed when drainage was <100mL/day. Traditional patients also had the tube removed when the drainage volume threshold was met.

The chest tube duration in the traditional surgery group was 3.81 days and in the VATS drainage group, 2.98 days. There was no difference in reintervention for pleural effusion among the groups. Pain control was much more effective in the group in which the tube was removed on POD2, regardless of drainage volume. The authors advocate for removing the chest tube on POD2 after VATS for lobectomy.

A third study examining criteria for chest tube removal after lobectomy also came from China.¹⁰ Patients undergoing VATS were put into one of three groups: remove when drainage is 150mL/day or less (n=49, Group A), remove when drainage is <300mL/day (n=50, Group B) or remove when drainage is <450mL/day (n=51, Group C). Of patients who required thoracentesis after tube removal, 85% were from Group C. Patients in groups B and C had significantly shorter LOS than Group A, and their pain scores dramatically decreased on the second and third days postoperatively, which was directly related to the day of chest tube removal.

The researchers believe the 300mL/day drainage threshold is feasible and safe, but express concern that 450mL/day may be too aggressive, with a significantly increased risk of thoracentesis.

UK researchers examined evidence-based practice related to chest drain suction after lobectomy.¹¹ Not only did they review the literature and perform a meta-analysis, but they also surveyed UK bedside practice to evaluate whether practice correlated to the evidence.

The meta-analysis showed patients who did not have suction had shorter air leak duration, shorter chest tube duration, and shorter LOS compared with suction patients. There was no difference in prolonged air leaks. Suction did significantly reduce postoperative pneumothorax, but the clinical implication is unclear.

Of particular interest is the authors’ distinction between efficacy and effectiveness. There is no dispute that suction increases the rate at which the lung re-expands by removing air and fluid. This, they note is ‘efficacy.’ However, suction use did not improve patient outcomes; thus, it is not ‘effective.’

The survey showed great variations both within and between hospitals. The majority of surgeons (68%) apply suction routinely. Only 20% of hospitals had a written protocol for postoperative care. While there is level 1a evidence that suction does not improve outcomes, applying suction remains common practice.

Finally, researchers at the University of Tennessee published a retrospective review of patients discharged with a chest tube (CT) following pulmonary resection.¹² These patients had a persistent air leak, pain managed by oral analgesics, and resolution of any medical conditions requiring hospitalization. Once patients met reasonable criteria for discharge, the chest tube was connected to a Mini 500 portable drain (Atrium/Gettlinge Group). Over five years, 65 patients (13%) were discharged, and only two were readmitted. One had a DVT, and the other a non-life threatening pulmonary

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embolus. Four patients had superficial CT wound infections that resolved with oral antibiotics. No serious complications were related to chest drainage.

Overall, patients who went home with chest tubes had a shorter mean LOS than other lobectomy patients. Mean time to CT removal after discharge was 4.7 days, potentially saving 305 inpatient days without an increase in mortality or morbidity.

Pleural Effusion

Chest published a point-counterpoint discussion on small bore pleural catheters for initial malignant pleural effusion management.^{13,14} The pulmonologists in favor note that the ultimate goals are to relieve dyspnea and avoid multiple procedures that would affect a patient's quality of life. They point out that the smaller tube requires a smaller incision and less dissection, consistent with a palliative approach.

The pulmonologists against this approach argue that there is not a one-size-fits-all approach, and much work is needed to sort out a particular patient's optimal management. They note that large-bore drainage has been the cornerstone of management, and while there is enthusiasm for new approaches, changes in care should be based on well-designed clinical research.

They express concerns about the scope of management that can transition from simple drainage to pleurodesis and the risk of small-bore catheter clogging with sclerosing agents. Instead of advocating for a particular approach, these authors note that multiple options – large- and small-bore tubes, drainage, pleurodesis, tunneled catheters and thoracoscopy – should all be considered and that treatment strategies should be customized. Clinicians should make a choice based on treatment performance, expected patient survival, extent of dyspnea, quality of life, social support systems, cost and patient preference.

Our next issue will review the 2015 research on chest tube insertion, chest tube management, and digital chest drains.

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In honor of Nurse's Week 2016,
we salute all of our colleagues
who make us proud every
week of the year.