

# THE TEAL PAPER

## *A Portrait of a Medical Revolution in the Making in Early Detection and Monitoring*

*In 2026, we are here to bring people together to transform breast cancer care. Our Teal Paper focuses on the opportunity that early detection presents for monitoring breast cancer. This Teal Paper follows our Pink Paper<sup>1</sup> which focused on the financial toxicity of breast cancer, especially when diagnosed at later stages, and the need to make early detection more accessible.*

*While we are not oncologists, we are seeking to portray and support a medical revolution we are witnessing led by heroic researchers, scientists, and oncologists who are transforming the world of science. Please see this as a bird's-eye view of a medical revolution in early detection and monitoring that can lead the reader to finding the pioneers and the work that can save their lives. The Teal Paper is an earnest effort to capture and support the extraordinary opportunity presented by this moment.*

## **Making the Invisible Visible: Transforming Breast Cancer Care Through Advances in Detection and Monitoring**

When breast cancer is found through methods of early detection, we have the opportunity to carefully monitor the cancer and treat each person in a way that reflects their individual needs. This is about making the invisible visible: both in terms of the disease and the women being ignored. By fully understanding the unique features of each person's cancer and making this accessible to all women, doctors can tailor treatments to be more effective and precise, and researchers can use recorded data and testing of metastatic disease to build on research and discoveries. Instead of responding to breast cancer when it appears, we can catch and treat the cancer before it surfaces.

Early detection and personalized treatments should reach women fast enough to alter outcomes for those already living with the disease, not only future generations or the privileged few. The reality is that there are many hurdles to receiving state-of-the-art care. Data remain fragmented, funding lags innovation, research translation is slow, and access remains deeply uneven. This moment demands medical change at scale. It requires global integration, data sharing, modernized policy, insurance reimbursement, and equitable deployment.

This paper highlights the advances in detection, cancer monitoring, and personalized

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care that are now possible in 2026. It discusses the doctors revolutionizing the field and is a key part of the Pink Eraser Project's advocacy platform for the year ahead.

### *Early Detection*

Early detection is the first step. When the disease is found early, outcomes are dramatically better. Cancers caught while still localized now have five-year survival rates above 99%, compared with about 33% when the disease is first diagnosed at a metastatic stage.<sup>2</sup> Late detection also carries heavy costs, both emotional for patients and families and economic through lost productivity and high medical expenses. Catching cancer early saves lives, protects livelihoods, and strengthens our shared future.

Breast density remains a major challenge for early diagnosis. Cancers are more likely to be missed on standard mammograms in women with dense breast tissue. Many organizations, such as My Density Matters, now focus on educating women about breast density, which has been crucial in helping them seek additional screening, such as magnetic resonance imaging (MRI) scans or contrast-enhanced mammograms (CEM), when appropriate.<sup>3</sup>

Assessing genetic risk from family history is also integral to supporting patients as they determine their own risk and receive regular testing. NHS England is trialing a first-of-its-kind genetic register, monitoring patients for certain genes that place them at higher risk of cancer and regularly screening them. It is a pioneering attempt to increase access to genomic testing that can determine risk and save lives.<sup>4</sup>

Furthermore, new technologies are creating many more ways to detect cancer early and to assess risk, including finding tumors that develop between routine mammograms. Artificial intelligence (AI) software can already review mammograms quickly and accurately, helping radiologists spot cancers and assess risk in images that are difficult to interpret. Scans that may be hiding disease can be flagged for additional screening, leading to earlier diagnosis for more patients. Blood tests, which are already showing promising early results, may also detect even the smallest signs of cancer. By improving accuracy, speed, and ease of use while reducing the chance of human error, these technologies will play a crucial role in saving lives.

AI is not replacing radiologists but improving the accuracy and efficiency of their work.

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A South Korean study recently showed that cancer detection rates for breast cancer increased by 13.8% when a radiologist was supported by AI-based computer-aided detection.<sup>5</sup> A key lab in Sweden, led by Fredrik Strand, has also used AISmartDensity as a detection tool to select which women should be sent for further screening, with the 2024 publication indicating the test was around four times as efficient as traditional methods of using breast density and family history to determine risk.<sup>6</sup> The incremental cancer detection for their top 6.9% of flagged risk was 64.4 per 1000 MRIs, a massive jump from the 16.5 per 1000 MRIs detected in the DENSE trial, Breast Imaging-Reporting and Data System (BI-RADS) D (corresponding to dense breast tissue).

