



Original Research

**Organizing a Dedicated Pleural Service at an Academic Center to Streamline Pleural Disease Care**

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**Abstract:**

**Introduction :** Specialized teams for management of pulmonary entities such as lung transplantation, pulmonary hypertension, cystic fibrosis and sleep disorders have been in place for many years. While pleural disease has been on the rise in the past decade, the availability of specialized teams with expertise in pleural medicine has been lagging. Pleural medicine is highly procedural and lack of focused attention may lead to suboptimal care. We describe our experience in reorganizing our general pulmonary fellowship program to accommodate a pleural subservice and the results thereof.

**Methods:** In 2013 the pulmonary consult service was reorganized so that four attending pulmonary physicians with experience in pleural medicine and procedures along with a first year fellow formed a pleural consult subservice. First year fellows were trained during orientation in pleural procedures and also provided year round dedicated didactic lectures, simulations and supervised patient care. Lastly, we established a pleural disease outpatient clinic to provide follow-up care for hospitalized patients or evaluate new patients.

**Results:** Between 2013-2015, there were a total of 1152 initial general pulmonary consults (average of 576/ year), 10% (113) of which were performed by the pleural service. Eighty four percent (84%) of these consults led to a pleural procedure while 16% did not. Based on our internal quality control review, 26% of the consults placed resulted in a change in management than was originally planned or documented by the primary service.

**Conclusion:** Our experience demonstrates that it is possible to set up a successful pleural sub-specialty in an academic center without a dedicated IP fellowship, leading to improved workflow and training of fellows in pleural disease management and procedures.

**Keywords:** Pleural disease service, patient safety pleural, pulmonary fellowship training

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**Introduction :**

Medicine has become highly specialized in recent times. The field of pulmonology has undergone recent restructuring with an increasing number of subspecialties including sleep medicine, allergy, pulmonary hypertension, transplant, sarcoidosis, cystic fibrosis, interventional pulmonology and pulmonary fibrosis teams managing a complex set of patients. Because of a worldwide increase in the incidence of pleural disease and available procedures, there is a need for a specialized team in management of these patients.<sup>1,2</sup> Procedures such as ultrasound guided thoracentesis, Seldinger guided chest tubes, indwelling pleural catheters, pleurodesis, closed pleural biopsies and medical thoracoscopy are becoming common practice in pleural medicine. In the past, many of these procedures including placement of intercostal drains were considered part of a core procedural skill set possessed by a physician. However, there are definitive data to show that the pleural procedural outcomes are improved when such cases are managed by a limited number of physicians who routinely perform them<sup>3</sup>. Furthermore, with changing management options and a decreased emphasis on procedural training in graduate medical education as a whole, there is concern for continued physician competency and patient safety.<sup>4,5</sup> In addition, in care systems where these procedures are delegated to other services (like interventional radiology or thoracic surgery), the expertise of a pleural specialist in interpreting the fluid analysis, imaging studies and developing a comprehensive management strategy is lacking. A specialist team may help improve these deficiencies.<sup>6,7</sup>

In centers with an interventional pulmonology(IP) program and fellowship, management of pleural diseases is delegated to pulmonologists who have been trained in diagnosing and caring for such patients. However, there is limited literature available on establishment of a formal pleural service in an academic medical center *without* a dedicated interventional pulmonology program. Given the increasing number of pleural procedural interventions available, management of such patients under the auspices of a dedicated trained team is likely to be superior.<sup>3</sup> For example, the limited available literature

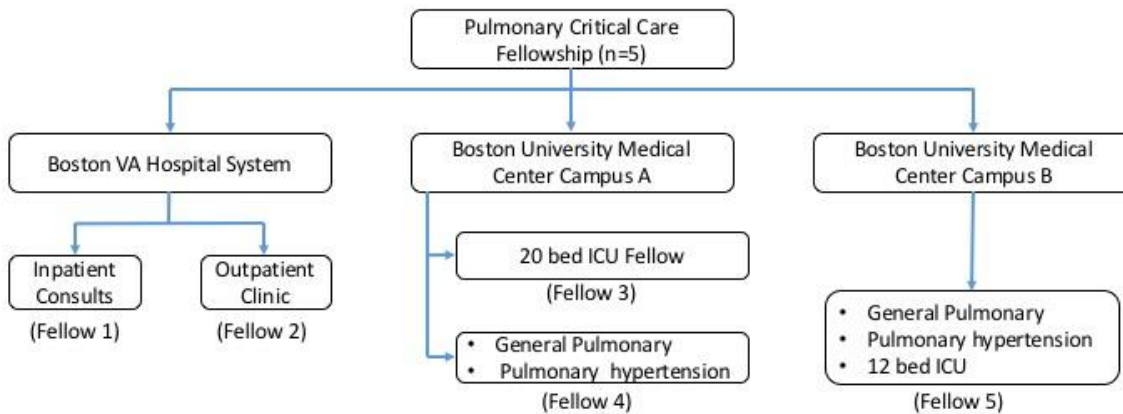
shows that the establishment of multidisciplinary pleural service<sup>6,7</sup> helps in decreasing average length of stay and unnecessary admissions.<sup>8</sup> However all such examples are from the United Kingdom or Australia which have a different academic fellowship structure compared to that in the United States.<sup>6,7</sup> We are unaware of a pleural disease service in the United States operating at an institution without an interventional pulmonology program. We share our experience in reorganizing an existing general pulmonary and critical care fellowship to include a dedicated pleural team.

