



Incidental Findings & The Opportunity To Improve The Early Detection of Cancer



The pros and cons of cancer screening



It's the same for any cancer. When discovered in the later stages, the prognosis is poor. When discovered in the early stages, treatment has a better chance to be effective, and the prognosis is much better. In fact, for some cancers like breast and thyroid, early diagnosis and treatment significantly improve patient outcomes and can lead to an actual cure. For breast cancer in particular, the 5-year survival rate is 98.9% when findings are localized (63% of cases). If, however, the cancer has metastasized to distant lymph nodes (6% of cases), the 5-year survival rate drops to 29% ^[1,2].

That's why cancer screening programs have proven to be so effective in discovering cancer in early stages and reducing mortality rates, especially for breast and lung cancer. But screening programs are limited to patients determined to be at higher risk to the disease. If you don't meet the criteria, then you're not eligible for screening. Does that mean you're completely not at risk? Of course not, you're just at average or lower risk. Screening programs may also have other limitations, like being available only in specific areas, potential insurance coverage restrictions and/or out-of-pocket costs, exposure to ionizing radiation, and the risk of false positives or false negatives.

Findings discovered incidentally outside of screening programs are critically important in the early detection of cancer.

Unfortunately, not all malignancies have established screening programs for early detection. Of the 1.9 million expected new cancer diagnoses in 2021 in the U.S., the top malignancies by rate have screening programs—#1 is lung and bronchus, #2 is colon and rectum, #3 is uterine, #4 is bladder, and #5 is skin ^[2]. Despite this, the 609,000 expected cancer deaths in 2021 are quite similar—#1 lung and bronchus, #2 breast, #3 prostate, #4 colon and rectum, #5 pancreas, #6 liver, and #7 ovary—because many people do not meet the screening criteria or simply don't participate. Many malignancies have no routine screening programs, such as pancreatic, renal, and ovarian cancer. In addition, thyroid screening has been deemed more harmful than helpful for asymptomatic patients by the United States Preventive Services Task Force (USPSTF), and is not recommended.

The growing benefit of incidental findings



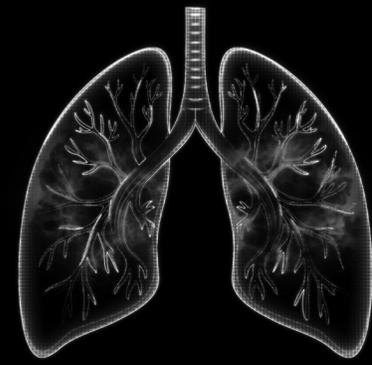
An incidental finding is an abnormality discovered on an imaging exam being performed for an unrelated reason. These findings in a normal population may represent an underlying malignancy, simply an anatomic variant, or a finding of no clinical consequence. A 2017 systematic review ^[3] of 20 studies involving 627,000 patients showed variability in the distribution of incidental findings across the most common radiology exams, ranging from quite often to rare. The prevalence was highest for computed tomography (CT) of the chest (45%), CT colonography (38%), and cardiac magnetic resonance imaging (MRI; 34%). The prevalence was intermediate for MRI of the brain and spine (about 20% each) and low for whole-body positron emission tomography (PET) and PET/CT (2%).

Up to 62 million incidental findings are detected each year, but only 39%–58% will receive proper follow-up.

Overall, between 10-25% of radiology exams will contain an incidental finding ^[4]. Because over 250 million imaging exams are performed yearly in the U.S., this means 25–62 million incidental abnormalities may be detected annually. Most of these findings are benign and of little clinical significance. Some of the findings will represent known malignancies and/or metastases, whereas others are previously unknown malignancies or premalignancies. In every case, a clinical decision must be made if further testing and/or surveillance with longitudinal tracking is warranted. Numerous evidence-based guidelines exist to assist with this decision making.

