

MEDICAL EDUCATION: PART II

CHEST TUBE MANAGEMENT IN HOSPITALIZED PATIENTS: AN INTERDISCIPLINARY COLLABORATIVE APPROACH

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Approximately one million adults are hospitalized each year for pneumonia in the United States—50,000 die from its complications.¹ Para-pneumonic effusions (PPE) can occur in up to 40% of patients with bacterial pneumonia.¹ Large uncomplicated effusions can effectively be drained by therapeutic thoracentesis; however, complicated PPE and empyemas require tube thoracostomy (TT).

Multiple studies²⁻⁵ have shown that the intrapleural administration tPA and DNase in patients with pleural infection increases chest tube output while decreasing surgical referrals and hospital length of stay. The treatment protocol consists of twice daily intrapleural administrations for three days. At our institution, 714 adult patients were hospitalized for pneumonia in 2017 with 20 (2.8%) requiring TT. At our organization, Pulmonary, Interventional Radiology (IR) and General Surgery (GS) have the ability to place chest tubes with the informal agreement that all aspects of its management are to be implemented by the service performing the procedure, including tPA and DNase administration. This arrangement was poorly enforced during evening hours leading to confusion and conflict for providers and nurses, delay in doses and unintended complications related to the lack of expertise of covering providers.

Given the twice daily administration of tPA and DNase coupled with the lack of 24-hour in-hospital coverage by two of the three services (Pulmonary and IR), Hospital Medicine (HM) was often asked to perform the administration of intrapleural fibrinolysis (IPF). Many HM providers felt they lacked the training to safely perform IPF.

Intervention and Findings

In order to standardize chest tube management, HM proposed to assume responsibility of all chest tubes placed for pleural infection. The key stakeholders in Pulmonary, IR, and GS supported the transition. Review of hospital policies and procedures revealed neither a protocol nor electronic medical record (EMR) order set to standardize the process of IPF administration.

The initial step involved a joint meeting with our Tier-1 stakeholders: leadership of HM, Pulmonary, GS and IR with the goal of highlighting the importance of standardizing chest tube management in regard to its effect on patient care as well as interprofessional relations; and to assess interest and motivation in formalizing the transition of chest tube management to HM.

Out of the three services that regularly place chest tubes, only GS provides around-the-clock coverage with in-house providers. Because chest tube management contributes to the education of surgical residents, it was felt that chest tubes placed by GS should continue to be managed by surgical residents, leaving HM to only assume management of chest tubes placed by Pulmonary and IR. A HM Work Group (HMWG) composed of Physicians and Advanced Care Providers then formed and conducted a gap analysis by performing literature review and determining our current vs. ideal state. Tier-2 stakeholders were also identified and consisted of leadership from Pharmacy, Nursing, Central Supply, and IT.

The HMWG was tasked with developing a stepwise approach leading to formation of a policy and standardized protocol for the administration of tPA and DNase.

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Actionable Items by Tube Thoracostomy with Intra-Pleural Fibrinolytic Management Protocol

Actionable Item	Finding Pre-protocol	Post-protocol
Number of phone calls involving Hospitalist (MD/APP) per dose	1. RN to HM to request/remind IPF dose 2. HM to consultant to request/remind IPF dose 3. HM to pharmacy for IPF verbal order 4. RN to HM to notify dose readiness 5. HM to RN for “unclamp tube” verbal order	1. RN to MD to notify IPF dose readiness
Number of phone calls by Nurse per dose	1. RN to HM to request/remind IPF dose 2. RN to HM to notify dose readiness 3. HM to RN for “unclamp tube” verbal order	1. RN to MD to notify IPF dose readiness
Standardized management of TT	Variable	Standardized
Ease to order IPF	Multiple verbal orders	Order set in EMR
TT management documentation and billing	Variable Concern for lack of billing capture	Standardized Good billing capture
Number of estimated missed doses/year	30% of evening doses \$18,000/year (average)	None expected
Estimated medical errors	Variable	None expected
Perceived hospitalist (MD/APP) self-confidence in IPF administration	Variable	Good
Accessibility to training material	No standardized training. Wide-ranging between literature review and over-the-phone instructions from consulting MD	Accessible 27/4 in EMR dashboard

TT: Tube Thoracostomy, IPF: Intra-Pleural Fibrinolytic; HM: Hospitalist; MD: Medical Doctor; APP: Advanced Practice Provider; RN: Registered Nurse; EMR: Electronic Medical Record

The steps included: 1) creating a gap analysis with identification of actionable findings; 2) developing evidence-based guidelines for IPF; 3) creating required training for staff; 4) working with pharmacy and IT to generate an EMR order set for TT and IPF; 5) collaborating with IT to create a standard EMR note for documentation; 6) analyzing and proposing quantitative and qualitative measures of success; 7) obtaining approval by institution’s policy and Executive Committee of Patient Safety and Quality (ECPSQ); and 8) facilitating a hospital-wide implementation of the process.

