



# Organizing and Maintaining a Flexible Bronchoscopy Program

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Robert E. Wood

A pediatric flexible bronchoscopy program is a complex operation, and requires a team, not merely one person. In order to justify the base costs to set up to do pediatric bronchoscopy, a certain volume of business is needed, and the bronchoscopist must pay attention to business matters.

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## The Team

A bronchoscopy team consists of (at least) the following:

- Bronchoscopist(s) – physician(s)
- Assistant(s) for procedures – nurse, respiratory therapist
- Anesthesiologist/sedation nurse – physician/nurse
- Scheduling/clerical/billing staff
- Cleaning staff

The composition of the team will be different in different institutions, but the tasks/roles above must be performed by someone with skill, training, and support to do the job properly. The bronchoscopist is the team leader, and must be aware of and should be personally competent to perform all the tasks of each of the team members. For example, the physician must be knowledgeable

about how to clean the bronchoscopes after procedures, and be willing to perform this task when necessary. *The team leader will have a difficult time supervising what he does not know how to do.*

Bronchoscopy is rarely done in a vacuum, and flexible bronchoscopists need to have colleagues who are skilled (and equipped) to do rigid bronchoscopy when the situation demands. Flexible bronchoscopists need to develop and maintain close collegial relationships with their surgical colleagues. Depending on the specific indication for the procedure, it may be important that *both* rigid and flexible instruments are employed during the same procedure (this is especially true for laryngeal lesions, where rigid instruments give a superior image of the structure, but flexible instruments yield a superior evaluation of *dynamics*).

Assistants for bronchoscopy need to be trained and skilled for the task. To draft a willing but untrained nurse or medical student to assist at a procedure is an invitation to disaster, be it damage to the equipment, mishandling of a specimen, or something worse. The assistant's first responsibility is to the patient, although the precise roles played by the assistants before, during, and following the procedures will vary from institution to institution and from situation to situation.

Patients must be safe and comfortable during procedures, and for pediatric patients, this almost always means sedation/anesthesia.

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R. E. Wood (✉)  
Division of Pulmonary Medicine, Cincinnati  
Children's Hospital, Cincinnati, OH, USA  
e-mail: [RobertE.Wood@cchmc.org](mailto:RobertE.Wood@cchmc.org)

Someone other than the bronchoscopist must be responsible for the safe and effective sedation and monitoring of the patient. This can be a sedation nurse, working under the supervision of the bronchoscopist, or it can be an anesthesiologist. This person's sole responsibility is to monitor the patient and the response to sedation, as well as record keeping (charting medications given, vital signs, etc.). It is useful to note that not just any anesthesiologist will do, as pediatric bronchoscopy is particularly challenging to every basic concept held dear by anesthesiologists (control of the airway, etc.). *There must be clear and effective communication between the bronchoscopist and the anesthesiologist before, during, and after the procedure.* Use of the wrong type or level of sedation/anesthesia or the wrong technique for airway management during the procedure may well lead to an incorrect diagnosis.

Patients do not magically appear – they must be scheduled. The efficiency and style with which patients are scheduled can have a dramatic impact on the success or failure of a program. Procedures must be scheduled with care to take into account other procedures, needs, etc. When feasible, multiple procedures can be scheduled for the same anesthesia session; this requires skillful coordination among services.

Scheduling is more complex than merely picking a date and a time and telling the patient when and where to appear. The scheduler must take into account the availability of the venue, staff, coordination with other services, the urgency of the procedure, the wishes and schedule of the patient/family, etc. Someone must ensure that the patient will be properly prepared for the procedure. This task can be shared among the physician, who sees the patient in advance of the procedure and obtains the informed consent; the nurse, who makes sure that the family understands such matters as when to stop feeding the child, and where and when to appear; and the scheduler, who provides the family with written materials to help them prepare.

Nursing input into patient preparation is important. At CCHMC, families are contacted by phone in advance of the scheduled procedure,

after the physician visit, if the nurse did not see the patient at the time of the physician visit. It is a fact of life that nurses, contacting the family after the patient has seen the physician, can often obtain important information that the physician did not. This may be because some parents feel less intimidated by a nurse than a physician, because they may later remember facts not recalled during the physician visit, or for other reasons. The nurse should review risk factors, including specific medical history, behavioral history, medication history, allergies, etc. My personal patients are prescreened by my nurses prior to the initial visit, which allows me to be more prepared for the visit. In patients in whom there are perceived risk factors for anesthesia, a formal anesthesia consult is obtained in advance of the procedure.

*The work product of endoscopy is information* – images, observations, and their interpretation, as well as test results on specimens obtained during the procedures. The physician must prepare a formal report of the procedure, which is then distributed to the appropriate caregivers (referring physicians, consultants, etc.) and to the medical record. If referring physicians do not receive timely and informative reports, they will have much less incentive or desire to refer patients in the future. While it is the responsibility of the physician to prepare the procedure note, the nursing and clerical staff play an important role in the distribution of the reports and other data. They may also help deliver information to the families.

