



Catching Those Who Fall Through the Cracks: Integrating a Follow-Up Process for Emergency Department Patients with Incidental Radiologic Findings

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Study objective: Abnormal findings unrelated to the indication for testing are identified on emergency department (ED) imaging studies. We report the design and implementation of an electronic health record–based interdisciplinary referral system and our experience from the first 13 months of ensuring that patients with incidental radiology findings were connected with the appropriate outpatient surveillance.

Methods: Our informatics team standardized the contemporaneous reporting of critical radiology alerts using our ED trackboard and created a companion follow-up request form for the treating ED clinicians to complete. The forms were routed to nurse case managers, who arranged follow-ups based on the findings and clinical significance. The primary outcome was the proportion of ED patient visits with identified incidental findings that had documented communication of the incidental findings and surveillance plans.

Results: Over the first 13 months after implementation, 932 ED patient visits had critical radiology alert referrals, for a total of 982 incidental findings. The primary outcome (confirmed post-ED communication and documented follow-up plan) was attained in 888 (95.3%, 95% confidence interval [CI] 93.9% to 96.6%) ED patient visits with confirmed post-ED communication and documented follow-up plans. The team was unable to contact or confirm follow-up with 44 (4.7%, 95% CI 3.4 to 6.1) patients by telephone or through the health care system's electronic communication tools.

Conclusion: We report the implementation of a standardized notification and referral system for ED patients with incidental radiology findings. The development of a reliable notification and follow-up system is an important patient safety intervention given the opportunity to potentially identify undiagnosed malignancies. [Ann Emerg Med. 2022;80:235-242.]

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0196-0644/\$-see front matter

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<https://doi.org/10.1016/j.annemergmed.2022.04.026>

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INTRODUCTION

Background

Abnormal findings unrelated to the indications for testing are occasionally identified on plain-film, ultrasound, and cross-sectional radiology imaging studies performed on patients during emergency department (ED) evaluations.¹⁻¹⁰ These have been denoted as incidental findings in the literature and represent an important patient safety and medicolegal issue for emergency clinicians and hospital systems.^{11,12} Although the majority of these findings do not represent harmful diagnoses for the patients, it has

been reported that 6% to 27% of these findings are related to first diagnoses of malignancies.¹³⁻¹⁵ Identifying cancer in its nascent stages may lead to improved morbidity and mortality for patients.¹¹ Our ED previously reported that incidental findings occurred in 32% of our trauma patients who underwent complete computed tomography (CT) trauma evaluations (ie, head, spine, chest, abdomen, and pelvis imaging), including 20% that were considered clinically significant.⁸ This prevalence is comparable to those in other trauma centers, which have reported incidental findings in 20% to 44% of patients undergoing complete CT evaluations.¹⁶⁻¹⁸ Studies have reported that less than 50% of incidental findings are communicated to

Editor's Capsule Summary*What is already known on this topic*

Emergency department (ED) trauma patient imaging detects abnormalities unrelated to the event, often not well communicated.

What question this study addressed

Can a structured electronic trigger coupled with someone tasked to ensure follow-up create high frequency patient notification of findings and care recommendations?

What this study adds to our knowledge

At one urban quaternary care site, the new process ensured that 888 of 932 targeted ED patient care episodes (95%) resulted in shared patient findings and care plans, though failure was higher in the noninsured subgroup.

