Guidelines of the Papanicolaou Society of Cytopathology for the Examination of Cytologic Specimens Obtained from the Respiratory Tract

Papanicolaou Society of Cytopathology Task Force on Standards of Practice*

Cytologic examination of specimens obtained from the respiratory tract is a primary and frequently the initial diagnostic technique performed in patients with respiratory symptoms or in those presenting with a pulmonary abnormality. While occasional cytologic specimens are obtained from the upper respiratory tract, the majority of pulmonary diagnostic cytology involves the study of the lower respiratory tract. The guidelines contained within this document will address evaluation of specimens relating to the lower respiratory system (trachea, bronchi, bronchioles, and alveoli).

Due to the complexity of the respiratory tract and the location of various target lesions, a variety of cytologic techniques have been developed for the study of diseases involving the respiratory system. Both exfoliative cytology techniques and fine-needle aspiration (FNA) are used extensively for diagnosis of pulmonary lesions. While respiratory cytology is used predominantly for the study of neoplastic or potentially neoplastic disease, it is also variably useful in the investigation of a variety of benign diseases including opportunistic infections, tuberculosis, sarcoidosis, industrial disease (e.g., asbestosis), and lung transplant rejection.[1–24]

Safety at Work

Laboratory staff processing pulmonary cytologic materials are at particular risk of exposure to aerosol infections. They must protect themselves from this potential hazard by wearing protective masks and gowns, handling the material within an appropriate cabinet equipped with a laminar flow biohazard containment hood, and following standard laboratory hygienic procedures.

Exfoliative Cytology of the Respiratory Tract

Each of the techniques used for obtaining exfoliative specimens from the respiratory tract has associated limita-

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tions, advantages, and diagnostic accuracy. Diagnostic accuracy can be optimized by selecting the most appropriate technique for a given clinical situation. Sputum cytology is noninvasive and is the most easily obtainable of the techniques available.

Sputum Cytology

The spontaneous production of significant amounts of sputum often indicates pulmonary disease. Sputum is composed predominantly of mucoid substances, as well as variable numbers of inflammatory and epithelial cells.[24] Variations in the numbers of macrophages, neutrophils, and epithelial cells and morphologic alterations in the latter elements can yield significant insight into the underlying pathologic process. Similarly, the level of pigmentation within macrophages and the presence or absence of Curschmann's spirals indicate much about the underlying pulmonary pathophysiology.[25–28]

Specimen Procurement and Processing

Diagnosis of pulmonary lesions is optimal when the specimen is an early-morning spontaneously produced sputum.[29,30] When sufficient amounts of spontaneously produced sputum are unobtainable, specimens may be induced by inhalation of a nebulized solution composed of 15% sodium chloride, with or without 20% propylene glycol, or simply 3–8% sodium chloride heated to 115°F.[31] Fixation is not necessary if specimens can be promptly delivered to the laboratory.[32] A variety of techniques have been adopted for the processing of sputum specimens. Predominant among these are ''pick and smear,'' fixation by the Saccomanno blender technique, membrane filtration, and cytocentrifugation.[33–39]

The most popular techniques are the ''pick-and-smear'' technique and the Saccomanno methodology.[40–44] The ''pick-and-smear'' technique avoids the use of carbowax and begins with visual inspection of fresh specimens for strands or flecks of solid or bloody material. Experience is essential to pick out significant areas for processing. These are selected along with random samples, and prepared as direct smears for immediate fixation (95% ethyl alcohol or spray fixation).[45] If the material is abundant, paraffin-embedded cell blocks may be prepared, sectioned, and stained with hematoxylin-eosin.[42] This may increase the diagnostic yield but at added expense.

When a significant delay is anticipated between specimen procurement and laboratory processing, prefixation and processing by the Saccomanno method are preferred. Cells are collected in 50% ethanol and 2% polyethylene glycol (carbowax). Upon receipt in the laboratory, a blender is used to emulsify the specimen, which is subsequently centrifuged and prepared as smears.[43,44] Multiple additional smears can be made from such a specimen if the first several do not demonstrate malignancy but the clinical suspicion is high.

The sensitivity of sputum cytology is optimized when five samples are obtained over 5 consecutive days.[40,41] Using this methodology, the detection rate for malignancy can approach 90–95%.[40,41] However, submission of three adequate single specimens has been accepted as the minimum requirement for reasonable sensitivity in sputum cytology.[42] This number of specimens will identify at least 65% of carcinomas occurring in the lung.

