

A thoracic surgery clinic dedicated to indeterminate pulmonary nodules: Too many scans and too little pathology?

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Objective: Widespread application of computed tomographic scans has increased detection of asymptomatic pulmonary nodules. A dedicated clinic was established to encourage referral and manage large numbers of patients with such nodules.

Methods: Patients were evaluated periodically by a nurse practitioner with surgeon oversight, and follow-up imaging was centralized. Patients were rescanned at intervals on the basis of radiologist recommendation.

Results: A total of 414 patients, 189 male and 225 female with a median age of 60.2 years (20.7–84.1 years), were evaluated since April 2000. Median follow-up was 1.51 years (0–6.65 years). Thirty-seven percent (153/414) were older than 60 years with at least 10 pack-years of tobacco use, whereas 30% (123/414) had never smoked. A total of 286 patients completed at least 2 years of follow-up computed tomographic evaluation. After 2 years, 24.2% (69/286) were deemed in stable condition and were discharged from further follow-up, whereas 22.4% (64/286) of patients were followed up longer than 2 years owing to the development of new nodules. Forty-five percent (127/286) of patients did not complete their recommended follow-up at our clinic. Overall, 3% (13/414) of our patients have been shown to have a malignant tumor. Only 5 patients underwent curative resection of a primary lung cancer.

Conclusion: In a population of patients with indeterminate nodules in routine clinical practice, few patients required intervention and few cancers were detected. Although the benefits of a “nodule” clinic may include patient reassurance and convenience to referring physicians, a significant number of patients did not complete their follow-up in our clinic.

The widespread application of computed tomography (CT) scan technology has increased the detection of otherwise asymptomatic lung nodules. Unfortunately, there is no consensus as to the optimal strategy to evaluate and follow up these radiologic abnormalities. Both the Fleischner Society and the American College of Chest Physicians (ACCP) have offered guidelines as to the follow-up and frequency of repeat imaging studies, but they are not in complete agreement.^{1,2} Furthermore, in a controversial recommendation, the ACCP has recommended against the use of CT scan to screen individuals at risk for lung cancer except in the context of a clinical trial. For patients with existing nodules, the ACCP has offered guidelines as to the use of adjunct studies such as fluorodeoxyglucose positron emission tomography (FDG–PET), as well as imaging and invasive procedures for tissue diagnosis based on the pretest probability of

a lesion being cancer. Both the Fleischner Society and the ACCP use 2-year stability as a suggestion for a benign etiology of a pulmonary lesion.

In an effort to evaluate the growing population of patients with chest radiographic and CT abnormalities, we implemented a clinic dedicated to these patients. This study reports the outcomes of our clinic since its inception in April of 2000.

METHODS

This study is a retrospective review of patients referred to our clinic for the evaluation of chest CT abnormalities—most commonly, asymptomatic pulmonary nodules. Patients were directly referred to the nodule clinic by any referring physician. No specific guidelines or restrictions were given for patient referral, but the intention of the clinic was to centralize management of surveillance of small and indeterminate lung nodules detected on studies performed at our home institution and elsewhere. The original name for this service was the “SPIN clinic,” an acronym for “Surveillance of Pulmonary Indeterminate Nodule.” It was not anticipated that patients with highly suspicious lung lesions typical for cancer would be referred via this mechanism. All patients were initially evaluated by both a nurse practitioner and a thoracic surgeon. If the patient was believed to be a candidate for imaging follow-up, the patient was identified as being eligible for enrollment in the Surveillance of Pulmonary Indeterminate Nodule Clinic. If the lesion was considered to be highly suspicious for cancer on evaluation by the surgeon, the patient was not deemed eligible for inclusion in our surveillance clinic. Follow-up was arranged with a nurse practitioner dedicated to the clinic with continued oversight by the thoracic surgeon. Dedicated chest radiologists supervised and interpreted all follow-up CT studies. These studies were performed without intravenous contrast, using a low

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Abbreviations and Acronyms

ACCP	= American College of Chest Physicians
CT	= computed tomography
ELCAP	= Early Lung Cancer Action Program
FDG-PET	= fluorodeoxyglucose positron emission tomography

radiation dose technique with an effective tube current of 30 mA, which is approximately 3 to 4 times lower than used for CT scans performed for clinical diagnostic purposes at our institution.

For inclusion in this study, all patients must have presented with an initial chest CT scan. For patients presenting with more than one nodule, we identified, for the purposes of this review, the nodule on the initial scan and first follow-up scan having features most concerning for malignancy as the "index" nodule and tracked the changes of this nodule on subsequent scans.