How this is relevant to clinical practice

Creating structure aids communication of incidental trauma imaging, though its health impact remains unknown and creating equal performance for noninsured patients remains an opportunity.

patients, leading to patient safety and medicolegal concerns.^{11,18-20}

Importance

Due to the rapid care provided in EDs and the common involvement of multiple specialties and providers, it may be difficult to ensure that patients always receive the appropriate communication regarding test results. This is particularly true for radiographic findings that may not be pertinent to the current visit. The timely communication of these incidental findings to patients is important, and medical associations have provided guidelines surrounding this practice.²⁰⁻²² However, there have been few examples of comprehensive systematic processes for the management of incidental findings.^{2,17,23} Incidental findings have also been shown to have significant consequences from a medico-economic standpoint.⁴ Despite this, it is common for actual practice to deviate from the recommended guidelines with respect to follow-up imaging for this patient population.⁶ The reasons for this disconnect include insufficient resources, workforce shortages, poor safety measures, and, most important, the lack of a consistent and codified process not only to relay information but then to ensure that the appropriate next steps are taken. In response to an increasing number of identified incidental findings, in 2015, our hospital developed a critical radiology alert

process in our locally developed electronic medical record system that was subsequently incorporated into our Epic implementation in November 2017. In May 2020, we expanded this process to include outpatient cancer center navigators and facilitated ambulatory visit scheduling.

Goals of This Investigation

The objectives of this manuscript are to detail the implementation of our standardized electronic health record–based interdisciplinary referral system and report the first 13 months of data from ensuring that patients with incidental radiology findings were connected with the appropriate outpatient surveillance follow-up.

METHODS**Setting and Participants**

This quality improvement study was performed at an academic, quaternary care system of hospitals that cares for more than 2 million ambulatory outpatient visits and treats approximately 68,000 adult ED patients annually. Our hospital is the city's only Level I trauma center and regional burn center and has the region's only National Cancer Institute–designated comprehensive cancer center for adults and children. As our hospital is the only adult Level I trauma center in our region, trauma evaluations account for approximately 7,700 ED visits each year. Many of these patients undergo CT imaging as part of their trauma evaluations, which increases the likelihood of incidental finding identification.⁸ In 2020, 44% and 35% of all ED patients underwent one or more plain radiography and CT imaging studies, respectively. These imaging studies are the most common radiology studies in which incidental findings are identified and reported as critical radiology alerts in our hospital's ED.⁸

Study Design

We performed a retrospective cohort study to evaluate this quality improvement process for the management of incidental findings. All adult ED patient visits that included critical radiology alerts for incidental radiology findings between May 3, 2020, and June 30, 2021, were included in the cohort. These patients were entered into the cohort in 1 of 2 ways: the treating ED clinician completed an ED follow-up request form in our electronic health record system or an ED patient visit appeared on the critical radiology alert weekly report. ED patient visits were added to the nurse case manager or navigator work queues through both data entry mechanisms. Our medical center's institutional review board reviewed and exempted this study based on its designation as a quality improvement project.

Critical Radiology Alert Process

In 2015, our ED informatics team and hospital health information technology team developed a process to standardize the reporting of important radiology findings to the emergency clinicians in real time using our institution's developed ED electronic track board. When the radiologist—resident or attending—who is reading the imaging study identifies an important clinical or incidental finding, he or she types or dictates the finding into the critical alert messaging system. This message activates a red “stop sign” icon on the ED trackboard that is visible to all ED clinical staff. This alerts the ED clinical team that there is a critical alert that must be reviewed and acknowledged. If the critical alert is not acknowledged within 60 minutes, the hospital operator telephones the ED and delivers the communication directly to the ED attending physician. In November 2017, our medical center retired our local electronic health record system and implemented Epic across the enterprise. This same process, with slight electronic health record–specific modifications, was implemented within our Epic ED trackboard. Our ED administrative team developed a standard acknowledgment, notification, and referral process to implement on receiving the notification of a critical radiology alert for an incidental finding (Figure 1). The treating clinician was to inform the patient of the finding, obtain any additional pertinent history (eg, smoking history, family history of lung cancer, prior identification of the finding), and submit an ED follow-up request form.