Finally, bronchoscopy cannot be performed without appropriate instruments that are suitable for use in the patient. Someone, be it the physician, the nurse or RT assistant, or someone specially trained for the task, must be responsible for cleaning the instruments after each use. Another fact of life is that in most institutions, people hired for roles such as this are not college graduates, and may not be highly motivated by intellectual goals. It is important to carefully train, supervise, and encourage staff who care for the instruments. They can make or break the program. In their own way, the role (and the responsibility) of the instrument cleaners is as important as is the role of the physician.

## The Venue

Bronchoscopy must be performed in an appropriate venue. The venue must be safe, and it must be effective for the purpose. Flexible bronchoscopy *could*, in theory, be performed almost anywhere (on a city bus, an airplane, an operating room), but what *can* be done is not necessarily what *should* be done. There are three basic venues for bronchoscopic procedures: operating rooms, endoscopy suites, and intensive care units.

An *operating room* is almost always an appropriate venue, especially when an anesthesiologist is employed to assist with the sedation of the patient. There may be challenges in scheduling, and one cannot be certain (without prior evaluation and arrangement) that the proper/necessary equipment and supplies are available in the OR. Depending on the acuity of the patient's problem, the complexity of the intended procedure, and the anticipated need for other services, the OR may be the only logical place for the procedure.

An *endoscopy suite* is an ideal venue for many bronchoscopic procedures. The suite must be fully equipped for any foreseeable emergency (hemorrhage, pneumothorax, cardiac arrest, etc.). Unless there is a "critical mass" of procedure numbers, staffing may be a problem. In many institutions, an endoscopy suite can be shared among several services (i.e., pediatric and adult pulmonology, or pediatric pulmonology and pediatric gastroenterology, etc). This will result in more efficient utilization of resources, including equipment (light sources, video processors, procedure tables, etc.), but may result in some difficulties due to scheduling conflicts. Properly administered and operated, however, an endoscopy suite that includes pediatric flexible bronchoscopy can be among the most cost-effective units in a hospital.

It is technically possible to perform flexible bronchoscopy at the patient's bedside. This makes it tempting to "have scope, will travel..." and to perform procedures just about anywhere. However, *this is unwise in the extreme, and it is rarely safe or effective to do bedside procedures outside an intensive care unit.* Even in an ICU,

the bronchoscopist must ensure that appropriately trained staff are available to assist. Not any ICU nurse will be an effective bronchoscopy assistant, especially when the patient is unstable. On the other hand, for many patients, the ICU is an ideal venue, if moving the patient to another facility involves risk or very serious inconvenience. When procedures are done in the ICU, the bronchoscopist must ensure that everything that could possibly be needed comes along to the ICU. This includes such simple things as slip-tip syringes (not usually available in ICU's – the standard Luer-lock syringes will not work with flexible bronchoscopes).

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## Preoperative and Patient Recovery Facilities

Many pediatric flexible bronchoscopies are performed on an outpatient basis, and there must be an appropriate venue for the patient prior to the procedure. Sharing an outpatient surgery facility with surgical services can be very cost effective. Likewise, the patient must have a safe and effective venue for postoperative recovery from sedation, and it is very effective to share the post anesthesia recovery unit with surgical services. The most dangerous time for a patient undergoing bronchoscopy may be immediately after the procedure is completed; with no further stimulation, the patient may become apneic, and the staff tend to relax their vigilance once the procedure is completed.

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## Equipment

It has been said that the difference between men and boys is the price of their toys. Flexible bronchoscopists must be *real* men, because our toys are *very* expensive (with all due apologies to the women who are also very good flexible bronchoscopists). A pediatric flexible bronchoscope costs on the order of \$25,000. It is difficult to operate a meaningful pediatric bronchoscopy program with only one instrument. At a *minimum*, I recommend the following:

- 2–2.8 mm flexible bronchoscopes
- 1 adult bronchoscope (available; possibly borrowed on an ad hoc basis from the adult services) with 2.0 mm suction channel
- 1–2.2 mm flexible bronchoscope (this instrument has no suction channel, and is therefore of relatively limited utility, but when it is needed, nothing else will do)
- 1 light source
- 1 video processor
- 1 monitor
- 1 video recording system

It can be cost effective (especially when sharing an endoscopy suite) to share the light sources, video processors, monitors, and video recording systems. I strongly recommend, however, that the 2.8 mm flexible bronchoscopes not be shared with other services, as they are not robust, and are very easily damaged by users not accustomed to these small instruments (no matter how otherwise skilled or well-meaning). The half-life of a flexible bronchoscope in the hands of a gorilla (i.e., anyone untrained or irresponsible) is approximately 17 milliseconds.