Follow-up recommendations were based on clinical evaluation and CT findings. Follow-up appointments were made for the patient at the end of each clinic visit, and a letter was sent to the referring physician detailing our recommendations. The patient would receive a telephone call before the next scheduled visit as a reminder. Follow-up and outcomes were determined by review of clinic notes and imaging studies. The conduct of this study was approved by the Washington University School of Medicine Human Research Protection Office.

Categorical data are expressed as counts and proportions. Descriptive statistics are expressed as mean \pm standard deviation and median (range) unless otherwise specified. Comparisons are done with independent samples *t* tests for means of normally distributed continuous variables, and Fisher's exact test was used to analyze differences among the categorical data. All data analysis was performed with SPSS software (SPSS 11.0 for Windows; SPSS Inc, Chicago, Ill).

RESULTS

A total of 414 patients, 189 male and 225 female with a median age of 60.2 years (20.7–84.1 years), were evaluated since April 2000. The initial CT scan of the chest that led to referral for this service was obtained because of an abnormal chest x-ray film in 20.3% (84/414), enrollment in the National Lung Screening Trial (<http://www.cancer.gov/NLST>) in 27.3% (113/414), incidental findings on CT scans done for other reasons in 51.4% (123/414), and direct patient referral or primary care physician order in 1% (4/414).

Whereas 30% (123/414) of our patients were never smokers, the remainder were former (40%; 166/414) or active smokers (30%; 125/414). Of these former and active smokers, 92% (269/291) had more than a 10 pack-year smoking history. Ten percent (38/414) of patients in our series presented with a diagnosis of chronic obstructive pulmonary disease.

Only a minority of patients in our cohort had a single CT abnormality. Review of the first follow-up CT scan done on admission to our clinic revealed resolution of the CT abnormality in 4% (16/414), 1 nodule in 23% (97/414), 2 nodules in 16% (67/414), and more than 2 nodules in 50% (206/414) of patients. In the remaining 28 patients, no data are available as 6 patients were discharged from the clinic with-

out further follow-up, 6 are awaiting their first follow-up scan, 9 patients declined further follow-up in our clinic or chose to continue their care with their referring physician, 1 patient died before follow-up, and the remaining 6 patients were lost to follow-up.

The median initial nodule size was 0.6 cm (0.2–4.3 cm). Seven patients in our series presented with masses greater than 3 cm in size. On review of the clinical notes and radiology reports, the cause of these largest lesions was attributed to infectious etiology in 4 of 7, and 1 patient was given a diagnosis of silicosis of the lung. In 1 patient the mass demonstrated a benign pattern of calcification, and in the remaining patient ground-glass opacity requiring further evaluation was noted.

Median follow-up was 1.51 years (0–6.65 years). At least 1111 CT scans were performed in the entire cohort of patients. A total of 286 patients received their initial scan at least 2 years before the preparation of this report and would therefore have been eligible for discharge on the basis of CT stability. Of these eligible patients, only 55% (159/286) completed 2 years of clinic follow-up. Forty-five percent (127/286) of patients did not return for all of the scheduled follow-up visits. After at least 2 years, 24.2% (69/286) were deemed in stable condition on CT and were discontinued from further follow-up. Despite stability of the index nodule, 22.4% (64/286) of patients were followed up longer than 2 years owing to the development of new nodules. Of the remaining 26 patients who completed 2 years of follow-up, 2 were discharged after further imaging studies, 17 patients continued to be observed, and 7 patients were lost to follow-up. In the patients who had completed at least 2 years of follow-up, the mean number of scans was 4, with a time interval between CT scans of 266 days.

Forty-two (10.1%) of 414 patients underwent FDG-PET imaging, which suggested malignancy in 8 of the 42 scanned patients. Measurements of standardized uptake value were not uniformly reported by the radiologists and therefore not reportable here. In 67% (28/42) of PET-screened patients, the PET imaging was used within the first two clinic visits. However, FDG-PET was not consistently used before invasive procedures for tissue diagnosis in all patients. Of the 20 patients undergoing an invasive procedure for pathologic diagnosis, 11 had preliminary FDG-PET imaging and 9 went directly to biopsy or resection without FDG-PET.