Between March and May 2018, the workgroup met on a weekly basis and addressed the following concerns and inefficiencies (see table) related to lack of chest tube management standardization:

1. *Hospitalist-Consultant communication conflict:* Given the

previous understanding that the service that placed the chest tube was in charge of its management, conflict arose with twice daily IPF as there is not 24-hour in-hospital coverage by the Pulmonary and IR services. By formally transitioning responsibility to HM, calls to consultants decreased significantly leading to perceived improved collegiality.

2. *Lack of a standardized process for chest tube management:* We found a significant variability in style of chest tube placed and recommendations on technique for administering medications between the services placing chest tubes. Based on literature review, we developed a protocol agreed upon by all services standardizing medication administration, thus decreasing variability and increasing patient safety.
3. *Lack of an order set and readily availability of IPF drugs:*

Previously, tPA and DNase for intrapleural use were not on the pharmacy formulary and therefore an order could not be placed in the EMR, requiring providers to call pharmacy and place a “verbal order” for the medicine to be dispensed. The HMWG facilitated the addition of tPA and DNase for intrapleural use to the pharmacy formulary and to our point-of care medication dispensing system on the inpatient units. This action streamlined our process and reduced calls. An order set was also created in our EMR, which is time efficient as well as standardized for patient safety.

4. *Unreliable documentation and billing:* A “dot phrase” (macro) to standardize IPF administration documentation in our EMR was developed and distributed among hospitalist providers.

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This dot phrase included time-based codes to facilitate billing for the procedure and clarified the time and result of the procedure.

5. *Hospitalists' inconsistent training and confidence with IPF and TT management:* To reduce stress and conflicts with consultants, hospitalists would frequently agree to administer IPF after receiving verbal instructions from the sub-specialty provider. Many HM providers felt that their training was inadequate to safely administer IPF and perform subsequent TT care, causing stress and anxiety. We developed a training module which had both an in-person training session, providing time to practice different tube manipulation and a picture-based protocol that was added to our online dashboard for easy, real time access.
6. *Safety concerns related to lack of training:* There was at least one patient safety event reported in the first quarter of 2018. The patient suffered no injury; however this was as an error related to insufficient nurse communication. Safety concerns were addressed by developing the training as well as the order set, which includes more detailed nursing instructions.
7. *Financial waste:* The IPF protocol for PPE includes intra-pleural dosing every 12 hours for 3 days. We estimated that due to confusion on who was expected to administer dose, time inefficiency, and lack of training, at least 30% of nocturnal doses were not administered after being mixed in the last year. Our pharmacy's cost per dose of 5

mg DNase and 10 mg tPA in 30 ml is approximately \$1,000. Our Institution's calculated yearly cost (6 doses x 20 patients) is \$120,000. The missed 30% nocturnal doses would result in approximately \$18,000 annual waste. No doses are expected to be missed after launching the protocol.

8. *Time inefficiencies:* It was also assessed that before protocol, HM providers would spend between 30-60 minutes to accomplish IPF. The process consisted of the following: contacting consulting service to request help, discussing patient with pharmacy and placing a verbal order, waiting for medications to be mixed and brought to the bedside, quickly reviewing "how-to-administer IPF", administering it, clamping the TT and returning in 30-60 minutes to unclamp. This led to inefficient use of physician time, with an estimated waste of 30-60 physician-hours/year. These inefficiencies were addressed by the protocol.

Next Steps and Operational Implications

Through this multidisciplinary, collaborative, consensus-building process, we were able to develop successful and lasting partnerships; improve efficiency and decrease waste; enhance patient quality of care and safety; standardize documentation leading to better billing capture; develop and implement the 24/7 access to educational materials; and enrich communication and collegiality amongst services. The protocol was approved by the ECPSQ and instituted as a hospital policy at our organization and is currently under

implementation phase.

Hospitalists provide 24/7 patient care, and they are uniquely positioned and trained to collaborate and partner with many diverse departments to foster safe and efficient care for our patients. This project highlights the importance of communication and collaboration as the keystone for operational success.

References

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