*Nature* published a paper with the results of a U.S.-based study on digital breast tomosynthesis, using an AI workflow for breast cancer screening. There, flagged tests by the software were then reviewed by a radiologist. They already achieved an increase in cancer detection rate (CDR) of between 20.4% and 22.7%, with no disparities between different ethnicities, holding promise for not just improved detection rates, but also more equitable care.<sup>7</sup> However, these findings should be interpreted cautiously. AI systems are built from available datasets and will reflect existing biases in that data. Careful collection and representative data inputs must be prioritized to avoid this. These technologies will continue to improve through further inputs, across hospitals and geographies, and it is imperative to continue to build on these already impressive results.

The Breast Screening—Risk Adapted Imaging for Density (BRAID) trials, led by Fiona Gilbert of the University of Cambridge, found that the two most effective supplementary screening techniques, superior to ultrasound, were CEM and abbreviated magnetic resonance imaging (AB-MRI). CEM found an extra 19.2 breast cancers missed by standard mammograms per 1,000 women, while AB-MRI found an extra 17.4. Ultrasound only found an extra 4.2 cancers.<sup>8</sup>

What does all of this show us? A new normal is emerging and will soon be within reach. In imaging labs, AI can already support radiologists by helping find cancers on mammograms and by flagging scans that need additional tests. We are also learning that AB-MRI scans and CEMs should be treated as essential follow-up tools and part of the standard of care for women who need supplemental screening. Bringing these technologies into everyday screening will allow doctors to assess risk more accurately, so some women can be tested more often and sent for further screening even when their cancer is invisible on a mammogram.

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Multi-cancer early detection (MCED) tests, such as the Galleri test, made by GRAIL, which detect pieces of cancerous DNA in the bloodstream, are another promising frontier of medicine.<sup>9</sup> They particularly hold the hope of improving our ability to detect early-stage cancers from circulating tumor DNA in the blood. These tests could also indicate the character of a tumor and help assess whether it is benign or aggressive. Nevertheless, there remain issues of false positives, as overdiagnosis can be a burden on the healthcare system, alongside the test's low sensitivity for early-stage cancers.<sup>10</sup>

President Donald Trump recently signed H.R. 7148 into law which includes the *Nancy Gardner Sewell Medicare Multi-Cancer Early Detection Screening Coverage Act*.<sup>10</sup> The bipartisan bill will ensure Medicare beneficiaries gain timely access to multi-cancer early detection (MCED) tests once they are approved by the Food and Drug Administration.<sup>12</sup> The test, as medical scholar Siddhartha Mukherjee, MD, D.Phil. argues, requires a long period of implementation to gauge effectiveness, "ultimately, proving not just that we can detect more cancers but that we can prevent more deaths."<sup>13</sup>

Emerging detection technologies are reshaping how early-stage disease can be identified and treated. We cannot allow anyone to fall through the cracks of the system, to face life-altering and deadly metastatic breast cancer. This represents a foundational shift in how breast cancer could be intercepted earlier.

However, detection also means understanding more about the character of early-stage cancer, treating each person with appropriate and considered care. In stark contrast to 50 years ago, when we relied on chemotherapy or mastectomies, we have now reached a period in which we can increasingly characterize and target each person's cancer at the molecular level. Through regular testing and monitoring, and targeted treatments, we are on the doorstep of a revolution in care that preserves, saves, and maintains the quality of life.

### *Personalized Diagnostics, Tumor Monitoring, and Preventing Recurrences*

Personalized care means using the biological and genetic information from a person's tumor, alongside advanced analytics, to guide decisions at every stage: from choosing the right drug combinations, to monitoring for recurrence, and to adapting care as the cancer evolves. This approach turns cancer treatment into a dynamic, tailored process

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rather than a one-size-fits-all protocol. Personalized diagnostic tests and tumor monitoring now help patients and doctors better understand the specific biological makeup of a cancer and inform initial and subsequent approaches to treatment. These tests look for genetic changes and other signals inside cancer cells that can guide therapy. In breast cancer, the most commonly used methods include multi-marker panel testing and staining for protein expression to find biomarkers to target. Although a whole genomic assay can provide valuable information, it remains less common in clinical settings.<sup>14</sup>