The light source, video processor, etc., should be mounted on a cart so it can be moved from site to site. There also needs to be a cart with all the supplies and ancillary equipment that would be needed at another venue (i.e., ICU); the video monitor can be mounted on this cart, which can then be positioned appropriately for best visibility during the procedure.

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## Equipment Cleaning

Next to performing the procedure, cleaning the equipment is the most important aspect of bronchoscopy. An improperly cleaned bronchoscope can be lethal. There is only one criterion for a clean bronchoscope – it is ready to be used on the bronchoscopist. After the procedure is completed, the soiled instrument must be carefully transported to the cleaning facility. This step is a critical one, for it is here that many instruments are physically damaged. Care must be taken to avoid contamination of the clean environment by a dirty instrument. A cleaning facility must be

capable of maintaining effective separation between dirty and clean equipment, of properly cleaning and then disinfecting the instruments, and storing them appropriately.

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## Equipment Storage

It is important to have a secure place to store equipment. The cost of a flexible bronchoscope exceeds \$25,000, and theft or vandalism (intentional or otherwise) can wreak havoc on a bronchoscopy program's operations (not to mention the budget). Storage should not only be secure, but should ensure that the equipment is kept clean and ready for use on short notice. The hospital's Infection Control staff should be involved in decisions about instrument storage.

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## Handling the Data Generated by the Procedures

The job is not done until the paperwork is done. A sad fact of life is that often what we write seems more important than what we've done. But *the work product of endoscopy is information* – images, observations and their interpretation, and data generated from specimens obtained during the procedure.

**Image management** – I believe that all procedures should be recorded whenever possible. I have had the miserable experience of reviewing a video recording of a procedure done as long as a year previously, and finding a very significant abnormality that I missed during the procedure itself. I have also been an expert witness in legal cases that I believe would never have become a legal case had the procedure been recorded.

Bronchoscopy generates large volumes of images, whether still images or video recordings, and it is important to have a systematic way to retrieve the images when they are needed. A computerized database of procedures, with information about the image storage (e.g., videotape number, DVD number) is virtually mandatory. There are systems now available for the central recording and archiving of video data, which

make the results of endoscopic procedures readily available for review at multiple locations as needed. At CCHMC, all endoscopic procedures since 2006 are recorded in an online video archive, and can be accessed very quickly.

Images obtained during bronchoscopy are useful not only for the medical record, but for teaching medical professionals and for education of patients and families. Still images can be incorporated into procedure notes. It may be very helpful to show parts of the video record to parents or even the patient, to help them understand the findings and their significance.

**Procedure reports** are an important part of the medical record, and, sadly, in our current medicolegal atmosphere, are perhaps the most important aspect of the procedure. They are used for many purposes, including patient management, teaching, research, and as support documentation for reimbursement. The report needs to include the indications for the procedure in the context of a brief history, a description of the procedure and the findings, the complications, diagnostic impressions, and a discussion and plan for follow-up. It can be helpful to incorporate photos into the report, although this requires special editing and cannot readily be done through centralized hospital dictation systems. There are software packages available that can help generate a report and incorporate photos.

Procedure reports need to be distributed to the appropriate places, including the medical record, the referring physician and other physicians participating in the care of the patient, etc. While the report should, in general, be prepared as soon after the procedure as possible, in many cases it may be advantageous to defer preparation of the final version of the report until data from the BAL specimen (cultures, cytology) are available and can be incorporated into the final impressions and recommendations. If not, then care must be taken to ensure that the data do not disappear into the ether, and that appropriate action is taken in response to the findings.

**Handling specimens** – other than death of the patient, the most serious complication of bronchoscopy is to do the procedure and get the wrong (or no) answer. One of the most common

mistakes that can lead to a wrong answer is mishandling of the specimens (BAL, biopsy, etc.). The bronchoscopist must be sure that the laboratory knows how to process the specimen in the most appropriate way, and that the laboratory understands what information is needed and how to report the data. It does the patient no good to entrust the BAL specimen to a courier who leaves it sitting on a desk while he takes a break, only to have the specimen (finally) arrive after the laboratory has closed for the night. What then happens to it? BAL specimens need to arrive in the microbiology laboratory within an hour after collection, and should be processed promptly. It does the patient no good if the biopsy specimen is placed into the wrong preservative, or if the wrong tests are requested on the requisition. The bronchoscopist should pay careful personal attention to the laboratory requisitions, making sure that all the important information is recorded properly, *and if necessary, carry the specimen to the laboratory himself.*

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## Communication

The name of the game is effective communication. The bronchoscopist must communicate with the team members in a timely and effective manner (and vice versa). It is very important to achieve effective communication with the patient/family prior to the procedure. Setting the proper expectations can be critically important to patient and family satisfaction, regardless of the diagnostic findings of the bronchoscopy. There needs to be effective and timely communication with the family afterwards, as well. If the family expects to receive the results of the BAL cultures but has no idea of the time frame, they may call the physician's office three times a day. If, however, they are told ahead of time that it will take 4–5 days for the information to become available, many unnecessary phone calls, wasted time, and considerable angst can be avoided.