Specimen Adequacy

Adequate sputum samples must contain alveolar macrophages. Absence of such cells indicates the presence of only saliva. No numerical cutpoint for number of macrophages is consistently reported in the literature, but an adequate specimen should have numerous easily identifiable cells of this type. Greenberg stated that the ''adequacy of a sputum sample is directly proportional to the number of alveolar macrophages it contains.''[46] In addition, a sputum sample should be large enough to prepare 2–4 slides.[46] Bardales et al.[47] showed that the preparation of four smears from a sputum specimen increased the diagnostic yield, but significantly increased the screening and turnaround times and, hence, was not cost-effective. At present, it appears that a sputum specimen should be considered adequate for evaluation if a minimum of two smears can be prepared, and microscopic evaluation reveals numerous alveolar macrophages. In addition, the cytologic material should be well-preserved and well-stained.

Bronchial Washings and Brushings

Indications

Bronchial brushings and washings are complementary to sputum cytology in the diagnosis of pulmonary lesions. The most common indications for bronchoscopy are persistent cough, radiographic documentation of a new solitary pulmonary nodule, hemoptysis, bronchial obstruction, atelectasis, persistent localized wheezes, and persistent infiltrates on chest X-ray.[48–50] Bronchoscopy may also be used to confirm an abnormal sputum cytology. Bronchoscopy is of questionable value for nodules occurring within peripheral lung fields. However, bronchial brushing appears to have greater sensitivity than either bronchial washings or sputum cytology for peripheral tumors, necrotic carcinomas, and metastatic cancer.[51]

The indications for repeat bronchial cytology specimens are poorly formulated, but include initial negative bronchial cytology associated with positive sputum cytology, and highly suspicious clinical or radiographic findings in the face of negative sputum cytology and a negative first bronchial cytology.[52–54] Some authorities believe that an unequivocal positive sputum cytology associated with clinical findings of cancer is adequate to proceed directly to treatment. Ng and Horak[53,54] demonstrated that diagnostic

sensitivity increased from 70% to 90% when two bronchial cytologic specimens were obtained instead of one.

Specimen Procurement

Technical aspects of the bronchoscopic procedure are beyond the scope of these guidelines but have been well-summarized by Walloch.[55] In general, both washings and brushings are taken of any clinically suspicious areas. Washings are obtained by repetitive instillation of 3–5 ml of a sterile balanced salt solution through the bronchoscope and reaspiration of fluid. Brushings are obtained by the use of a small circular stiff-bristle brush. Brushings must be obtained before ''bite'' biopsies are performed to avoid excessive and obscuring blood.

Smears are prepared by immediately rolling the end of the brush on a glass slide. The smears are fixed immediately in 95% alcohol. Any delay in fixation will result in severe air-drying artifacts and an uninterpretable specimen. In many institutions, clinicians are discouraged from preparing direct smears from endoscopic samples. The disposable brush is cut off its shaft, placed in a tube containing balanced salt solution or Saccomanno fixative, and transported to the laboratory where more uniform and high-quality preparations can be made. In the laboratory, the brush is rolled between two frosted glass slides. The smears are air-dried to increase cell adhesion and stained by the Papanicolaou technique. The brush is placed back in the tube, the tube with the brush is vortexed, the brush is discarded, and a cytocentrifugation specimen and/or cell block is prepared from the cell-enriched fluid.

The aspirated washing material should be immediately transported to the cytopathology laboratory, where they are centrifuged and smears prepared from the cell buttons. The buttons may also be fixed in 10% neutral-buffered formalin and embedded in paraffin for histologic sectioning. Alternatively, material from the washings can be prepared by cytocentrifuge techniques, membrane filtration preparations, or one of the new monolayer methods. In general, a combination of techniques yields the most satisfactory diagnostic sensitivity.

Specimen Adequacy

A bronchial washing/brushing specimen is considered satisfactory when cells or agents diagnostic of a pathologic process are present, but in the absence of such cells or infectious agents, specimen adequacy is less easily defined. In general, a satisfactory specimen should contain a large number of well-preserved, optimally stained ciliated bronchial epithelial cells and macrophages. Specimens which contain few cells or are heavily contaminated and obscured by large numbers of oral squamous cells or oral saprophytes should be deemed unsatisfactory. Similarly, specimens in which the cellular details are obscured by blood, inflammation, or air-drying artifacts should be considered unsatisfactory for definitive evaluation. The reasons for the inadequacy should be documented in the report. A specimen can be considered less than adequate if there is inadequate clinical information provided.