**Methods:**

Prior to 2013, Boston University Medical Center had 5 first year Pulmonary/Critical Care fellows each academic year, who together with pulmonary staff were required to care for intensive care unit (ICU), inpatient consults and outpatient pulmonary patients across three distinct hospitals (Fig. 1). Two fellows were assigned to the affiliated Boston Health System Veterans Hospital (VA) providing inpatient and outpatient services. The remaining three fellows were assigned to Boston Medical Center, comprising 2 different campuses separated geographically by a few blocks, each of which has inpatient pulmonary consult and ICU needs. Since it was not possible with only 3 trainees to dedicate one individual to each of these needs across two different campuses, one fellow was assigned the larger of our two ICUs- a 20 bed unit. The two other fellows were based on the individual campuses to perform general pulmonary and pulmonary hypertension subspecialty consults. Lastly, one of these two fellows also provided support for the smaller of our ICUs- a 12 bed unit.

Attending staffing of these services was notably different from fellows. Each ICU had distinct attending physicians who were different from the dedicated general pulmonary and pulmonary hypertension consult attendings. This system engendered multiple problems, including operational flaws and decreased efficiency. Some fellows—especially those covering general pulmonary consults, pulmonary hypertension and the smaller ICU (Fellow 5) felt overburdened and faced difficulty while trying to mesh schedules with

**Figure 1.** Outline of division of duties prior to the introduction of a pleural team.



three different staff members. There were occasions when care for decompensating ICU patients or necessary pulmonary procedures were delayed or when house staff were left without adequate supervision.

Since there was no dedicated pleural team, a new consult for such a patient was initially seen by the general pulmonology consult fellow and either staffed with a general pulmonary consult attending or “curbsided” with one of four attendings who specialize in pleural diseases (Fig. 2). The recommendation from the pleural attending was then relayed back to the primary team by the general pulmonology fellow. This system was not felt to be sustainable and the need for a pleural subspecialty required a restructuring of the services and reassignment of duties.

In 2013, with the addition of a sixth pulmonary fellow, the pulmonology service was reconfigured to include a “Physiology” fellow, who would be responsible for consults and procedures for both pulmonary hypertension and pleural patients across both campuses (Fig 3). Per the new system, any patient requiring a pulmonary consult for a pleural disease was now referred to the pleural subservice. In addition to direct consultation from hospital based services, consults to the pulmonary hypertension or pleural

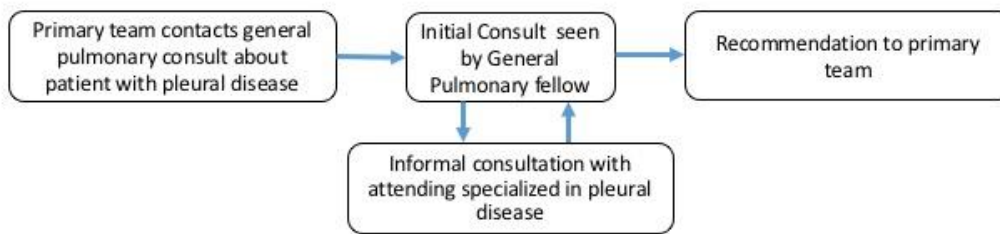
service could also be triaged by the general pulmonary consult fellow. The attendings that staffed these patients had undergone extra training in pleural procedures, point of care (POC) ultrasound and had a general interest in pleural medicine. On weekends and at night, however, all consults were routed to the general pulmonology attending who was available on site and/or the pleural attendings who were available by page.