Unfortunately, follow-up does not often happen in accordance with the guidelines. A study done in 2020 ^[5] found only 39% of findings requiring follow-up received it. Another 6-year study found only 58% were appropriately followed ^[4]. These publications call attention to the missed opportunity that appropriately-followed incidental findings may provide to identify cancer at an early, treatable stage. Equally concerning is the report of patients who have the most significant findings also have the least information and/or the lowest follow-up rates ^[6].

The vital role of incidental findings with lung cancer



Lung and bronchial cancers are the leading cause of cancer death in men and women in the U.S. The 5-year survival rate for non-small cell lung cancer is 25%, and 7% for small cell lung cancer ^[7]. In response to these statistics and the outcomes of several clinical trials, the USPSTF recommended that people at high risk for lung cancer have yearly screening with low-dose CT (LDCT) exams. While lung cancer screening (LCS) is effective in detecting cancer early for patients who participate, patients need to participate and need to adhere to the annual screening protocol to maximize their benefit. Unfortunately, LCS participation rates are quite low—just 2% in 2016 ^[8] and 5% in 2018 ^[9] of eligible patients who were enrolled—and adherence to the follow-up and screening protocol was less than perfect at 35% to 46% respectively.

70% of patients with IPNs do not receive the proper clinical follow-up, and potentially life-saving intervention.

A more recent report showed LCS participation rates had improved slightly, but they are still very low. Between 2019 and 2020, only 6.5% of the 8.51 million eligible adults received screening ^[10]. The USPSTF recently revised their LCS recommendations and expanded the age range (50–80 years) and lowered the smoking history (minimum of 20 pack-years).

Even though the number of LCS-eligible patients will almost double, the overall low participation rate for screening is still a serious problem.

Because of this low participation, relatively few new lung cancers are detected in screening programs versus incidental detection. Incidental pulmonary nodules (IPNs) thus play a vital role in the detection of lung cancer. Over 1.5 million patients with IPNs are discovered each year and approximately 63,000 (4%) are estimated to be diagnosed with lung cancer within 2 years ^[11]. Most of these lung nodules are benign and require no or infrequent follow-up. However, those highly suspicious nodules and high-risk individuals (including the 4% with cancer) need to be tracked to ensure they are receiving proper follow-up. With appropriate evidence-based management ^[12] of these patients, the disease can be caught early when treatment is more effective. The problem is, only 30% of patients with IPNs receive the proper clinical follow-up ^[13]. That means the vast majority of patients with IPNs are not being tracked for the early detection of cancer.

Early detection of lung cancer has an enormous impact on the chance of surviving five years after diagnosis. For lung cancer, only 17.8% of patients are diagnosed at the local stage where the 5-year relative survival rate is 59.8%. That rate drops significantly to 6.5% when the cancer is distant ^[7]. If all IPNs were tracked according to the Fleischner Society guidelines ^[12], the number of lung cancer cases detected early would increase dramatically.



The fight against breast cancer needs to include incidental findings too

Breast cancer screening programs have greatly improved early detection and mortality rates since their incorporation into clinical practice in the late 1970s. But, like in lung cancer screening, there are millions of eligible women who don't undergo routine breast care. According to the National Cancer Institute, in the U.S. in 2019, only 76.4% of women aged 50–74 years (the screening age range) had a mammogram within the past 2 years ^[14]. So, despite the relatively long history and broad dissemination of mammography, as well as the high participation rate in breast screening and success in detection of cancer, three significant populations still remain at risk. The first is screening eligible women who aren't getting screened; the second is women who fall outside of screening eligibility criteria; the third population is men—yes, a small fraction of men get breast cancer, and usually with poor outcomes

For the 23.6% of screening-eligible women who do not participate, the women too young for screening and the men with breast cancer, the missed opportunity to a cure is life-changing. This is where incidentally found breast lesions can play an increasingly vital role. Based on Eon's review of about 5.6M radiology reports (all anatomic regions, all imaging modalities), the rate of unexpect breast findings was about 0.03%. Of these, about 50% of incidental breast lesions were found in women eligible for breast cancer screening.