Diagnostic Accuracy

Bronchoscopic samples can achieve a sensitivity of up to 90% when multiple brushings are performed during one bronchoscopic examination.[56] Multiple brushings not only increase diagnostic sensitivity but also decrease the need for rebronchoscopy or other invasive procedures, including FNA.[56] Overall sensitivity depends on a number of factors, including skill of the endoscopist and the location, size, and histologic type of the neoplasm.[41,53,57,58]

Bronchoalveolar Lavage

Although invasive, bronchoalveolar lavage (BAL) has such low morbidity that it can be safely used in critically ill patients. BAL, along with fine-needle aspiration, represent the only cytologic techniques which can study the contents and composition of the most terminal air spaces. While fine-needle aspiration cytology generally requires a localized and circumscribed target, BAL can successfully investigate diffuse pulmonary disease.

Clinical Applications of BAL

Bronchoalveolar lavage is most widely and effectively used in immunosuppressed patients with pulmonary infiltrates for the diagnosis of opportunistic infections.[59] Many infectious microorganisms can be diagnosed by cytologic examination of BAL fluid on conventional smears or with the aid of special stains. If indicated, BAL fluid can be submitted for microbiologic cultures. In addition to the identification of microorganisms, BAL shows specific recognizable features in the following conditions: alveolar proteinosis, alveolar microlithiasis, presence of malignant cells, and dust exposure, such as asbestos bodies, and silica and talc particles.[60]

Semiquantitative methods for counting the number of hemosiderin-laden macrophages in BAL have been published.[61,62] In one study,[63] the finding of $>$20% hemosiderin macrophages in BAL was indicative of significant alveolar hemorrhage. Alveolar hemorrhage has diverse causes, and the physician must therefore interpret this information in the context of clinical or other laboratory findings. Similarly, semiquantitative methods for counting the number of oil red-O-stained lipid-laden macrophages in BAL have been used for the diagnosis of aspiration pneumonia.[19–23,64]

BAL in most noninfective interstitial lung diseases shows nonspecific changes and its diagnostic value is controversial, but BAL can provide useful prognostic information and monitor disease activity in some selected cases. For example, in the fibrosing alveolitis group, a marked increase in neutrophils and eosinophils has been found to be associated

with a high risk of functional deterioration, whereas a high percentage of lymphocytes in BAL correlates with a better outcome.[60,65,66] In sarcoidosis, a study of the number of T-helper lymphocytes or the ratio of helper lymphocytes to suppressor lymphocytes in BAL fluid can predict clinical activity and response to steroid therapy.[60] Phenotyping of alveolar lymphocytes can be done by flow cytometry, or immunofluorescent or immunocytochemical techniques.[67]

Specimen Procurement

While techniques of BAL differ,[67,68] it is usually performed under local anesthesia with a 5-mm bronchoscope. The bronchoscope is advanced into a subsegmental bronchus and wedged into position. In the absence of a localized lesion, the right middle lobe or lingula is usually selected for sampling because of technical convenience and associated high yields of fluid and cells. The lavage is performed with warm saline, using a total volume of 100–300 ml to sample each site. Several sequential fluid instillations are performed with 20–100-ml aliquots. This fluid floods the airspace distal to the bronchoscope and is then reaspirated by the bronchoscopist.

Standardization of the amount of fluid used and the number of aliquots is important because these factors influence cytologic yield.[61,64] It appears to be preferable to use five 20-ml aliquots, with fractionation for lavage specimens. The first aliquot is usually separated from the subsequent four, which are pooled.[69] This technique optimizes the separation of bronchial epithelial cells from truly alveolar material. Fractionation decreases the number of unsatisfactory specimens when percentages of bronchial epithelial cells are used as a rejection criterion.

The BAL specimen should be rapidly transported to the cytopathology laboratory, where it may be processed by either a filtration method or cytocentrifugation. Chamberlain et al.[64] suggested that the filtration technique may be superior to cytocentrifugation because there are fewer unsatisfactory specimens with this technology. If conspicuous amounts of mucus are present, most laboratories begin processing of the specimen with passage through a loose nylon gauze mesh to trap mucous aggregates. Alternatively, the specimen may be treated by *sputolysin.* Passage through mesh leads to some loss of epithelial cells, but generally to a degree insufficient to affect sample interpretation. Following mesh filtration, the fluid is subjected to low-speed (1,800*g*) centrifugation to obtain a cell pellet. This is resuspended in balanced salt solution, and aliquots (100,000–200,000 cells are desirable) are used to prepare cytocentrifuge slides or membrane filtrates. For routine evaluation, some slides are stained by the Romanowsky technique, and others by the Papanicolaou method. Some authorities[63,64] have recommended preparation of hematoxylin-eosin (H&E) eosin stained slides. Additional cytocentrifuge slides should be prepared if special stains (acid fast bacteria, Grocott, methenamine silver) are required for identification of microorganisms. Issues of cytocentrifugation speed and the potential superiority of membrane filtration over cytocentrifugation are discussed in a number of recent publications.[70–74]