A pathologic diagnosis was made by CT-guided fine-needle aspiration in 3 patients and by operative procedure in 17 patients. Seven (7/20) of the patients having a biopsy underwent a surgical procedure for what turned out to be a diagnosis of an infectious or inflammatory process. In 3 patients with a benign diagnosis, a thoracotomy was required to obtain tissue diagnosis. Overall, 3% (13/414) of our patients have been proven to have cancer. Nine patients had non-small cell lung cancer, 1 patient had small cell lung cancer, 1 patient had lymphoma, and 2 patients had lung metastasis

of a distant tumor. All 10 patients with lung cancer underwent a biopsy procedure owing to change in the nodule from baseline size and appearance on follow-up CT scan. There was considerable variability in the length of follow-up before pathologic diagnosis. Forty-six percent of patients (6/13) were followed up by radiologic imaging for at least 2 years before the diagnosis of a cancerous lesion. In 9 of 13 patients with cancer, at least 4 follow-up scans were obtained before the diagnosis of malignancy, and in 2 patients, tissue diagnosis was obtained after 8 follow-up CT scans. In those patients followed up for more than 2 years, the index nodule began as a lesion 1 cm or less in size and was often accompanied by multiple other small nodules. Development of new small subcentimeter lesions in these cases prompted continuation of CT surveillance beyond the 2-year period originally intended for the index nodule.

Among the 10 patients with lung cancer, the median age was 64 years (58.0–78.0 years) with a mean smoking history of 57.3 ± 30.8 pack-years. There was no difference in age ($P = .173$), gender ($P = .406$), or smoking history ($P = .063$) between these 10 patients diagnosed with primary lung cancer and the entire cohort. The patient with a diagnosis of small cell lung cancer did not undergo surgical resection but was offered chemotherapy and radiation. Of the 9 patients with non-small cell lung cancer, 1 patient was not offered surgery owing to discovery of asymptomatic metastatic disease and 1 patient underwent thoracotomy only to discover extensive multistation N2 disease resulting in wedge resection and lymph node sampling being performed. Two patients believed not to be operative candidates owing to poor pulmonary function were treated with stereotactic radiation, and the remaining 5 patients underwent resection of node-negative lung cancer (3 patients with T1 N0, 1 patient with T2 N0, and 1 patient with T4 N0).

DISCUSSION

Our clinic was designed to facilitate the follow-up and evaluation of patients with pulmonary indeterminate nodules. The original intent was to provide a streamlined service for our patients and their referring physicians. This report is a retrospective review of our experience. Although we are unable to offer conclusions as to the rationale and utility of current recommendations for the imaging evaluation and clinical testing of patients with indeterminate pulmonary nodules, we are able to provide an overview of the experience of a busy thoracic surgery service at a large tertiary referral hospital in the United States.

Both the Fleischner Society and the ACCP recommend 2 years of surveillance to deem a lesion stable.^{1,2} Using the 2 years of imaging follow-up as the benchmark for discharge from our clinic, surprisingly few patients met the criterion. We do not have data on why patients did not follow up in our clinic over the recommended 2-year period. We did contact a subset ($n = 16$) of patients who did not return for the

first recommended follow-up. Of these 16 patients, 1 died of unrelated illness, 9 declined further follow-up in our clinic and chose to continue care with their referring physician, 1 patient declined follow-up owing to his own opinion that the nodules were not a health care issue, 1 patient had insurance deny further follow-up at our center, and the remaining 4 were unable to be contacted. We speculate that a significant reason for patient attrition may be the wide region of referral to our center. After reassurance from the initial visits that no immediate surgical intervention was needed, patients may have elected to follow up with their own local physicians owing to the difficulties associated with prolonged travel times to our clinic. At the implementation of this clinic, we did not undertake any formal assessment to study the psychosocial impact of patients being evaluated in a clinic dedicated to chest CT abnormalities. However, from patient and family interaction, it is clear that many patients find reassurance from periodic evaluation by a thoracic surgeon for their CT abnormalities. Referring physicians were also kept continually informed of the progress of their patients and our decision-making process, facilitating long-term care by the referring physician.

Of the patients eligible for 2 years of follow-up, 22.4% had a new nodule develop, leading to recommendation for further imaging. The development of new nodules is expected in patients with smoking history. In the Early Lung Cancer Action Program (ELCAP) study, 23% of patients had a nodule on the initial screening, and an additional 5% had a new nodule develop during the follow-up period.³ The highest prevalence of lung cancer reported in any trial of CT scanning has been the 2.7% reported by the ELCAP investigators.⁴ The variability of tumor doubling times further affects recommendations for duration of follow-up. At presentation, a very small nodule may take considerably longer to become clinically relevant than a larger nodule with the same doubling time. Given the lengthy time interval from initial presentation to pathologic diagnosis demonstrated in our series, it is unclear what implication this has for the numerous other patients who were discharged from our clinic because of stable imaging findings with 2 years of follow-up. A longer period of follow-up may be necessary.

