



Obtaining bronchial fluid samples:

Can workflows compromise clinical outcomes?

White paper from Ambu

Obtaining bronchial fluid samples: Can workflows compromise clinical outcomes?

Bronchoalveolar lavage (BAL) and bronchial wash (BW) performed with flexible bronchoscopes are considered routine procedures in many intensive care units (ICU) around the world. They are common procedures to help diagnose and treat lung infections such as Ventilator-Associated Pneumonia (VAP) with targeted antimicrobials^{1,2}. VAP is the second most common nosocomial infection in the ICU and accounts for about half of all antibiotics administered in the ICUs³.

Even though BAL and BWs are widely accepted and appreciated, there seems to be no clear recommendations on how to perform them.

Workflows for BAL and BW procedures differ from facility to facility, and with no common guidance on which equipment to use, clinicians are often left to develop their own workflows⁴. There may even be a (mis)perception that procedures that include flexible bronchoscopes are costlier and more time consuming. To understand the workflow challenges and sampling concerns, Ambu conducted a survey among physicians practicing in the ICU and/or bronchoscopy suites (BS) in the US and UK with 116 respondents.⁵

Routine procedures with high clinical value

BAL and BW are fast, safe and minimally invasive procedures done to obtain material for a cultural or histologic analysis, the likes of which can result in early administration of the correct treatment.² Early and correct treatment is important for several reasons apart from the patient's general health; across the world attention to how antibiotics are administered is increasing due to multidrug resistant bacteria and healthcare systems are under pressure to reduce costs.

BAL and BW are²:


- Excellent methods for ruling out opportunistic infections in immunocompromised hosts.
- Useful for helping diagnose certain diseases.
- Able to help assess, in some cases, the clinical stage of a disease as well as the patient's potential responsiveness to therapy.

Physicians report performing up to 6 of these procedures every week in the ICU or BS and with several physicians in the department the total number of weekly procedures quickly adds up. This high frequency bears witness to the high clinical value the samples add when diagnosing and treating patients. However, despite their increased use over the last three decades, both procedures are associated with cumbersome workflows that may increase the risk of sample contamination or loss.

A complicated workflow

The BAL/BW procedure workflow involves a multitude of activities and resources are required to perform each step.⁶

An example of a BAL/BW procedure workflow

Preparation outside ward/room	Preparation within ward/room	BAL/BW procedure in patient	Post procedure steps	Post processing and waste disposal
Collect accessories Collect scope Collect monitor/tower	Establish sterile work area Open sterile packs Prepare saline and syringe(s) Attach suction equipment Prepare patient (preoxygenate, anesthesia, respirator access)	Insert scope (topical anesthesia) General bronchial inspection (Wedging) Attach saline syringe(s) Perform suction (Change sample container and repeat if necessary) 	Post BAL/BW cleaning suction in bronchial tree	(Sample splitting) Sample labelling and documentation General cleaning Patient recovery

The first task involves collecting bronchoscopes and sampling accessories. In facilities that use reusable bronchoscopes, there may be significant waiting time, or the facility may need to plan ahead to ensure the bronchoscope can be reprocessed quickly and thereby minimize the time the scope is unavailable.

"43% of doctors in the ICU often or always have to wait for a bronchoscope to become available"

Though the initial preparations may seem like simple tasks, they can be time consuming: certain accessories may be forgotten, or they might be located in remote locations. In fact, 43% of doctors in the ICU say they often or always have to wait for a bronchoscope to become available before they can perform a BAL/BW procedure.⁵

The preparations inside the room call for a number of different materials to be unpacked, laid out, connected, and more. In addition, the many generic elements used to perform the sampling might not fit properly together, a situation that may cause cumbersome sampling setups and may also compromise the sample integrity or expose the healthcare professionals to the aspirated fluids. For example, a Lukens trap may be loosely attached to the bronchoscope, or a compromised vacuum seal could lead to inefficient suction. In addition, certain accessories such as the suction or trap tube might not be the right fit for the scope, or fluid leakage could occur due to a poor fit.

And then comes the procedure itself, during which tubing needs to be switched after suction and between each sample – again increasing the risk of contamination. Care and skill are also required to retrieve a good percentage of the 100 to 200 mL given as the total lavage⁷. If carried out incorrectly, excessive suction can collapse the airway⁷. Incorrect suction may also block the suction channel and diminish fluid recovery⁸.

Compromising clinical outcomes?

Inefficiencies aside, the current workflow could compromise samples and, ultimately, lead to sample loss.