The most important factors are access, speed, and cost. Vital diagnostics should not depend on who can pay for this analysis. They are central to effective treatment and saving lives. Testing also needs to be fast, and technologies that can rapidly analyze a tumor from a biopsy or blood sample should be widely available. In 2021, the American Cancer Society surveyed oncologists and found that 71% saw lab turnaround time as a moderate to significant barrier to testing, while out-of-pocket patient costs and insurer coverage stood at 64% and 66% as a moderate to significant barrier, respectively.<sup>15</sup>

It is clear that this can be instrumental in determining the direction of a patient's care. Stanford researchers have shown how genomic archetypes of cancer "contribute to replication stress and immune evasion, and persist throughout tumor evolution, unveiling potential vulnerabilities."<sup>16</sup> Insurance coverage, class, and the quality of a hospital's lab should not determine a patient's outcome, but unfortunately, they do. 18 states have passed biomarker bills to mandate insurance coverage for this testing, and it is imperative that more follow suit.<sup>17</sup>

Ongoing research is uncovering new biological markers that can be targeted by future drugs and therapies, and this progress will accelerate further as these tools are adopted more widely. In laboratories, as Mukherjee highlighted in a recent interview, AI will help drive much of this work by using large data sets to identify new markers that can guide diagnosis, predict outcomes, and shape treatment for each individual tumor. It can also do the work of genetic analysis more quickly and at a lower cost, increasing accessibility to directed, guided treatment.<sup>18</sup>

AI will also strengthen personalized care by supporting doctors with systems that can forecast how a patient is likely to respond to different treatments, using patterns drawn from large sets of genetic data and past clinical results. Studies have published

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evidence of predicted sensitivity to CDK4/6 inhibitor treatment. This can prevent toxicity and optimize outcomes.<sup>19</sup>

It can also be more adaptable and responsive as a tumor mutates and changes, as AI-enhanced precision medicine can study drug resistance and identify treatment options, and even identify new drugs that can overcome resistance. In a recent study published in *Mol Cancer*, the authors' note that "In the near future, AI is expected to predict and combat tumor drug resistance with higher efficiency and precision and become an integral part of every stage of tumor screening strategy, patient management, and prognosis, thus realizing personalized treatment and precision oncology."<sup>20</sup> Alongside all the cost savings of early detection, Morgan Stanley predicts that AI could "generate healthcare savings between \$100 billion and \$600 billion by 2050."<sup>21</sup>

When cancer may not be seen, it remains dormant and present in the body. The work is not over. Although very dependent on tumor size, grade when first treated, and the lymph node burden, one study highlighted that for ER+ breast cancer "between 5 and 20 years after primary diagnosis, the risk of distant recurrence ranged from 13% to 41%."<sup>22</sup> This probability range indicates how little we know about recurrence, which will be discussed in the next paragraph. It is clear that for many women who have had breast cancer, the cancer never leaves their body and remains in dormant tumor cells (DTCs). The best one can hope for is no evidence of disease. That is changing because researchers are now beginning to locate and target DTCs. Angela DeMichele, MD, MSCE, FASCO at the University of Pennsylvania has already indicated the potential of this in her research into DTCs located in the bone marrow.<sup>23</sup> Her research has highlighted that as we find more ways of targeting these dormant cells, the possibility of finding a cure to cancer grows nearer. Her collaborator Lewis A. Chodosh, MD, PhD, articulated the certainty this can give patients in a recent article: "Something that patients are yearning for is some greater degree of certainty. Am I cured, or likely to be cured, or not?"<sup>24</sup>

The United States still does not have a national registry that records recurrence, which can increase our understanding of the disease and support adaptive approaches to care. 10 years ago, Joan Warren, PhD and Robin Yabroff, PhD, MBA called for "design of software for the electronic medical record that enables rapid and standardized reporting of recurrence, use of electronic pathology reports to facilitate streamlined collection of recurrence by cancer registries, and mandates by insurers to require reporting of recurrence on health claims submitted by physicians."<sup>25</sup> This still has not