In another large prospective study of the role of CT screening studies, investigators at the Mayo Clinic reported that 847 new nodules were detected in their cohort of 1520 patients followed up for 5 years with annual CT scan.⁵ In fact, 56% of patients presented with a malignancy not found on the initial CT scan.⁵ The development of new indeterminate nodules raises the question of when to stop screening patients. Given the lack of compelling data, we would not offer continued screening CT scans outside the setting of a clinical trial.

Few patients required surgical intervention. From our clinic's evaluation process, 3 patients were referred to the radiology service for CT-guided biopsy, and 17 operative procedures were performed. Of these procedures, the majority

were bronchoscopy or mediastinoscopy. Only 3 thoracotomies were performed for what was ultimately deemed a benign process. Participation in our clinic, with early involvement of a thoracic surgeon, may have prevented unnecessary procedures. Whereas 5% (20/414) of patients in our series underwent a diagnostic procedure, the International Early Lung Cancer Action Program Investigators reported nearly double the rate of diagnostic procedures—9.4% (535/5646 patients with nodules).³

We were able to identify 10 patients with primary lung cancer. Unfortunately, only 5 patients underwent curative resection. Early detection and frequent follow-up did not lead to curative resection in the other 5 patients. In fact, 3 of the 5 patients who underwent curative resection required more than 2 years of follow-up before a clinical decision was made to perform a procedure for tissue diagnosis. The need for prolonged follow-up was not due to change in the initial index lesion, but to the development of new subcentimeter lesions, with subsequent recommendations for continued follow-up.

The management and follow-up of patients with asymptomatic pulmonary nodules remains an important and challenging clinical problem. Although a number of professional societies provide recommendations to guide the care of these patients, our experience with this group of patients has not been straightforward. We were not able to centralize the care of these patients at our institution, and close to half of patients enrolled in our clinic did not complete 2 years of follow-up at our center. Well over 1000 CT scans were performed at our center in a cohort of 414 patients. Whereas a diagnosis of primary lung cancer was made in 10 patients, only 5 of these patients could be definitively treated with surgery. At the time of this report, our formal clinic for the evaluation and follow-up of patients with indeterminate nodules has been disbanded owing to cutbacks in advanced nurse practitioner personnel. We believe that further prospective investigation is required to evaluate the optimal treatment strategy for patients with indeterminate pulmonary nodules and to determine the long-term benefits of early detection.

We are grateful for the efforts of Dr Joel Cooper for the design and inception of this clinic.

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Discussion

Dr Joel D. Cooper (Philadelphia, Pa). I think you have probably disclosed conflict, which I was going to disclose, having been involved in setting this up. I have no financial conflict. Ego is another matter. [Laughter.]

Dr Veeramachaneni, it was a very good presentation, providing a lot of very useful information. Perhaps I can summarize, as you did, and add a little bit more.

Why does a surgeon want to get involved with ditzels, with little nodules? As you pointed out, it certainly is a way of alleviating anxiety on the part of the patient and providing a service to the patient and the primary physician, both of whom have received letters from the radiologist saying, “You have a nodule. It could be lung cancer. You should be followed up.” And who better to follow it up than a surgeon, ideally a conservative surgeon, who is in the best position to make a judgment as to what should be watched and what should be excised? By the way, I think it does promulgate the interest of thoracic surgeons in all things relating to lung cancer. I have often been quoted as saying nothing is too small, in my opinion, for a thoracic surgeon to be involved in.

I think it also fosters research into the early diagnosis: how to tell which nodules are cancer or not. It not only maintains the radiologic skills of the thoracic surgeons, but also encourages other investigators to use this as a population base to figure out some tag, some marker, some immunologic way of determining if a nodule is malignant. Here you have a database, a group of patients who are being followed up. I think that is another potential environment.

I think it supports the minimally invasive treatment of early cancers, whether by ablative techniques or excisional techniques. Again, I think it is not bad for the thoracic surgeon to be involved.

We started a clinic in Philadelphia. We talked to the HMO that did not send their patients to our institution for CT scans. I said, “I will not take the responsibility of following the patients and saving you a lot of money and unnecessary surgery unless you agree to allow us out of network to do the CT scans,” and they said yes.

My final question concerns the loss of follow-up of patients. Have you any idea as to whether it was because of the patient or because of insurance issues, and do you have any follow-up on those patients to know what the ultimate outcome was?