Of the remaining incidental findings, 42% were found in women either too young or too old for screening, and 8% were found in men. Thus half of the patients with incidental breast findings were not eligible for screening, and their findings would not have happened if not for the serendipity of an unrelated CT, MRI, or X-ray exam.

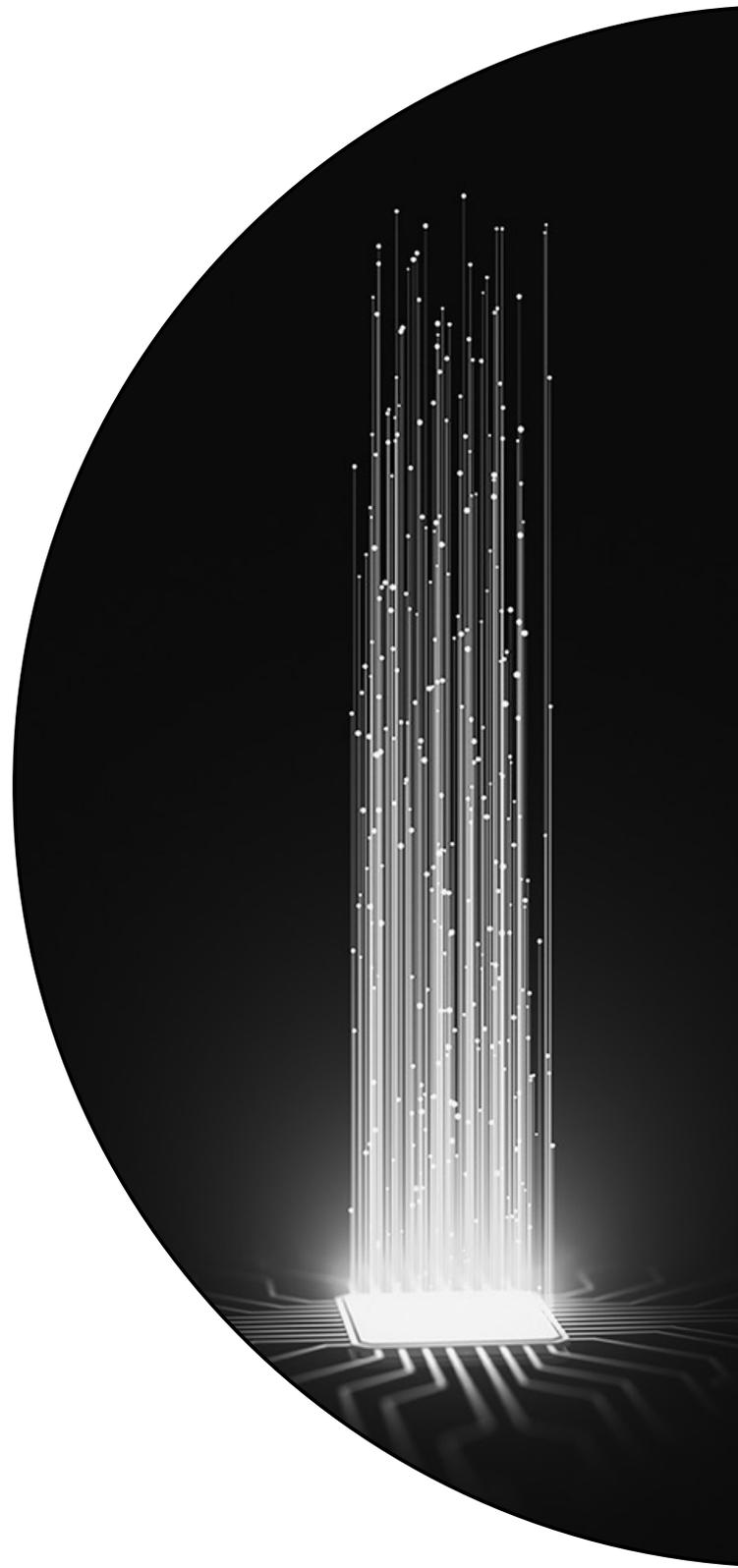
42% of women with incidental breast findings were not eligible for breast cancer screening.