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been routinely implemented nationally or globally across cancer registries and health systems. In a recent 2024 study led by Eileen Morgan, PhD, two of the four recommendations are “[l]obbying for cancer registries to have a waiver on data protection laws to support data collection of recurrence and other long-term follow-up information through linkage of databases,” and “[a]dditional resource allocation for cancer registries to implement and collect recurrence information as a routine data item.”<sup>26</sup>

METAvisor has also highlighted that the Surveillance, Epidemiology, and End Results (SEER) Cancer Registry, “SEER database systematically undercounts the number of people with metastatic breast cancer (MBC) by failing to collect data on metastatic recurrence, which is when early-stage breast cancer progresses to stage IV because it has spread to other parts of the body. Instead, SEER data only reflects the 6% of people whose first breast cancer diagnosis was Stage IV MBC.”<sup>27</sup> This means that many women who have metastatic breast cancer are not accurately recorded. In Australia, the number of women with MBC doubled when a comprehensive population study was carried out.<sup>28</sup> This undercounting means research is severely underfunded for MBC because the true extent of the disease remains unknown.

While current circulating tumor DNA (ctDNA) tests like the Galleri assay are multi-cancer early detection tools, ongoing research is refining ctDNA approaches specifically for breast cancer recurrence monitoring, where early detection of relapse can change outcomes dramatically. Nick Turner, from the Royal Marsden, is advancing research and care that integrates ctDNA into this spectrum of care.<sup>29</sup> His research has shown the strong correlation between detection of ctDNA in the blood and relapse, and when the presence of ctDNA reaches a certain level, doctors can intervene to prevent recurrence. This provides the foundations for integrating ctDNA into the monitoring of breast cancer patients with no evidence of disease.

Once we have a complete molecular profile, the future of care lies in integrated therapy, combining targeted drugs, immunotherapy, and adaptive treatment plans that attack cancer from multiple angles and evolve with each patient’s disease. Bora Lim, MD, a leading oncologist at MD Anderson whose translational research moves from the lab to care itself, has stated that this should “pursue two complementary goals: preventing metastatic progression before it becomes clinically evident, and helping patients with metastatic disease live long, full, normal lives through precision maintenance strategies.”<sup>30</sup>

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### *Applied Clinical Framework: Dr. Bora Lim's Integrated Model of Detection, Monitoring, and Adaptive Care*

Dr. Lim's research demonstrates how these diagnostic and monitoring technologies can be woven into a comprehensive clinical workflow, one that begins with diagnosis and continues through treatment and beyond. This framework illustrates the future of personalized breast cancer care in practice, not as isolated tests, but as a connected, adaptive system.

At initial diagnosis, particularly for the approximately 6% of patients who present as de novo metastatic, a comprehensive workup now integrates multiple modalities: positron emission tomography (PET), mammography, ultrasound, blood tests, ctDNA analysis, biopsy, pathology, and increasingly single-cell RNA sequencing (scRNA). Together, these tools build a detailed molecular portrait of each cancer—identifying it while it is still early and curable, and providing a baseline against which all future changes can be measured.

For patients entering neoadjuvant therapy (NAT), treatment given before surgery to shrink tumors, ctDNA monitoring as early as three weeks into therapy can identify early responders, offering the first real-time signal of whether the chosen treatment is working at a molecular level. At the three-month mark, imaging with mammography, ultrasound, or MRI provides further confirmation. This approach addresses two critical clinical questions: first, predicting which patients are at risk of recurrence, non-response, or progression, and identifying this early enough to change course during treatment; and second, optimizing therapy selection and predicting treatment outcomes.

Following treatment, the pathway diverges. For patients who achieve a complete response, ctDNA monitoring continues to serve as the earliest indicator of relapse, catching recurrence to Stage IV before it becomes clinically apparent. For patients with a non-complete response, ctDNA status helps stratify ongoing risk: a large proportion of patients may achieve a sustained halt of the disease, while around 45% remain at elevated risk of recurrence and require intensified monitoring and adaptive treatment strategies.

This integrated framework, from comprehensive initial workup through real-time treatment monitoring and post-therapy surveillance, represents the practical

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architecture of personalized cancer care. It turns what has historically been a sequence of disconnected decisions into a continuous, data-driven process in which each test informs the next and every patient's trajectory is individually tracked and managed.