Communication among professionals is also of critical importance. First of all, for proper patient care, the physician(s) responsible for the patient need to have the information gained by

the procedure. Secondly, bronchoscopy is primarily a referral service, and without a steady flow of patient referrals, the bronchoscopy program will not support itself. Satisfied customers (aka referring physicians) will be repeat customers.

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## Business Matters

Business matters *matter*. Someone, if not the bronchoscopist, must pay careful attention to billing for procedures, setting appropriate charges, accounting for expenses and revenue, etc. While many patients' medical needs are covered by insurance, you can be certain that insurance companies will take every excuse not to pay for your services (this is another reason careful documentation is so important). The documentation must support the charges submitted, and the procedure coding must be appropriate. In the United States, CPT codes are required for billing. The current code for a diagnostic bronchoscopy is 31622; if bronchoalveolar lavage is also performed, the code is 31624. It is not appropriate to utilize *both* (and to charge for) 31622 and 31624 on the same procedure by the same physician. Likewise, it is usually (although not always) considered inappropriate to bill for both a diagnostic bronchoscopy 31622/4 *and* a laryngoscopy (31575). The rules for procedural coding can be complex, may change from year to year, and the bronchoscopist should learn to use them most effectively. In any case, the bronchoscopist must be prepared to back up the billing with a procedure note, which documents the indications, procedure, findings, and plan.

Reimbursement for procedures is always an unsettling process for physicians. No matter how we charge for our services, third-party payers will attempt to reduce the payments. It is important to track billings and receipts, to investigate and follow up on denials, and to adjust practices to ensure that the maximum fair payments are received. In general, there will be two components to the charges for a bronchoscopy: the professional fee, and the facility fee. Generally, the facility fee is managed by the

institution, and should be structured to include the costs of the equipment, supplies, staff, procedure room, etc.

Capital equipment costs for flexible bronchoscopy can be significant. As noted above, sharing resources with other services that use the same light sources, video processors, etc., can be very cost-effective. At current prices, a flexible bronchoscope costs approximately \$25,000, a light source \$14,000, a video processor \$24,000. Thus the cost to set up even a relatively modest program can exceed \$75,000. This can seem like a major investment on the part of the institution. However, the global revenue to the institution generated by a flexible bronchoscopy program far exceeds the direct costs attributable to the procedures themselves. There are radiology studies, clinic visits, hospital admissions, OR charges, and laboratory fees, as well as additional services directly or indirectly resulting from the patient referral (i.e., other surgical procedures, ICU stays, etc.). These revenues constitute a hidden "multiplier factor," which hospital administrators use to evaluate the potential impact of a program. Only the administrators know the factor the institution uses in its considerations, but you can be assured that the numbers are larger than you might suspect. Be aware of this when you negotiate with the institution for support of your program.

Equipment repairs can be a major headache, especially if there is no service contract. The cost of a service contract will depend on a number of factors, including your track record with the equipment supplier, the number and type of instruments you have, etc. The cost to replace a fiberoptic bundle in a flexible bronchoscope is on the order of \$10,000; it is easy to see why a contract is a good idea. Flexible bronchoscopes can last for years if they are cared for in a proper fashion, but can be broken in milliseconds if not. When an instrument must be sent for service, it is important to have a replacement instrument for patient care. While a "loaner" instrument may be available from the manufacturer, this is not always the case, and I strongly recommend that you have a minimum of two instruments. If you are not doing enough procedures to justify having



two, you are probably not doing enough procedures to justify doing any. ☹️

The economics of a flexible bronchoscopy program can be complex. However, it can be a source of significant revenue, not only from the procedures themselves, but also from cost savings (early diagnosis leading to decreased ICU stays, for example), and can lead to increased patient referrals to the institution. In building a business plan with your institution, consider all potential revenue, and plan for expansion. In my 20 years at Cincinnati Children's Hospital, the number of flexible bronchoscopies performed by pulmonologists increased from approximately 100/year to more than 2200 in 2019. A rather sizeable impact.

The road to success

1. Build, train, and nurture your team.
2. Ensure that you have a proper venue.
3. Obtain and maintain proper equipment.
4. Handle data (images, reports, specimens) properly.
5. Maintain good records – a database is essential.
6. Have a good business plan.
7. Work with your institution for mutual support.
8. Communicate.
9. Communicate.
10. Communicate.
11. Build and nurture collegial relations within your institution.
12. Build and nurture collegial relations with referring physicians and institutions.
13. Pay close attention to business matters.
14. Have fun!

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