Losing a sample during a BAL/BW procedure is not uncommon – mostly due to fluid leakage or the sample being absorbed by the wall suction. In fact, as many as 72% of clinicians have lost a sample⁵. Not only is this bothersome for clinicians, but more importantly, since the patient needs to recover, repeating the procedure right away may not be an option. This could potentially delay both the right diagnosis as well as the appropriate treatment.

“As many as 72% of clinicians have lost a sample.”

The equipment itself may also pose a potential cross contamination risk. In fact, studies show that even after high-level disinfection, microbiological traces can still be found inside the working channels of up to 4 out of 5 reusable bronchoscopes⁹. This poses a risk, not only for the patient, who may be exposed to cross-contamination, but also to the sample integrity that could potentially show a false positive due to material in the bronchoscope's working channel.

Contamination can also occur because of the cumbersome workflow, as the many switches between suction and sampling as well as open containers expose the sample to surrounding agents.

Many of the current sampling techniques pose a risk for healthcare professionals throughout the workflow as well: contamination through exposure to the aspirated (and most likely infected) fluid, particularly during the many switches between suction and sampling along with open containers.

Considering BAL/BW procedures are regularly performed in the ICU, these risks should be of great concern.

“94% of doctors are concerned about contamination risks during BAL/BW procedures.”

A dedicated sampling solution

Doctors clearly have a range of challenges and concerns that, if resolved, could simplify BAL/BW workflows and potentially help improve clinical outcomes.

Of top priority is reducing the risk of contamination and sample loss during BAL/BW procedures. The samples are precious, and their integrity must be preserved⁵. At the same time, the workflow could be simplified to make these common and valuable procedures more efficient, which would benefit both doctors and patients. This could potentially be of high value in the ICU in particular, where time is always critical.

The value of a complete solution

Healthcare professionals routinely perform BAL/BW procedures but there are clear opportunities to improve the workflow and better protect the samples. To reduce the risk of contamination, doctors need a sampling solution that is tailor-made for the bronchoscope. The solution should provide a closed-loop between the bronchoscope and the sample container, and it should be easy and intuitive to work with.

References

1. American Thoracic Society; Infectious Diseases Society of America. Guidelines for the management of adults with hospital-acquired, ventilator-associated, and healthcare-associated pneumonia. *Am J Respir Crit Care Med.* 2005; 171(4):388-416.
2. King TE et al. Basic principles and technique of bronchoalveolar lavage. https://www.uptodate.com/contents/basic-principles-and-technique-of-bronchoalveolar-lavage?search=brochoalveolar&source=search_result&selectedTitle=2~150&usage_type=default&display_rank=2. Last accessed 21 February 2019
3. Kalanuria et al. Ventilator-associated pneumonia in the ICU. *Critical Care* 2014; 18:208
4. Baughman RP. Technical Aspects of Bronchoalveolar Lavage: Recommendations for a Standard Procedure. *Semin Respir Crit Care Med.* 2007; 28:475-485.
5. Ambu. Conjoint Analysis Report. 2019
6. American Thoracic Society. Bronchoalveolar Lavage. <https://www.thoracic.org/professionals/clinical-resources/critical-care/clinical-education/critical-care-procedures/bronchoalveolar-lavage.php#prep>. Last accessed 21 February 2019.
7. Meyer KC et al. An official American Thoracic Society clinical practice guideline: the clinical utility of bronchoalveolar lavage cellular analysis in interstitial lung disease. *Am J Respir Crit Care Med.* 2012; 185(9):1004-14
8. Stocks J. Bronchoscopy and Bronchoalveolar Lavage. <http://www.rtmagazine.com/2007/02/bronchoscopy-and-bronchoalveolar-lavage/>.
9. Last accessed 21 February 2019
10. Ofstead CL et al. Practical toolkit for monitoring endoscope reprocessing effectiveness: Identification of viable bacteria on gastroscopes, colonoscopes, and bronchoscopes. *AJIC.* 2016; 44(7): 815-819

About Ambu

Since 1937 Ambu® has been bringing breakthrough healthcare solutions to life within anaesthesia, patient monitoring and diagnostics, and emergency care. Today, we are dedicated to improving safety for millions of patients and healthcare professionals around the world through the advancement of single-use devices, including aScope – the world's first single-use flexible video scope. Our commitment to bringing new ideas, exceptional product performance and superior service to our customers has made Ambu® one of the most recognised medical companies in the world. Headquartered near Copenhagen, Denmark, Ambu® employs around 2,500 people across Europe, North America and Asia Pacific. For more information, please visit www.ambu.com