Specimen Adequacy

Bronchoalveolar lavage fluids must be assessed for adequacy. Excessive numbers of ciliated or squamous epithelial cells (greater than 5%) are indicative of contamination by bronchial or oral material, indicating that the specimen may not be representative of the distal portions of the respiratory tract.[59] Chamberlain et al.[64] suggested specific criteria for judging specimens as unsatisfactory for evaluation. Criteria for rejection included: 1) paucity of alveolar macrophages on the prepared glass slides (less than 10 alveolar macrophages per 10 high-power fields or less than 25 alveolar macrophages per high-power field in combination with either criterion two or three); 2) excessive numbers of epithelial cells, either showing morphologic degenerative changes or exceeding the number of alveolar macrophages present; 3) a mucopurulent exudate of polymorphonuclear cells; 4) numerous red blood cells in combination with at least one of the other criteria for inadequacy; or 5) degenerative changes or artifacts obscuring cell identity. In addition, a specimen should be considered adequate if it demonstrates a specific pathologic process (viral infection, neoplasia, or fungal or bacterial disease).

Fine-Needle Aspiration

Fine-needle aspiration (FNA) cytology is a widely used technique for the diagnosis of localized pulmonary pathology and is the most effective cytologic technique for establishing a definitive diagnosis of lung carcinoma.[48] Transthoracic FNA is successful at diagnosing both primary and metastatic disease, and is associated with an overall diagnostic sensitivity between 75–95%.[75–79] Both transthoracic percutaneous needle aspiration and transbronchial (Wang) needle aspiration biopsy are used for investigation of pulmonary nodules.

Percutaneous Transthoracic Biopsy

Percutaneous transthoracic aspiration biopsy is the more widely used of the two procedures. In many centers, if sputum cytology is negative and the pulmonary lesion is present at the periphery or apex of the lung, transthoracic FNA will be performed without bronchoscopy. In the majority of cases, a 22-gauge Chiba or Greene needle will optimize specimen procurement.

The fine needle is guided to the desired location by fluoroscopy or CT imaging, and once the needle tip is confirmed to be in position, the stylet is removed and a syringe is attached. Suction is applied and the needle moved rapidly forwards and backwards in the lesion. The vacuum is then released, and the needle removed while the patient

holds his breath. A portion of the sample is expelled onto glass slides and smears prepared. Some are allowed to air-dry, while others are fixed in 95% ethanol. The needle may be washed out in either a balanced salt solution or formalin. The air-dried material is stained by the Wright-Giemsa technique (Diff-Quik) and immediately assessed as to specimen adequacy. Alternatively, rapid evaluation can be achieved using smears appropriately fixed and stained by the rapid Papanicolaou stain or a frozen section-type H&E stain. If diagnostic material is not obtained, repeat aspirations are performed until satisfactory material is obtained or the radiologist or patient chooses to end the procedure. Immediate microscopic assessment of material also allows the performance of additional passes when the cytopathologist on immediate review deems special studies, including immunohistochemistry, flow cytometry, electron microscopy, or microbiologic culture, necessary for complete evaluation.[80, 81] Specimens submitted (other than smears) can be processed by either cytocentrofugation or cell-block techniques. When cytocentrifugation is preferred, the needle should be rinsed in 1–2 ml of balanced salt solution or RPMI medium. Blood clot and visible tissue fragments are best processed as cell-block preparations, and these are obtained by rinsing the needle in 2–3 ml of 10% neutral-buffered formalin. The cell blocks are routinely processed through paraffin, and H&E sections are prepared. In selected cases, immunohistochemistry can be performed on the cell block or cytocentrifuge specimens.[81] Many centers prefer using cell-block material for immunohistochemistry.

