

National Survey of Hospitalists' Experiences with Incidental Pulmonary Nodules

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Incidental pulmonary nodules (IPNs) are common and often require follow-up. The Fleischner Society guidelines were created to support IPN management. We developed a 14-item survey to examine hospitalists' exposure to and management of IPNs. The survey targeted attendees of the 2016 Society of Hospital Medicine (SHM) annual conference. We recruited 174 attendees. In total, 82% were identified as hospitalist physicians and 7% as advanced practice providers; 63% practiced for >5 years and 62% supervised trainees. All reported seeing ≥ 1 IPN case in the past six months, with 39% seeing three to five cases and 39% seeing six or more cases.

Notwithstanding, 42% were unfamiliar with the Fleischner Society guidelines. When determining the IPN follow-up, 83% used radiology report recommendations, 64% consulted national or international guidelines, and 34% contacted radiologists; 34% agreed that determining the follow-up was challenging; only 15% reported availability of automated tracking systems. In conclusion, despite frequent IPN exposure, hospitalists are frequently unaware of the Fleischner Society guidelines and rely on radiologists' recommendations. *Journal of Hospital Medicine* 2019;14:353-356. Published online first February 20, 2019. © 2019 Society of Hospital Medicine

Pulmonary nodules are common, and their identification is increasing as a result of the use of more sensitive chest imaging modalities.¹ Pulmonary nodules are defined on imaging as small (≤ 30 mm), well-defined lesions, completely surrounded by pulmonary parenchyma.² Most of the pulmonary nodules detected incidentally (ie, in asymptomatic patients outside the context of chest CT screening for lung cancer) are benign.¹ Lesions >30 mm are defined as masses and have higher risks of malignancy.²

Because the majority of patients will not benefit from the identification of incidental pulmonary nodules (IPNs), improving the benefits and minimizing the harms of IPN follow-up are critical. The Fleischner Society³ published their first guideline on the management of solid IPNs in 2005,⁴ which was supplemented in 2013 with specific guidance for the management of subsolid IPNs.⁵ In 2017, both guidelines were combined in a single update.⁶ The Fleischner Society recommendations for imaging surveillance and tissue sampling are based on nodule type (solid vs subsolid), number (single vs multiple), size, appearance, and patient risk for malignancy.

For IPNs identified in the hospital, management may be particularly challenging. For one, the provider initially ordering the

chest imaging may not be the provider coordinating the patient's discharge, leading to a lack of knowledge that the IPN even exists. The hospitalist to primary care provider (PCP) handoff may also have vulnerabilities, including the lack of inclusion of the IPN follow-up in the discharge summary and the nonreceipt of the discharge summary by the PCP. Moreover, because a patient's acute medical problems often take precedence during a hospitalization, inpatients may not even be made aware of identified IPNs and the need for follow-up. Thus, the absence of standardized approaches to managing IPNs is a threat to patient safety, as well as a legal liability for providers and their institutions.

To better understand the current state of IPN management in our own institution, we examined the management of IPNs identified by chest computed tomographies (CTs) performed for inpatients on our general medicine services over a two-year period.⁷ Among the 50 inpatients identified with IPNs requiring follow-up, 78% had no follow-up imaging documented. Moreover, 40% had no mention of the IPN in their hospital summary or discharge instructions.

To inform our approach to addressing this challenge, we sought to examine the practices of hospitalist physicians nationally regarding the management of IPNs, including hospitalists' familiarity with the Fleischner Society guidelines.

METHODS

We developed a 14-item survey to assess hospitalists' exposure to and management of IPNs. The survey targeted attendees of the 2016 Society of Hospital Medicine (SHM) annual conference and was available for completion on a tablet at the conference

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TABLE 1. Demographics of Respondents of a National Survey of Hospitalists' Experience with Incidental Pulmonary Nodules

Survey Item	Response Choices	n (%)
What is your role in patient care? ^a	Hospitalist Physician	138 (82%)
	Advanced Practitioner (NP, PA)	12 (7%)
	Non-Hospitalist General Internist (I care for inpatients and outpatients)	5 (3%)
	General Internal Medicine Fellow	6 (3%)
How many years have you been in practice?	<5 years	63 (37%)
	5-9 years	36 (21%)
	10-15 years	38 (22%)
	16-20 years	11 (7%)
	>20 years	22 (13%)
What is your current practice setting? (Please specify all that apply)*	University/Teaching hospital	86 (49%)
	Private hospital	21 (12%)
	Veterans Affairs hospital	9 (5%)
	Community hospital	65 (37%)
What is your specialty? ^a	Internal Medicine	147 (87%)
	Family Medicine	19 (11%)
	Pediatrics	0 (0%)
	Obstetrics - Gynecology	0 (0%)
Do you supervise medical students, residents, or fellows in clinical service?	Yes	105 (62%)
	No	65 (38%)
Which one option best describes your current practice location? ^a	Northeast	52 (31%)
	Midwest	34 (20%)
	Southeast	35 (21%)
	Southwest	14 (8%)
	West	19 (11%)
	Pacific Northwest	13 (8%)

^aThis survey item also included "Other, please specify" as a response choice.