Pulmonary fellows received additional training: a pleural service curriculum that included procedural simulation and didactics along with direct supervision while performing pleural ultrasound, thoracentesis, Seldinger catheter placement, tunneled pleural catheter placement, pleurodesis and closed pleural biopsies. The fellows also received feedback and evaluation on their procedural skills throughout the year.

**Results:**

Between 2013 to 2015 there were 1152 initial pulmonary consults (average of 576 yearly) Of these, 81% (933) were triaged to the general pulmonology consult service, 9%(106) were pulmonary hypertension and the remaining 10% (113) were pleural service consults. Eighty-four percent (84%) of these initial

**Figure 2.** Pathway for communication on patients with pleural disease prior to intervention



consults resulted in a pleural procedure while 16% did not. The case diagnoses were diverse and included malignancy (35%), infection (19%) postoperative complications (10%), pneumothorax (10%), volume overload (5%), hepatic hydrothorax (4%), connective tissue disorders (4%) and other (13%).(Fig 4). In 26% of the cases pleural team involvement resulted in a new diagnosis or a change in management than originally planned or documented by the primary service. These included instances in which an alternate condition was diagnosed (i.e. hepatic hydrothorax, chylothorax, lupus effusion and lung entrapment) or in which alternate management was recommended (i.e. placement of tube thoracostomy for an unsuspected loculated effusion or empyema, pleural biopsy for suspected TB or deferring a requested procedure). In addition to these formal consults, the pleural team was instrumental in providing procedural support to an additional 349 patients. These were, for the most part, patients from medical or surgical services who had pleural effusions of known etiology or pneumothoraces who needed a discrete procedure; in sum, they were patients in whom the primary service did not have a specific clinical question concerning diagnosis or management.

Having a dedicated pleural service also afforded an opportunity to perform pleural research, either clinical or translational. There is currently an active IRB for collection of pleural fluid for further analysis using gene expression studies and ultrasonic fluid characterization.

Lastly, internal surveys have demonstrated that

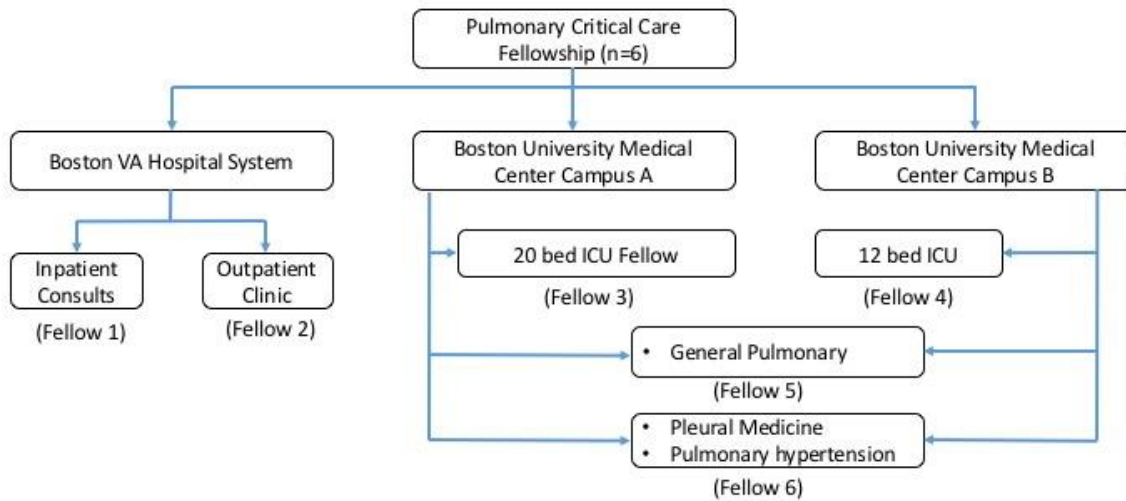
pulmonary fellows have an increased satisfaction with their training and believe they provide better patient care provided with the reconfigured system.

**Discussion:**

During the past three years the pleural subservice has become increasingly important in the management of patients with primary pleural diseases at our institution. In addition, the service has also performed pleural procedures on patients assigned to other subspecialties including heart failure, cardiothoracic surgery and general medical services. Introduction of a dedicated service has changed management in patients admitted with pleural diseases and has resulted in improved supervision of procedures, more timely procedures and change in management in many cases.