Transbronchial (Wang) Needle Biopsy

While transbronchial aspiration biopsy via flexible bronchoscope was originally used to detect metastases within mediastinal lymph nodes, it has become popular with pulmonologists for the workup of lung nodules in or near the major bronchi.[82–84] The procedure is used less frequently because it is relatively time-consuming and requires a skilled bronchoscopist. It is, however, a low-risk procedure and may provide diagnostic information when other techniques fail, such as bronchial brushing, washing, and biopsy. It is useful for investigating external bronchial compression or submucosal lesions and for evaluating mediastinal lymph nodes in staging of bronchogenic carcinoma. The addition of transbronchial needle biopsy to bronchoscopy increases the overall sensitivity of that technique to nearly 100% for tumors located in large bronchi.[85] Wang needle biopsy should be obtained prior to performing other diagnostic procedures, including bronchial washings, brushings, and grasp biopsy.[86,87] Processing and interpretation are performed by a technique identical to that used for percutaneous aspirations. An adequate specimen usually contains many diagnostic cells. Unsatisfactory specimens include samples with much blood, with low cellularity, or with many benign bronchial mucosal cells and macrophages representing contaminants from tracheobronchial secretions on the mucosal surface. A malignant aspirate may be obtained by inadvertent aspiration of endotracheal secretions containing neoplastic cells from the more distal airways. Similarly, in mediastinal staging of pulmonary neoplasms, the aspirate may be contaminated by inadvertent sampling of tumor in the lung parenchyma rather than in the lymph nodes.[88] In this situation, the cytopathologist should ascertain that the smears contain lymphocytes as evidence of accurate sampling of the peribronchial or tracheal lymph nodes. It seems prudent for the cytopathologist to interpret with caution specimens containing only a few tumor cells, no lymphocytes, and abundant respiratory cells or mucus.[88]

Contraindications for Fine-Needle Aspiration (Percutaneous and Transbronchial)

Relative contraindications for fine-needle aspiration of pulmonary nodules include an uncooperative or unconscious patient, an individual who is unable to control his or her cough reflex, uncorrectable coagulation abnormalities, poor lung function, severe emphysema, marked hypoxemia, pulmonary hypertension, intrapulmonary vascular lesions, and hydatid cyst.[89–94] While none of these conditions is an absolute contraindication for fine-needle aspiration of a pulmonary lesion, the potential benefits should be substantial before proceeding with the procedure. Because of the potential hazards of transthroacic FNA, it may be best performed in a setting where emergency services are immediately available and where the services of a thoracic surgeon are within reasonable proximity.

Complications associated with percutaneous fine-needle aspiration include pneumothorax,[95–100] intrathoracic hemorrhage with hemoptysis,[101,102] and air embolization.[103–105] Up to one third of patients may develop a clinically significant pneumothorax, but only 5–10% will require treatment.[95–100] Hemoptysis occurs in between 2–8% of patients but is usually not a significant clinical problem.[101,102] Air embolism is a very rare complication which may be fatal. Transbronchial needle aspiration of pulmonary lesions is associated with complications similar to those of percutaneous transthoracic fine-needle aspiration, but pneumothorax is less frequent.

Specimen Adequacy

The assessment of specimen adequacy in fine-needle aspirates from pulmonary nodules is a complex issue. The presence of neoplastic cells in a specimen defines it as adequate. However, there are no universally accepted morphologic criteria defining a specimen as adequate in the absence of malignant cells. Demonstration of etiologic agents of infectious disease (e.g., fungal forms or AFB) may also be indicative of the disease process. Other findings, including those of pneumonia, do not necessarily guarantee that the specimen represents the primary pathologic process.

Multiple samplings and immediate specimen assessment with repetitive sampling as indicated improve the satisfactory rate. Often factors other than the cytopathologist's opinion of specimen adequacy will determine whether additional passes are attempted:[88] these include lesional size, location, vascularity, and operator skill.[80] In general, 2–3 passes optimize the relationship between sample adequacy rates and patient comfort.[105] Williams et al.[105] demonstrated that 80% of pulmonary malignancies were diagnosed within the first two passes, and all malignancies detectable were identified when six separate passes were performed.

Since specific morphologic or numeric criteria for specimen adequacy do not exist for pulmonary fine-needle aspiration cytology, we recommend the terms ''adequate'' and ''nondiagnostic'' in the evaluation of pulmonary FNA specimens. When a specimen yields material representative of a specific pathologic entity, the specimen is designated as ''adequate.'' A specimen composed of benign respiratory epithelium, macrophages, and inflammatory cells in the presence of a significant clinical or radiographic lesion is designated as nondiagnostic despite the presence of abundant cellular material. This category implies that clinical follow-up or further investigation should be considered. The assessment of a specimen as adequate or nondiagnostic preferably occurs during the aspiration process and should be reported immediately. Additionally, the assessment of adequacy should be addressed in a comment contained within the final report. This is best done by inclusion of a section which addresses immediate evaluation of adequacy. Such a section has the benefit of documenting the performance of immediate assessment for billing purposes.