ED Follow-Up Request Form

Our health information technology developers and ED leadership team created a companion ED follow-up request form for the treating ED clinician to complete contemporaneously on receiving a critical alert notification. The follow-up request forms are routed to a team of ED nurse case managers, who work with the patient, family, and primary care physician to arrange the recommended follow-up based on the finding and its clinical significance. During our medical center's conversion from its local electronic health record system to Epic systems, we created an Epic form that was easily accessible from the patient's chart (Figure 2). Details about the implementation process, communication plan, and weekly critical radiology alert monitoring report are provided in the Appendix E1 (available at <http://www.annemergmed.com>).

Data Collection and Outcome Measures

We compiled an electronic health record report using a Structured Query Language program query and anchored

based on “ED Incidental Finding” identifier for ED patient visits that had critical radiology alerts communicated between May 3, 2020, and June 30, 2021. Each report included the patient's medical record number, date of service, free-text radiology interpretation critical alert, ED visit insurance network status, and clinician who completed the ED follow-up request form. We excluded patients whose critical alerts were not related to incidental findings (eg, reported appendicitis or pulmonary embolism that was the indication for the test). When a patient had multiple ED visits with critical radiology alerts, we considered only the patient's initial ED visit in the analysis to prevent duplicate counting in the cohort, as the patient would have been entered into our follow-up system on their first visit during the study period.

The study's primary outcome was the proportion of ED patient visits with identified incidental findings that had documented communication with the patients regarding the incidental findings and surveillance plans. The secondary outcomes included the frequencies of post-ED surveillance clinic visits and procedural encounters within our health care system. We also reviewed the distribution of the incidental findings by organ/body system. To track the post-ED communication and surveillance for in-network patients, we performed a Structured Query Language program query anchored based on “ED Incidental Finding” identifier for ED patient visits routed through the established message basket workflow (ie, those with completed “ED Follow-Up Forms”). The report details are provided in Figure E1 (available at <http://www.annemergmed.com>). Investigators reviewed the medical records using a standardized data entry form and documented the following data: communication from ED nurse case managers or cancer center navigators about follow-up referral, completed post-ED ambulatory encounters within our health system related to the incidental findings, and categorization of the types of encounters. Out-of-network patients' medical records were reviewed by an investigator using a standardized data entry form to review the ED case manager notes that were identified by both the note title (referencing the test result) and the note author (identifying 1 of the 2 ED case managers). The ED case managers' notes documented either a communication and surveillance referral plan or their inability to contact the patient and plan to mail a letter. The radiology free-text interpretations were reviewed by an investigator, and each incidental finding was further classified based on organ location (eg, pulmonary nodule, adrenal nodule, pancreatic cyst, etc).