Whenever establishing a new clinical service, some challenges can be expected. First, a core component of the team is one or several physician champions without whom such a service is inconceivable. Our institution was fortunate to have 4 pulmonologists with sufficient interest in pleural medicine to participate in coverage of the team. Because the volume of the team was insufficient to support an entire full time equivalent, and no additional funding for the team was granted at an institutional level, staff members had to fulfill other clinical responsibilities. Initially, there was apprehension among the clinic nurses and medical assistants regarding the feasibility of performing pleural procedures in an ambulatory setting. This was overcome through simulation sessions and also familiarizing the staff with new equipment. Lastly the

**Figure 3.** Restructured fellowship program to include a pleural subservice



relationship with Interventional Radiology and Cardiothoracic Surgery Departments, those who would otherwise have been consulted for these procedures, is one of cordiality and they were appreciative of the establishment of such a service as it helped decompress their workload.

From review of clinical activity thus far, we have found a large number of instances in which staff from the pleural service was asked to perform only a requested procedure without a formal consultation. Although most of these patients already had known pathology (i.e. cancer or post-op CABG patients with pleural effusions), some may have benefited from formal pleural service input. Cases such as these, raise the possibility that there remain “missed opportunities” for this service to provide clinical input on a greater number of patients. Without a formal consult, the interpretation of fluid studies remains the responsibility of the primary service. Clearly, this flaw in the current system can be improved is being actively pursued to allow the pleural service to perform a procedure, and substantive evaluation and management services (E/M) that are compliant with CMS guidelines for modifier -25.

Lastly, implementation of a pleural service has been instrumental in educating the fellows about pleural diseases and ensuring that they are trained in newer

modalities of pleural medicine. Establishment of this service has afforded new and additional opportunities in both clinical practice and research. In addition, patients requiring follow-up for their pleural disease have been referred to a newly established pleural clinic which ensures continuity of care and long term follow up.

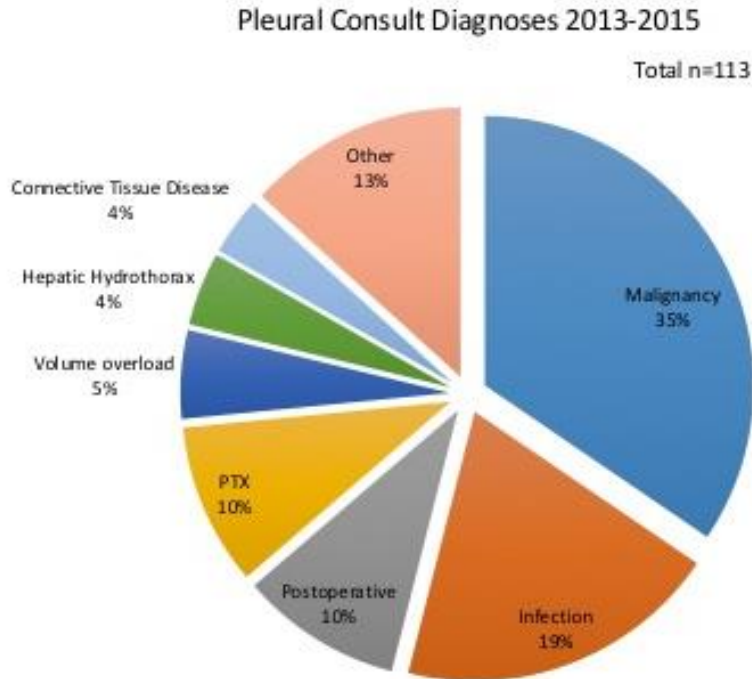
**Limitations :**

There are limitations to establishment of such a service, depending on the facilities available at various academic centers. This model is appropriate in centers that do not have a dedicated interventional pulmonology program or fellowship. In such a scenario, it would be expected that the interventional pulmonologists have been trained in managing pleural-related disease and have also received training in advanced management of such cases. Second, sustainability of such a service requires sufficient attendings trained in managing these patients. Third, objective measures of the impact of this service are currently not available and difficult to study (i.e. decreased length of stay or decreased morbidity and mortality).

**Conclusion:**

Pleural disease is increasing worldwide and there have been many advances in management. There are data from existing pleural units in the UK that dedicated pleural teams provide objective benefits, such as

**Figure 4.** Breakup of case diagnoses that were managed by the pleural service 2013-2015



decreased waiting times, length of stay and hospitalizations.<sup>6,7</sup> Our experience demonstrates that it is possible to establish a successful pleural sub-specialty at an academic center without a dedicated IP fellowship; thus far, this service has resulted in improved workflow, improved fellow satisfaction, a change in patient management in some cases, and establishment of a valuable research and educational platform.

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