OPEN ACCESS Freely available online

Journal of Hepatology and Gastrointestinal disorders

Commentary

Recent Advances in Hepatocellular Carcinoma Surveillance and Early Detection

Emily Thompson*

Department of Gastroenterology and Hepatology, Johns Hopkins University School of Medicine, Baltimore, MD, USA

DESCRIPTION

HepatoCellular Carcinoma (HCC) remains one of the leading causes of cancer-related mortality worldwide and despite major improvements in liver disease management, its incidence continues to rise, particularly in high-income countries. The increase is largely driven by the rising prevalence of Metabolic Dysfunction-Associated Steatosis Liver Disease (MASLD), formerly known as NAFLD, along with aging populations and lifestyle-related comorbidities. Early detection remains the cornerstone of effective HCC management, as curative treatments such as resection, transplantation, or ablation are largely dependent on diagnosis at an early stage. However, traditional surveillance tools have shown limitations in sensitivity, prompting an urgent need for more reliable, accessible and precise strategies.

Standard surveillance protocols typically recommend biannual abdominal ultrasound with or without Alpha-FetoProtein (AFP) testing in at-risk populations, especially individuals with cirrhosis or chronic hepatitis B. Yet, this approach is hampered by the limited sensitivity of ultrasound, which often fails to detect small or early-stage tumours particularly in patients with obesity, nodular livers, or advanced fibrosis. AFP, though widely used, lacks adequate specificity and can yield both false positives and false negatives. As a result, a significant proportion of HCC cases continue to be diagnosed at intermediate or advanced stages, where treatment options are more limited and prognosis is poor.

To address these gaps, recent innovations have emerged in imaging technologies, biomarker discovery and risk stratification models. Among the most promising developments is the growing use of abbreviated MRI (aMRI), which provides high-resolution imaging in a shorter time frame and at reduced cost compared to full MRI protocols. Studies have shown that aMRI can achieve detection sensitivity upwards of 85% for early HCC, outperforming traditional ultrasound in many patient populations. Similarly, Contrast-Enhanced Ultrasound (CEUS) is gaining clinical use due to its ability to visualize tumour vascularity and differentiate malignant from benign nodules more effectively.

Artificial Intelligence (AI) applications in radiology are further transforming the surveillance landscape. Machine learning algorithms trained on large imaging datasets are now capable of flagging subtle hepatic lesions that may be overlooked by human interpretation. These tools are especially valuable in high-income settings where access to sophisticated imaging infrastructure and computational power allows seamless integration into clinical workflows.

Beyond imaging, biomarker research has also seen meaningful advances. The GALAD score, which combines gender, age, AFP, AFP-L3 and Des-Gamma-Carboxy Prothrombin (DCP), has demonstrated improved diagnostic accuracy compared to AFP alone, with Area Under the Curve (AUC) values exceeding 0.85 in several validation studies. Additionally, novel biomarkers derived from circulating tumor DNA (ctDNA), microRNAs and exosomal content are being actively explored. These liquid biopsy techniques are non-invasive and hold the potential not only for early detection but also for monitoring disease recurrence after treatment. While still under evaluation for routine clinical use, they represent a promising frontier in personalized oncology.

Risk stratification tools are also evolving. Models like PAGE-B, aMAP and REACH-B help clinicians better identify patients at highest risk for HCC and tailor surveillance accordingly. This is particularly useful in settings where resource optimization is necessary, even within high-income countries. The integration of Electronic Health Records (EHR) with AI-based risk calculators further enables dynamic, real-time monitoring and individualized surveillance strategies. These tools can help avoid both over-surveillance in low-risk individuals and under-surveillance in high-risk groups.

Despite these promising advances, challenges remain. Cost-effectiveness, implementation across diverse clinical environments and validation in multi-ethnic populations are essential considerations before widespread adoption. Moreover, healthcare systems must be equipped to handle the increased complexity of surveillance data and the potential for over diagnosis or overtreatment in certain scenarios.

Correspondence to: Emily Thompson, Department of Gastroenterology and Hepatology, Johns Hopkins University School of Medicine, Baltimore, MD, USA, E-mail: emily.thompson@jhmi.edu

Received: 02-Mar -2025, Manuscript No. JHGD-25-38255; **Editor assigned:** 04-Mar-2025, PreQC No. JHGD-25-38255 (PQ); **Reviewed:** 18-Mar-2025, QC No. JHGD-25-38255; **Revised:** 25-Mar-2025, Manuscript No. JHGD-25-38255 (R); **Published:** 03-Apr-2025, DOI: 10.35248/2475-3181.25.11.346

Citation: Thompson E (2025). Recent Advances in Hepatocellular Carcinoma Surveillance and Early Detection. J Hepatol Gastroint Dis.11:346.

CONCLUSION

The field of HCC surveillance is undergoing a critical transformation. Advances in imaging, biomarker panels and risk assessment models are reshaping how we detect hepatocellular carcinoma at its earliest and most treatable stages. High-income countries, with their access to advanced technology and robust healthcare infrastructures, are well-positioned to lead the integration of these tools into standard practice. Moving forward, a multidisciplinary and data-driven approach will be essential to translating these innovations into improved patient outcofmes and reduced cancer mortality.