Dr Veeramachaneni. We lost 45% of our patients to follow-up, and we were not able to contact all of them individually to determine why they did not follow up. All that we do have is a clinic note that indicates that they were scheduled for follow-up and they did not show up. A small subset of patients showed up for their first clinic visit where the surgeon as well as the nurse practitioner evaluated them. They were subsequently scheduled for follow-up. About 20-odd patients in that group failed to show up for their first follow-up. Those patients we have contacted. Approximately half of them chose to continue follow-up with their referring physician and the other half just chose to discontinue follow-up entirely. I do not have a good sense of whether it was an insurance or financial-driven thing, but given the large catchment area of Washington

University, I think travel distance might have been partially responsible.

Dr Cooper. I noticed that you had a very low incidence in the use of PET scans, which I greatly applaud. I think their value is uncertain for the 3-, 4-, 5-, and 6-mm nodule. The standard seems to be that everybody gets a PET scan, and if they have a positive one, they are told they have cancer. I certainly think that your limited use of PET scan saved a lot of money for the system. Do you have any comment as to what you believe the importance of PET scan is in monitoring these patients?

Dr Veeramachaneni. For this presentation, I did not actually include that information, but we had 42 patients out of the entire cohort, or approximately 10%, who underwent PET imaging. It suggested malignancy in 8 patients, but its accuracy was not 100%, because most of these lesions were in the 1-cm or perhaps even smaller category.

Dr Cooper. Actually, we have only gotten started. We are following up about 130 patients. Six people came in with lung cancers that were pretty obvious. It is surprising how many patients are out there who have been followed up for lesions that even the conservative individual would not normally follow. Maybe that is a secondary benefit.

My last question is this: You mentioned 2 patients who either had widespread metastases or N2 disease when they were finally discovered to have cancer. That is somewhat different from Claudia Henschke's experience. I know she has been subject to a lot of criticism, but what she did demonstrate is that careful follow-up using different types of tools for early nodules can lead to a resection of those that are cancer, an extremely high cure rate, and a very low incidence of unnecessary operative interventions. Have you any messages for us on how to avoid following up patients and subsequently finding out that they have N2 or widespread disease? Do you think in retrospect there is anything different that you would have done?

Dr Veeramachaneni. In 1 of those 2 patients the nodule in question was in the setting of an apical scar. The patient was followed up for a number of years, and there was some controversy as to whether there was any radiographic change. In fact, this case was actually presented at a multidisciplinary conference and the decision was made to offer the patient just another follow-up imaging study in a 6-month interval. In the meantime, however, bone metastasis developed. In the other patient, who presented with T1 N2 disease, the PET scan was also negative. I apologize that we do not have standardized uptake value measurements of that patient because none were reported at that time, but micrometastatic disease was noted at the time of thoracotomy.

Dr Cooper. Thank you very much, Dr Veeramachaneni. It was a great paper.

Dr Ross M. Bremner (*Phoenix, Ariz*). I think one of the benefits of having a clinic like this is to allow for easy referral for physicians who do not know what to do with a pulmonary nodule. It may be very obvious to us that it is a lung cancer. To allow that ease is a great benefit of having such a clinic.

I have two quick questions. Do you have any information on the cost-efficacy per patient who ended up being treated for cancer for those 1000-plus scans that you did? Second, how did you address the malpractice issues involved with this, the patients who do not get followed up and then the patients whom you stop following

up after 2 years, who may have an indolent cancer or bronchioloalveolar carcinoma lesion.

Dr Veeramachaneni. I cannot comment on cost analysis. I do not know the exact data as to how much revenue was generated or the cost. That is somewhat of a soft number, as I have discovered in terms of trying to figure out the exact cost of anything.

As to your second question, at the time that each patient is seen in clinic, we recommend follow-up and we also schedule their follow-up for their next visit. In addition, we inform the referring primary care physician of the need for follow-up and what our findings were in the form of a letter. However, we have not tried to track down those patients who do not show up subsequently.

Dr Scott J. Swanson (*New York, NY*). I enjoyed this. I think it is a great addition to what we do as thoracic surgeons.

It seems to me you may want to rethink the 2-year strategy, since over half of your patients presented after 2 years. What is your current recommendation about how long to follow up patients? Did you try to recontact the people that you dismissed after 2 years to see how they are doing?