Abbreviations; NP, nurse practitioner; PA, physician assistant.

registration desk, the SHM kiosk in the exhibit hall, and at the entrance and exit of the morning plenary sessions. Following the annual conference, the survey was e-mailed to conference attendees, with one follow-up e-mailed to nonresponders.

Analyses were descriptive and included proportions for categorical variables and median and mean values and standard deviations for continuous variables. In addition, we examined the association between survey items and a response of "yes" to the question "Are you familiar with the Fleischner Society guidelines for the management of incidental pulmonary nodules?"

Associations between familiarity with the Fleischner Society guidelines and survey items were examined using Pearson's chi-square test for categorical variables, Fisher's exact test for categorical variables with small sample sizes, the Cochran-Armitage test for trend for ordinal variables, and the t-test for continuous variables. The associations between categorical items were measured by odds ratios with 95% confidence intervals. Statistical tests were two-sided using a $P = .05$ level for statistical significance. All analyses were performed using R version 3.4.4 (R Foundation for Statistical Computing, Vienna, Austria), with the R packages MASS, stats, and Publish. Institutional review board exemption was granted.

RESULTS

We received 174 responses from a total of 3,954 conference attendees. The majority were identified as hospitalist physicians, and most of them were internists (Table 1). About half practiced at a university or a teaching hospital, and more than half supervised trainees and practiced for more than five years. Respondents were involved in direct patient care (whether a teaching or a nonteaching service) for a median of 28 weeks annually (mean 31.2 weeks, standard deviation 13.5), and practice regions were geographically diverse. All respondents reported seeing at least one IPN case in the past six months, with most seeing three or more cases (Table 2). Despite this exposure, 42% were unfamiliar with the Fleischner Society guidelines. When determining the need for IPN follow-up, most of them utilized radiology report recommendations or consulted national or international guidelines, and a third spoke with radiologists directly. About a third agreed that determining the need for follow-up was challenging, with 39% citing patient factors (eg, lack of insurance, poor access to healthcare), and 30% citing scheduling of follow-up imaging. Few reported the availability of an automated tracking system at their institution, although most of them desired automatic notifications of results requiring follow-up.

TABLE 2. Results of a National Survey of Hospitalists' Experience with Incidental Pulmonary Nodules

Survey Item	Response Choices	n (%)
1. How many patients have you encountered with an incidental pulmonary nodule in the last 6 months?	0	0 (0%)
	1-2	39 (22%)
	3-5	67 (39%)
	6-9	43 (25%)
	>9	24 (14%)
2. In addition to your clinical judgment, what additional factor(s) do you use when determining the need for follow-up in your patient(s) with an incidental pulmonary nodule? (Please choose all that apply) ^a	A. Reviewing radiology reports and recommendations	144 (83%)
	B. Speaking to a radiologist directly about a finding for his/her advice	60 (34%)
	C. Speaking to a hospitalist colleague for his/her advice	18 (10%)
	D. Speaking to residents for their advice	4 (2%)
	E. Informally speaking to a pulmonologist for his/her advice	55 (32%)
	F. Getting a formal pulmonary consult for their advice	40 (23%)
	G. Reviewing national/international guidelines for their recommendations	111 (64%)
	H. Reviewing local guidelines for their recommendations	26 (15%)
3. When encountering an incidental pulmonary nodule, I find the process of determining the need for follow-up challenging	A. Strongly Agree	14 (8%)
	B. Agree	45 (26%)
	C. Neither Agree nor Disagree	42 (24%)
	D. Disagree	62 (36%)
	E. Strongly Disagree	10 (6%)
4. If you find follow-up challenging, what specifically made the process of determining the need for follow-up challenging? (Please choose all that apply) ^a	Limited exposure to IPNs	12 (7%)
	No recommendation for FU in radiology report	21 (12%)
	Radiologist recommendations seemed to contradict national guidelines	12 (7%)
	National guideline recommendations did not seem appropriate/applicable for my patient(s)	14 (8%)
	Difficult to schedule FU imaging for patient(s)	52 (30%)
	Patient factors	67 (39%)
5. Does your institution or practice have a system in place to track incidental pulmonary nodules?	A. Yes	26 (15%)
	B. No	94 (55%)
	C. I'm not sure	52 (30%)
6. What features would you find most useful in a system that tracks incidental pulmonary nodules? (Please choose all that apply) ^a	Automatic notification when a nodule is detected	82 (47%)
	Automatic notification when a patient cancels/misses follow-up appointments	80 (46%)
	Automatic notification when a follow-up is completed	53 (30%)
	Automatic notification of concerning results that require further follow-up/action	112 (64%)
	Automatic notifications of all results	20 (11%)
	I'm not sure	17 (10%)

^aThis survey item also included "Other, please specify" as a response choice.