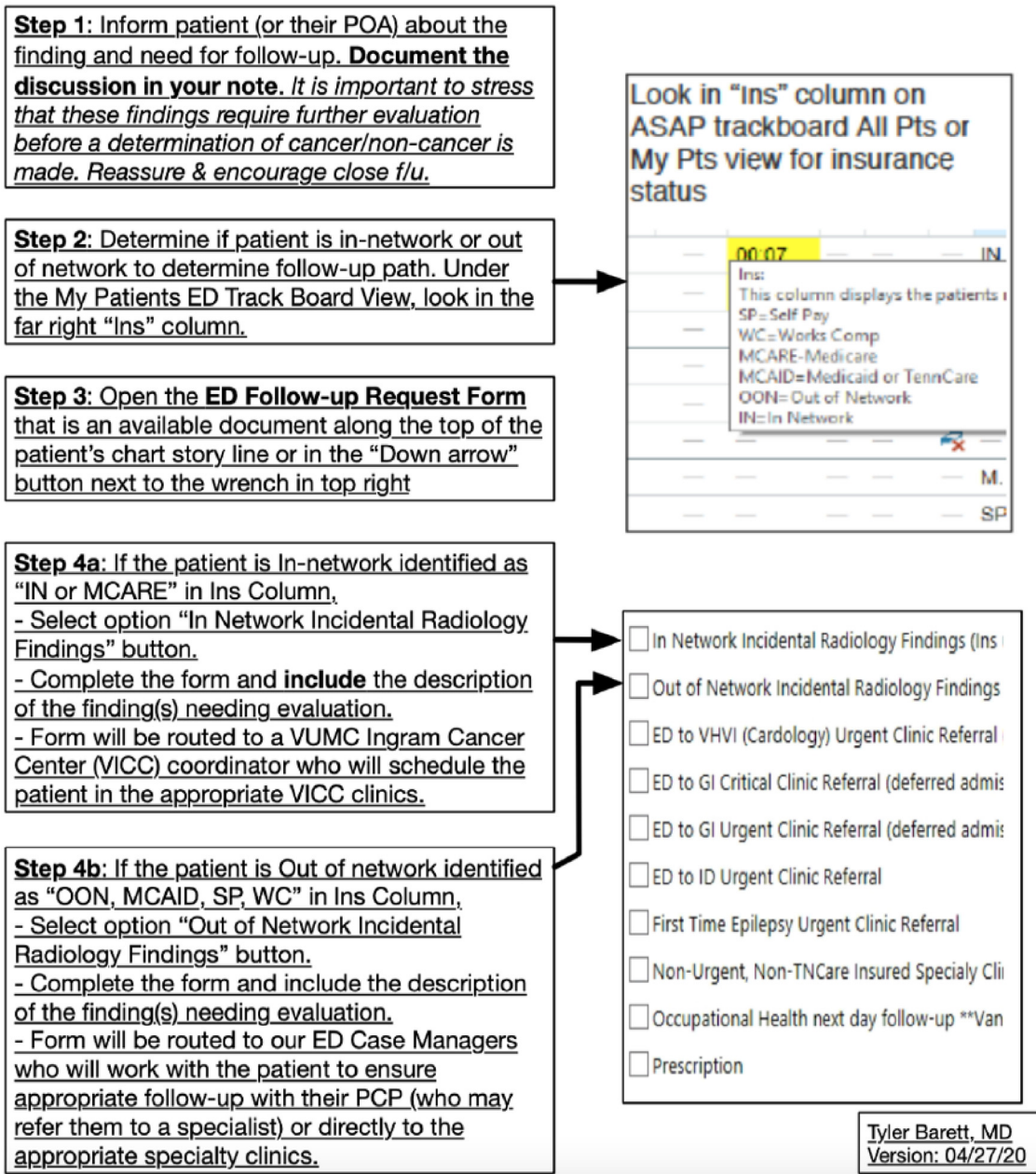


Figure 1. Process map for incidental finding process. This figure depicts the ED process for communicating the incidental finding to the patient, identifying the case management recipient, and communicating the result to the case manager or cancer center navigator using the ED follow-up request form.

Statistical Analysis

We provided summary data for ED visits during the first 13 months of the new process, from May 3, 2020, to June 30, 2021. The unit of analysis was an ED patient visit with the documented identification of one or more incidental radiology findings communicated as radiology critical alerts in our electronic health record. When patients had multiple findings reported, the findings were attributed to the various organ system categories, resulting in more total findings than unique patients. Communication and

surveillance outcome data are presented as frequencies (percentages). The statistical analysis was performed using SPSS, version 27 (IBM Corporation). Frequencies and percentages with 95% confidence intervals were reported to detail the prevalence of categorical outcomes.

RESULTS

We officially launched the new process on May 1, 2020. Over the first 13 months of the new process, out of 64,731 total ED visits throughout the study period, 932 (1.44%) ED

ED Follow-Up Request Form

Time taken: 12/27/2021 1153 + Add Group + Add Row Responsible Show Row Info Show Last Filed Value