Dr Veeramachaneni. I completely agree with you that the 2-year benchmark was established in an era before high-resolution CT scans and finding patients with these small nodules. Just as the ELCAP trial demonstrated, we might be diagnosing these patients at an earlier stage of cancer, but it is still a matter of debate as to whether we are accomplishing improved morbidity or mortality by acting on these data. Once we have identified patients with a nodule, I think we are somewhat obligated to continue to counsel these patients and follow them. We do not have a specific end point.

As to the question of what do we do about the patients who were dismissed from our clinic, all of these patients did have radiographic stability and they did not have new nodules that would have mandated further testing. If these individuals are considered at high risk, their physicians might want to enroll them in a screening trial. However, right now I do not think there are any data to support enrolling high-risk patients routinely into screening programs outside of a clinical trial.

Dr Frank C. Detterbeck (*New Haven, Conn*). The spectrum of disease that we are seeing is changing dramatically. I recently did a review of this. Tumor doubling time for normal, routine-care-detected patients is 136 days on average, and in CT screening studies it is 485 days, dramatically different. That is why the whole 2-year mark is changing. It is clear that we are seeing indolent tumors in a different spectrum of disease.

My question is really something to work on. I think that you would be in an ideal situation to look at patients who were discovered as part of a CT screening trial and those patients who happened to be walking down the street within 100 yards of an emergency room and somehow ended up with a scan and see if those are similar populations. I suspect they are, but it would be very useful.

Dr Veeramachaneni. Thank you.

Dr Walter Klepetko (*Vienna, Austria*). How many of your patients had a history of any other malignant disease? Did you exclude those patients from such a study? Would it have any impact on your follow-up strategy?

Dr Veeramachaneni. We did not exclude any patients who were referred to our clinic. The 2 patients who received a diagnosis of metastatic lesions in fact had a known history of nonlung

primary tumors. One patient had sarcoma and the other patient had colorectal cancer. In terms of clinical management and follow-up of those nodules, it was left to the discretion of the surgeon evaluating that patient whether it should be 6-month interval follow-up or 1-year follow-up.

Dr Klepetko. My second question concerns your judgment of changes in the size of the nodules. Was it done with the naked eye of the radiologist or did you apply volumetric assessment?

Dr Veeramachaneni. I do not know the specific technique used by our radiologists, but from my recent exposure to our radiologists, I do not believe they use an automated volumetric assessment. They rely on the measurements that they routinely take. I should stress that it is the same group of radiologists, the same CT scanner, and, no doubt, the same technique.

Dr Cerfolio. How many people in the audience are using volumetric measurements for these ditzelomas with thin-cut CTs as opposed to just linear?

[A show of hands.]

Dr Cerfolio. That is what we have gone to at the University of Alabama at Birmingham. I think that is a more accurate way. If they have only one nodule, you can get them in and they get a thin slice, they get less radiation, and they do not need intravenous contrast.

Dr Klepetko. It is extremely helpful and provides very objective data.

Dr Cerfolio. And it is more accurate.

Dr John R. Benfield (*Los Angeles, Calif*). A number of years ago I reviewed a paper that was subsequently published in the *Annals of Thoracic Surgery*, which indicated that there is perhaps little need, if any, for surgeons to follow up their patients postoperatively

long term. I wrote an invited, or perhaps not so invited, commentary speaking against that and in favor of surgeons following up their patients. What is your posture toward following up patients postoperatively long term? Do you agree or disagree with the thesis that long-term postoperative follow-up can simply be relegated to primary physicians or referring physicians?

Dr Veeramachaneni. I think as surgical oncologists and thoracic oncologists, we have an obligation to continue to follow up these patients, and that is certainly the practice at Washington University.

Dr Erino Angelo Rendina (*Rome, Italy*). My question echoes that of Dr Benfield. As a matter of fact, I think your paper is of extreme interest from a speculative point of view. However, from the standpoint of manpower, is it really indispensable that thoracic surgeons be involved in such a clinic, considering that in the time span of 2 years, only 5 patients were operated on out of more than 400?

Dr Veeramachaneni. In the interest of full disclosure, I should state that this clinic is formally disbanded owing to lack of nurse practitioner personnel. This happened within the past year, but these patients continue to be seen in the regular clinic. The way the clinic was designed, a nurse practitioner who was following up these solitary pulmonary nodule patients would show up at the same time as the regular clinic. These patients would be scheduled at the same time as the regular clinic, but most of the patient education follow-up would be done by the nurse practitioner. The surgeon would be able to come in and say hello or provide additional counseling, but the whole idea was to unburden the surgeon from routine follow-up while at the same time providing high-quality care.