Just how important are incidental breast findings? The same 2017 systematic review found that 42% of incidental breast findings were malignant ^[3]. For patients outside of breast screening eligibility, the incidental discovery of a breast abnormality is their only chance to be properly diagnosed and receive the care they need. Just like with breast screening, if the malignancy is identified when still localized, the prognosis for these breast cancer patients is quite good.

Incidental findings in other cancers

For the many malignancies without screening tests—such as pancreas, renal, and adrenal cancers—incidental detection is the only chance for early diagnosis. For example, pancreatic cancer has a 5-year overall survival rate of just 10%, mainly because it is typically asymptomatic with 82% of patients presenting in late stages when the prognosis is very poor ^[7]. However, incidental pancreatic cysts are being detected at an increasing rate—in up to 13.5% of radiology exams, most commonly CT and MRI exams ^[15]. With Computational Linguistics (CL) to help identify and capture patients with incidental findings, and using evidence-based guidelines on when, how, and if to follow up as well as a patient tracking system, this will help identify cancers in these organs—hopefully while in the early stages when treatment is more effective.

For cancers that don't have screening tests, incidental detection is the only chance for early diagnosis.



Incidental findings—and the right software—can improve the early detection of cancer

The data shows that incidental identified findings are incredibly important to the early detection of cancer. By capturing and longitudinally tracking these patients to ensure appropriate follow-up, facilities can have a significant impact on patient outcomes. This was the genesis for the development of the family of [Eon Patient Management \(EPM\)](#) oncology solutions. EPM is a scalable, comprehensive software platform a program can use to capture and track patients with incidental findings—including embedded evidence-based guidelines for follow-up monitoring—so it can achieve a stage shift in patient care and the early detection of disease. EPM also enables facilities to add and manage screening populations to the same dashboard so navigators and providers have complete visibility. For example, a comprehensive lung cancer program can combine the [EPM Lung Cancer Screening](#) module with [EPM Lung](#), which uses CL to identify IPNs documented in radiology reports with 98.3% accuracy and 98.1% precision, the best rates in healthcare. Another example is the new [EPM Breast](#), a single solution for both screening and incidental patient populations—the first of its kind in healthcare—and a CL model that identifies incidental breast findings with up to 95% accuracy.

EPM has solutions for many disease states to help facilities detect cancer early.

EPM also has solutions for [Pancreas](#), [Thyroid](#), Renal, and Adrenal diseases, for which incidental detection is the only chance for early diagnosis. In addition, EPM has a [Liver](#) solution similar to Breast, offering both screening and incidental findings technology and patient management. EPM enables patients with incidental findings in these disease states to be accurately identified so they can receive evidence-based follow-up care. These EPM modules also have the best CL accuracy rates in the industry—95.4% for Thyroid, 93.9% for Pancreas, and 94.2% for Liver. In fact, Eon's technology is advanced enough to be applied to aortic aneurysms. The [EPM Abdominal Aortic Aneurysm](#) solution identifies patients with enlargement of the aorta and automates follow-up for the 90% of patients who require routine screening and longitudinal tracking. Lastly, the EPM [Actionable Findings](#) module works across all disease states as a safety net to capture those findings that require immediate intervention, ensuring that no patient is left behind.