ED Follow-Up Request Form

ED Case Manager Follow-Up Request

- In Network Incidental Radiology Findings (Ins under My Pts equals "In" or "MCare")
- Out of Network Incidental Radiology Findings (Ins under My Pts equals "SP" or "OON")
- Referral for Evaluation for potential Covid Monoclonal Antibody Therapy
- ED to VHVI (Cardology) Urgent Clinic Referral (deferred admission) **Include specific Procedure Consideration, if needed
- ED to GI Critical Clinic Referral (deferred admission) within 1 - 2 weeks***include diagnosis
- ED to GI Urgent Clinic Referral (deferred admission) within 4 - 6 weeks ***include diagnosis
- ED to ID Urgent Clinic Referral
- First Time Epilepsy Urgent Clinic Referral
- Non-Urgent, Non-TNCare Insured Specialty Clinic Referral
- Occupational Health next day follow-up **Vanderbilt Employee
- Prescription
- Other

Outpatient Social Work Follow-Up Request

- Uninsured Referral for PCP
- TNCare PCP Referral

Transitional Manager Follow-up Request

- Home Health
- DME Supplies
- Physical, Occupation Therapy
- Pallative Care/Hospice Needs
- Infusion Needs
- Transfer to Kindred
- Transfer to Stallworth
- Transfer to other Skilled Nursing Facility

Accept Accept and New Cancel

Figure 2. Example of incidental finding alert on ED Epic trackboard and ED follow-up request form. This figure depicts the ED follow-up request form that the clinician completes to alert the case manager or cancer center navigator of the identified incidental finding and need to schedule follow-up.

patient visits had critical radiology alerts. The 932 ED patient visit encounters included 53 visits with multiple incidental findings, resulting in a total of 982 incidental findings. The primary outcome was attained in 888 (95.3%, 95% confidence interval [CI] 93.9% to 96.6%) ED patient visits with confirmed post-ED communication and documented follow-up plans. The team was unable to contact or confirm follow-up with 44 (4.7%, 95% CI 3.4% to 6.1%) patients over the phone or by our health care system's electronic communication tools. The inability to contact was more frequent for the out-of-network patient visits (39 of 344; 11.3%, 95% CI 8.1% to 15.1%) compared to in-network patient visits (5 of 588; 0.9%, 95% CI 0.2% to 1.7%). Tables 1 and 2 report the distribution of communication and surveillance plans for our in-network and out-of-network patients. Table E1 (available at <http://www.annemergmed.com>) reports the distribution of the incidental findings by body region. Additional details on the distribution of completed appointments and procedures are provided in Tables E2 and E3 (available at <http://www.annemergmed.com>).

LIMITATIONS

Our study has several limitations that are inherent to a retrospective cohort design, including that we had missing data for patients who were unable to be contacted, predominantly out-of-network patients, and out-of-network patients who completed their planned follow-ups outside of our health care system. The investigators did not contact out-of-network or self-pay patients after their ED visits to inquire about their post-ED courses beyond their documented communication with the ED nurse case managers. Some of the incidental findings were not new identifications, and our clinical experience was that patients occasionally reported prior awareness of their conditions based on imaging done through other health care systems. That data element may have been underreported, as patients may have had awareness of their conditions but declined to communicate this to the case managers or the conditions may not have been documented in the electronic health record notes. Established stable findings do not typically require the

Table 1. Distribution of follow-up outcomes for in-network ED patient visits with one or more incidental findings (N=588).

Follow-Up Plan	Frequency (%)	95% Confidence Interval
In-network referral to primary care provider or specialist	583 (99.1%)	(98.3–99.8)
In-network unable to contact patient by phone and letter mailed requesting call to case manager	5 (0.9%)	(0.2–1.7)

This table reports the distribution of communication and surveillance plans coordinated by our navigators. Totals are presented as frequencies (percentages) with 95% confidence intervals.

same intensity of follow-up surveillance as new findings. The association of the follow-up health care encounters was based on the cancer navigators manually reviewing the records and identifying that one of their navigator team members arranged the follow-up visit. This could have led to the misclassification—either undercounting or overcounting—of some visits that were temporally related to the identification of the findings but already planned as part of the patients' routine health maintenance. The new process was launched amid the global coronavirus disease 2019 pandemic, which caused a severe strain on our local and regional health care system. This resulted in limited access to recommended surveillance due to our community health care systems lacking the available capacity to further evaluate these post-ED patients.