Abbreviations: FU, follow-up; IPN, incidental pulmonary nodule.

Unadjusted analyses revealed that supervision of trainees and seeing more IPN cases significantly increased the odds of a survey respondent being familiar with the Fleischner Society guidelines (OR 1.96, 95% CI 1.04-3.68, $P = .05$, and OR 1.55, 95% CI 1.12-2.18, $P = .008$, respectively; Supplementary Table 1).

DISCUSSION

To our knowledge, the survey reported here is the first to examine hospitalists' knowledge of the Fleischner Society guidelines and their approach to management of IPNs. Although our data suggest that hospitalists are less familiar with the Fleischner Society recommendations than pulmonologists⁸ and radiologists,⁸⁻¹⁰ the majority of hospitalists in our study rely on radiology report recommendations to inform follow-up. This suggests that embedding the Fleischner Society recommendations into ra-

diology reports is an effective method to promote adherence to these recommendations, which has been demonstrated in previous research.¹¹⁻¹³ Our study also suggests that hospitalists with more IPN exposure and those who supervise trainees are more likely to be aware of the Fleischner Society recommendations, which is similar to findings from studies examining radiologists and pulmonologists.⁸⁻⁹

Our findings highlight other opportunities for quality improvement in IPN management. Almost a quarter of hospitalists reported formally consulting pulmonologists for IPN management. Hospitalist groups wishing to improve value could partner with their radiology departments and embed the Fleischner Society recommendations into their imaging reports to potentially reduce unnecessary pulmonary consultations. Among the 59 hospitalists who agreed that IPN management was challenging, a majority

cited the scheduling process (30%) as a barrier. Redesigning the scheduling process for follow-up imaging could be a focus in local efforts to improve IPN management. Strengthening communication between hospitalists and PCPs may provide additional opportunities for improved IPN follow-up, given the centrality of PCPs to ensuring such follow-up. This might include enhancing direct communication between hospitalists and PCPs for high-risk patients, or creating systems to ensure robust indirect communication, such as the implementation of standardized discharge summaries that uniformly include essential follow-up information.

At our institution, given the large volume of high-risk patients and imaging performed, and the available resources, we have established an IPN consult team to improve follow-up for inpatients with IPNs identified by chest CTs on Medicine services. The team includes a nurse practitioner (NP) and a pulmonologist who consult by default, to notify patients of their findings and recommended follow-up, and communicate results to their PCPs. The IPN consult team also sees patients for follow-up in the ambulatory IPN clinic. This initiative has addressed the most frequently cited challenges identified in our nationwide hospitalist survey by taking the communication and follow-up out of the hospitalists' hands. To ensure identification of all IPNs by the NP, our radiology department has created a structured template for radiology attendings to document follow-up for all chest CTs reviewed based on the Fleischner Society guidelines. Compliance with use of the template by radiologists is followed monthly. After a run-in period, almost 100% of chest CT reports use the structured template, consistent with published findings from similar initiatives,¹⁴ and 100% of patients with new IPNs identified on the inpatient Medicine services have had an IPN consult.

The major limitation of our survey study is the response rate. It is difficult to determine in what direction this could bias our results, as those with and without experience in managing IPNs may have been equally likely to complete the survey. Despite the low response rate, our sample targeted the general cohort of conference attendees (rather than specific forums such as audiences interested in quality or imaging), and the descriptive characteristics of our convenience sample align well with the overall conference attendee demographics (eg, conference attendees were 77% hospitalist attendings and 9% advanced practice providers, as compared with 82% and 7% of survey respondents, respectively), suggesting that our respondents were representative of conference attendees as a whole.

Next steps for this work at our institution include developing systems to ensure appropriate follow-up for those with IPNs identified on chest CTs performed for Medicine outpatients. In addition, our institution is collaborating on a national study to compare outcomes resulting from following the traditional Fleischner Society recommendations compared to the new 2017 recommendations, which recommend more lenient follow-up.¹⁵

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