Diagnostic Categories for Cytology Specimens

The present guidelines do not attempt to describe the cytologic features related to various lesions occurring within the lung as sampled by multiple techniques. Rather, these guidelines are meant to establish a set of diagnostic categories which succinctly and uniformly transmit pathologic diagnostic information in a standardized format to the clinician. It must be stressed that FNA diagnosis of pulmonary lesions is a clinicopathologic interpretation, and correlation with clinical and radiographic findings is mandatory.

Nondiagnostic Specimens

This category is composed of specimens where no cellular material is obtained, the material is artifactually distorted by blood, poor preservation, or processing artifacts such that a diagnosis cannot be rendered, or a specific clinicopathologic entity cannot be diagnosed. Included in this category are specimens composed of benign cellular elements (respiratory epithelium, macrophages, inflammatory cells) which are insufficient to account for the lesion identified by bronchoscopic or radiographic study. When this diagnostic category is used, a comment should be included explaining the reason the specimen is assigned to this category.

Specific Benign Lesions

This category should include all benign neoplasms, inflammatory processes, and smears in which infectious (fungal, mycobacterial, and bacterial) agents are identified. Within this category each process should be described as specifically as possible. For example, the formulation might read ''benign; pulmonary hamartoma'' or ''benign; granulomatous inflammation consistent with tuberculosis.'' A comment should be issued when additional information further specifying the nature of the lesion would be helpful to the clinician.

Atypical Cells Present, Probably Benign

This category should be used when an epithelial or mesenchymal component is present with nuclear atypia believed by the cytopathologist to represent a reactive or reparative change. This diagnosis is not a ''stand-alone'' diagnosis but requires clinicopathologic correlation and additional investigation if clinically indicated.

Atypical, Suspicious for Malignancy

This category includes specimens that show atypical features believed by the cytopathologist to have a significant risk of representing a malignant neoplasm. This category also applies to cases in which severely abnormal cells may be present in numbers too low to permit a definitive diagnosis or the degree of atypia is below the threshold for a definitive diagnosis.

Malignancy Present

This category should contain all specimens in which a definitive diagnosis of malignancy can be made. If a specific histologic type of carcinoma is recognized it should be so diagnosed. Although since definitive pathologic tumor typing is not always possible, an attempt should be made to state whether the malignancy is of epithelial or nonepithelial origin, and if epithelial, whether it represents a small-cell or nonsmall-cell carcinoma or a metastasis. Correlation with clinical history is recommended.

Because some studies[106] have reported only a 75% rate of correctly typing lung carcinomas, it may be prudent to separate lung carcinomas into small- and nonsmall-cell types. This division has clinical support in that most therapeutic decisions require only this level of subclassification. Raab and Silverman[107] reviewed the accuracy and significance of cytologic typing of lung carcinomas.

Reporting of Findings in Cytologic Specimens

The cytologic report should be clear, concise, and clinically relevant, as discussed by Suen et al. in the Guidelines of the Papanicolaou Society of Cytopathology.[108] A statement

regarding the nature of the specimen reviewed should be given to include the number of passes performed and the number of slides received, and it should be documented if materials were received for cytospin or cell-block preparations. Terminology should be consistent, and the cytopathologist should attempt to render as specific a diagnosis as possible. The Papanicolaou class system should not be used, and whenever possible the cytologic diagnosis should closely simulate the corresponding histopathologic diagnosis.

In many cases, a comment should address the adequacy of the specimen, those factors limiting the diagnostic accuracy of the specimen, and the reasons for the categorization of a specimen as nondiagnostic, atypical and probably benign, or atypical and suspicious for malignancy. A recommendation for future action may be included in the report when the cytopathologist feels that it is indicated. In other practice situations, the cytopathologist may wish to report recommendations verbally to the clinician. The recommendation may suggest further diagnostic studies, including bronchial biopsy, mediastinoscopy, or thoracotomy with biopsy. This recommendation need not be part of the report if a definitive diagnosis is rendered. Comments and additional communication are most important when the cytopathologist is unfamiliar with the clinician or clinicians receiving the report.

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