DISCUSSION

This comprehensive, interdisciplinary process utilized the capabilities of our electronic health record system to notify the treating ED clinicians of the incidental findings; create visual signals on the ED track board, for all to see both when the alerts occurred and when they were acknowledged; provide easily accessible ED follow-up request forms within the patients' electronic charts, routed to clinical nurses to assist with follow-up; and create a weekly report to ensure that all critical radiology findings were entered into the follow-up system. The system also connected knowledgeable nurse case managers and patient navigators directly with the patients to discuss the findings

and assist them with additional evaluations at our medical center's clinics, radiology imaging centers and laboratories, and at other regional health care facilities. This process could be implemented in other hospital EDs and extended to inpatient services. Previous publications have described sophisticated systems to address incidental findings that focused on either a specific type of finding or only specific components of the process (eg, identification, reporting, communication, or surveillance elements, including standardizing radiology reporting, ensuring communication with the patient, and ensuring follow-up) rather than a comprehensive process.^{9,11,13,18,23,24} These reports highlighted that a standardized system integrated into the radiology and electronic health record systems improved the communication and surveillance of these findings, with reported improvements from 45% to 48% to 90% to 95%.^{2,17} Our program included all of these elements and resulted in excellent documented communication of the incidental findings and surveillance plans with the patients, with 95% of patients having documented communication of their incidental findings and surveillance plans. Although our overall unable-to-contact percentage was less than 5%, this rate was 13 times higher for the out-of-network patients. This was universally due to the patients not answering calls from our team or returning voice mails or incorrect telephone contact information provided or documented in the ED registration records. Certified letters were mailed to the addresses on file, but the personal communication of the results could not be confirmed, so we classified these as "unable to contact." We have

Table 2. Distribution of follow-up outcomes for out-of-network ED patient visits with one or more incidental findings (N=344).

Follow-Up Plan	Frequency (%)	95% Confidence Interval
Out-of-network referral to primary care provider	175 (50.9%)	(43.7–58.9)
Out-of-network referral to in-network specialist	65 (18.9%)	(14.8–23.0)
Out-of-network referral to federal qualified health care clinic	55 (16%)	(12.2–20.4)
Out-of-network unable to contact patient by phone and letter mailed requesting call to case manager	39 (11.3%)	(8.1–15.1)
Out-of-network referral to county-supported hospital and clinics	10 (2.9%)	(1.5–4.9)

This table reports the distribution of communication and surveillance plans coordinated by our ED nurse case managers. Totals are presented as frequencies (percentages) with 95% confidence intervals.

implemented a new electronic health record text messaging system to provide patients with real-time clinical updates and are optimistic that this texting technology may increase the capture of correct mobile phone numbers for patients and reduce future contact failures.

Most incidental findings are benign and do not represent early malignancies or other serious conditions.^{3,12-14} There are costs and potential risks to the patient and the health care system associated with the surveillance of these incidental findings that should be considered when implementing a system. These include invasive diagnostic procedures, additional radiation exposure, increased health care utilization, and unnecessary patient stress and anxiety.¹² Ensuring that a patient's primary care provider is closely involved is critical to the process so that they may review prior radiology records for reports of a finding, schedule and monitor future surveillance, and, most importantly, determine the individual patient's surveillance plan based on the individual's risk profile (eg, lung nodule in a smoker versus a nonsmoker). A benefit of retaining patients who undergo follow-up surveillance within the same health care system is that it may reduce unnecessary repeated imaging when a previously identified and stable finding is newly detected at another facility. The continued expansion of global electronic health record systems and the ability to review imaging studies and interpretations from other institutions may also reduce unnecessary surveillance testing.