EPM leads the way in incidental findings and patient management technology

Because the scalable EPM platform is cloud-based and fully integratable enterprise-wide, a facility can use any of the different modules together on the same dashboard to manage multiple patient populations. For all programs, EPM automatically triages patients into a high-risk category for provider review and into a low-risk category for routine follow-up. This feature enables care providers to focus on the high-risk patients, without ignoring the appropriate next step in treating each and every finding. Eon's internal research combined 8 studies—this meta-analysis showed that patient tracking software and a referring clinician engagement program increases appropriate patient follow-up, often to over 90%. These findings were independently confirmed and support the use of an electronic patient tracking system as well as a centralized referral and care-coordination process ^[17].

EPM is now live in 270+ facilities, ensuring that patients with incidental findings are identified and tracking for evidence-based follow-up, so that no patient falls through the cracks.

With CL for incidental finding identification and Eon Patient Management, any finding could lead to the early identification of cancer or prevention of a catastrophic cardiovascular event—and a life saved.



SOURCES:

- [1] National Cancer Institute, Surveillance, Epidemiology and End Results, SEER Stat Facts on Female Breast Cancer.
- [2] American Cancer Society (cancer.org).
- [3] O'Sullivan JW, et al. Prevalence and outcomes of incidental imaging findings: umbrella review. *BMJ* 2018; 361: K2387. DOI: 10.1136/bmj.k2387.
- [4] Thusitha Mabotuwana, PhD, et al. Determining Adherence to Follow-up Imaging Recommendations. DOI: 10.1016/j.jacr.2017.11.022.
- [5] Shan S. Hansra, MD, Thomas W. Loehfelm, MD, PhD, Machel Wilson, PhD, Michael T. Corwin, MD. Factors Affecting Adherence to Recommendations for Additional Imaging of Incidental Findings in Radiology Reports. DOI: 10.1016/j.jacr.2020.02.021.
- [6] Al Mutairi, A. Meyer, A. N., Chang, P., & Singh, H. Lack of timely follow-up of abnormal imaging results and radiologists' recommendations. *Journal of the American College of Radiology*, 12(4), 385-389. DOI: 10.1016/j.jacr.2014.09.031.
- [7] SEER database (seer.cancer.gov/).
- [8] https://ascopubs.org/doi/abs/10.1200/JCO.2018.36.15_suppl.6504.
- [9] Stacey A Fedewa, PhD, et al. State Variation in Low-Dose Computed Tomography Scanning for Lung Cancer Screening in the United States. DOI: 10.1093/jnci/djaa170.
- [10] Stacey A. Fedewa, PhD, et al. Lung Cancer Screening Rates During the COVID-19 Pandemic. Published: July 19, 2021. DOI: 10.1016/j.chest.2021.07.030.
- [11] Bruce S. Pyenson et al. No Apparent Workup for most new Indeterminate Pulmonary Nodules in US Commercially-Insured Patients. DOI: 10.36469/9674).
- [12] Heber MacMahon, et al. Guidelines for Management of Incidental Pulmonary Nodules Detected on CT Images: From the Fleischner Society 2017. DOI: 10.1148/radiol.2017161659.
- [13] Denitza P Blagev, et al. Follow-up of incidental pulmonary nodules and the radiology report. DOI: 10.1016/j.jacr.2013.08.003.
- [14] Centers for Disease Control and Prevention, National Center for Health Statistics, National Health Interview Survey, 1987–2019.
- [15] Elta GH, et al. ACG Clinical Guideline: Diagnosis and Management of Pancreatic Cysts. *Am J Gastroenterol* 2018; 113(4): 464-479. DOI: 10.1038/ajg.2018.14.
- [16] [Incidental Pulmonary Nodules White Paper](#)
- [17] Nichole T. Tanner, MD. et al. Screening Adherence in the Veterans Administration Lung Cancer Screening Demonstration Project. DOI: 10.1016/j.chest.2020.04.063.



Eon is a Denver-based healthtech company dedicated to revolutionizing the way healthcare data is gathered, curated, and shared among industry professionals. We are on a mission to ensure the right data reaches the right people at the right time to identify disease early and stop it in its tracks.

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