For additional information, please see the following resources:

- *Lim B, Lin Y, Navin N. Advancing Cancer Research and Medicine with Single-Cell Genomics. Cancer Cell. 2020 Apr 13;37(4):456-470. doi: 10.1016/j.ccell.2020.03.008. PMID: 32289270; PMCID: PMC7899145.*
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- *Lee J, Thall PF, Lim B, Msaouel P. Utility-based Bayesian personalized treatment selection for advanced breast cancer. J R Stat Soc Ser C Appl Stat. 2022 Nov;71(5):1605-1622. doi: 10.1111/rssc.12582. Epub 2022 Sep 9. PMID: 36714159; PMCID: PMC9880964.*

For a robust list of Dr. Lim's research, please visit:

<https://scholar.google.com/citations?user=b9oHxFUAAA&hl=en>

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## Conclusion

For the first time in history, we can catch breast cancer before it appears. There is a revolution that allows for personalized early detection and monitoring. Our next step is truly personalized medicine, one in which each patient's care is precisely detected, managed, and treated. These are approaches that every patient deserves to learn about and gain access to. We are committed to removing the obstacles that are preventing this care from reaching all patients.

Nevertheless, the paper also highlights the gaps in care and the further research that is required for late-stage ER+ cancers. Patients have few options once resistance to endocrine therapies develops, but we are beginning to focus on the markers that can overcome this resistance, as mentioned in the earlier AI discussion. A 2023 study argues that “[b]y combining biomarker-driven therapies, with a better understanding of resistance mechanisms, and advanced technology that allows us to monitor tumor evolution non-invasively, we must make progress in using highly effective therapies while sparing most patients from the medical and financial toxicity of overtreatment.”<sup>31</sup>

The Pink Eraser Project exists to erase breast cancer before it becomes visible. It advocates for a transformation in how we detect, understand, and intercept disease at its earliest point using advanced imaging, molecular monitoring, personalized interventions, and AI technologies. We are supporting the research of the doctors making this vision a reality and providing hope to breast cancer patients across the world. Our advocacy, research, education, and fundraising efforts this year are all dedicated to a landscape of cancer care that prioritizes early, targeted action and improves outcomes for all patients.

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We are also grateful to Dr. Bora Lim for her pioneering work in integrating detection, monitoring, and adaptive treatment strategies continues to shape the future of breast cancer care. We are honored to highlight her work and deeply appreciate her commitment to advancing more precise, equitable, and effective care for patients everywhere.

*This Teal Paper was published on March 19, 2026.*

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<sup>2</sup> American Cancer Society, “Cancer Facts & Figures 2026,” Atlanta: American Cancer Society, 2026, <https://www.cancer.org/cancer/types/breast-cancer/understanding-a-breast-cancer-diagnosis/breast-cancer-survival-rates.html>

<sup>3</sup> My Density Matters - <https://mydensitymatters.org/>

<sup>4</sup> NHS England, “Thousands at risk of inherited cancers to receive regular NHS checks through world-first genetics programme,” press release, January 24, 2026, <https://www.england.nhs.uk/2026/01/thousands-at-risk-inherited-cancers-receive-regular-nhs-checks-genetics-programme/>

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<sup>7</sup> Louis, L.D., Wakelin, E.A., McCabe, M.P. *et al.* Equitable impact of an AI-driven breast cancer screening workflow in real-world US-wide deployment. *Nat. Health* 1, 58–66 (2026). <https://doi.org/10.1038/s44360-025-00001-0>

<sup>8</sup> Gilbert, Fiona J *et al.*, Comparison of supplemental breast cancer imaging techniques—interim results from the BRAID randomised controlled trial, *The Lancet*, Volume 405, Issue 10493, 1935 - 1944, [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(25\)00582-3/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(25)00582-3/fulltext)

<sup>9</sup> GRAIL, “GRAIL PATHFINDER 2 Results Show Galleri® Multi-Cancer Early Detection Blood Test Increased Cancer Detection More Than Seven-Fold When Added to USPSTF A and B Recommended Screenings,” press release, October 17, 2025, <https://grail.com/press-releases/grail-pathfinder-2-results-show-galleri-multi-cancer-early-detection-blood-test-increased-cancer-detection-more-than-seven-fold-when-added-to-uspstf-a-and-b-recommended-screenings>

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