Our process included several key patient safety elements to ensure that critical incidental radiology findings are communicated to the patients with recommended follow-up plans. The process was intended to safeguard against ED factors that may have complicated the notification process, such as the fast pace of clinical care, patients' and family members' anxiety about the primary presenting complaints, and handover to other clinicians before patients' ED evaluations were complete. These factors may have resulted in suboptimal communication due to a combination of the clinicians forgetting to communicate the incidental findings to the patients, the patients or their families misunderstanding or forgetting the conversations due to the emotional stress of the ED and focusing on their primary reasons for visiting the ED, or the failure to document the findings on the patients' discharge paperwork. Our process incorporated several elements to overcome these potential communication gaps, including the following: the visible stop sign icon on the trackboard that alerted the entire ED team of a critical alert and cued the treating physician to inform the patient and complete the follow-up form, the active calling from the ED case manager or cancer center nurse navigator directly to the

patient in the days after their ED discharge, and documentation detailing the follow-up plan. The weekly report, produced each Monday, was cross-referenced by the ED case managers and cancer center navigator to ensure that every patient was contacted by one of the teams.

Second, from a hospital growth opportunity, this process increased the numbers of new and established ED patients who visited our hospital and continued their additional evaluations within our health care system. Previously, patients were informed of their findings and recommended to arrange subsequent follow-ups through their primary care providers. Many community physicians, including specialists focused on the most frequent findings, may not have been aware of the expanded specialty care options at our medical center. Direct communication and urgent follow-up scheduling by our navigators resulted in an increased number of patients receiving urgent follow-ups within our system, where their recent imaging and diagnostic laboratory studies were available. The quality of the follow-up is also important in scheduling patients with physicians who have specific expertise in the appropriate field to optimize the specificity and appropriateness of care delivery. For example, patients with identified pulmonary nodules were evaluated at our interventional pulmonary clinics and risk stratified based on nodule size, smoking history, and other established risk factors.^{18,20,23} Having those surveillance data in our electronic health system assisted our radiologists in knowing that an identified finding had been present on past imaging studies and additional imaging, when recommended, was completed to better risk stratify the clinical importance of the finding. Maintaining the surveillance imaging in one system also allows for radiologist comment on a finding's stability or growth concerning for disease progression.

Third, from a quality and risk management perspective, this process leverages the electronic health record to document that these critical communication steps have occurred and the recommended follow-up plan. Such documentation is critically important from a risk management perspective if the patient subsequently experiences a complication related to not following the recommended management plan.

Based on the capture, communication, and follow-up planning for 95% of these ED visits, our leadership team and hospital administration deemed this a successful initiative and are expanding the process to admitted patients initially on 2 service lines—a surgical team and a medicine team. Translating the process to the inpatient unit introduces new challenges, but our team is excited for the program expansion.

In conclusion, we report the implementation of a standardized notification and referral system for patients who have incidental radiology findings detected during their ED evaluations. The development of a comprehensive, reliable notification, and follow-up system is an important patient safety intervention given the opportunity to potentially identify undiagnosed malignancies.

Supervising editor: Donald M. Yealy, MD. Specific detailed information about possible conflict of interest for individual editors is available at <https://www.annemergmed.com/editors>.

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All authors attest to meeting the 4 [ICMJE.org](http://www.icmje.org) authorship criteria: (1) Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND (2) Drafting the work or revising it critically for important intellectual content; AND (3) Final approval of the version to be published; AND (4) Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Funding and support: By *Annals* policy, all authors are required to disclose any and all commercial, financial, and other relationships in any way related to the subject of this article as per ICMJE conflict of interest guidelines (see www.icmje.org). The authors have stated that no such relationships exist.

Publication dates: Received for publication February 16, 2022. Revision received April 15, 2022. Accepted for publication April 20, 2022.

An abstract titled "Oncology Capture of ED Patients with Incidental Radiologic Findings" was presented at The Association of Community Cancer Centers 38th National Oncology Conference on Thursday, October 21, 2021, in Austin, Texas.

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