Supplementary Table S1

Illustrative appraisal of five representative prediction studies against TRIPOD+AI and PROBAST+AI signalling domains

This table accompanies the manuscript "Artificial Intelligence in Viral Hepatitis Care: A Narrative Review and a Preliminary Clinical-Readiness Framework (CRAVE-Hep)." It is a focused, illustrative appraisal of five representative prediction studies cited in the main text (Table 3), conducted conceptually against the PROBAST+AI risk-of-bias/applicability signalling domains (Participants, Predictors, Outcome, Analysis, Applicability) and cross-referenced against core TRIPOD+AI reporting expectations. It is not a full systematic risk-of-bias assessment and reflects the authors' jointly discussed qualitative interpretations, not independent duplicate ratings; it is provided for transparency about how the narrative synthesis characterized validation rigour and risk of bias in Sections 3.2–3.5 and 3.8 of the main text, and should not be read as a completed, validated PROBAST+AI or TRIPOD+AI instrument.

Domain ratings (qualitative: Low concern / Some concerns / High concern)

Study	Participants	Predictors	Outcome	Analysis	Applicability
Harabor et al. 2023 [12] — HBV/HCV case-finding	Low concern — prospective primary-care screening cohort, clearly defined	Some concerns — routine clinical/survey variables; predictor definitions not fully harmonized across sites	Low concern — serostatus is objectively defined	Some concerns — internal validation only; class imbalance not clearly addressed	Some concerns — single-country cohort (Romania); generalizability to other settings unverified
Xue et al. 2020 [13] — transfer-learning fibrosis staging	Some concerns — single-centre, predominantly chronic hepatitis B	Low concern — imaging inputs clearly specified	Low concern — histology-based fibrosis stage	High concern — internal random split of imaging data; leakage risk not excluded	High concern — single setting; no external or multi-aetiology validation
Yang et al. 2025 [14] — liver–spleen 2D-SWE framework	Some concerns — modest sample (n=198), single centre	Low concern — elastography inputs well specified	Low concern — histology/clinical reference standard	High concern — internal validation only; wide performance range across subtasks (AUC 0.57–1.00) suggests instability	High concern — small, single-centre sample; best-case AUCs likely optimistic
Park et al. 2022 [16] — DAA failure prediction registry	Low concern — large, well-characterized HCV-TARGET registry	Low concern — clinical/laboratory predictors clearly defined	Low concern — treatment failure objectively defined	Some concerns — single-registry train/validation split; no external or temporal validation	Some concerns — registry population may not represent all treatment settings; clinical need for this prediction has also declined
Nishwa et al. 2026 [18] — SVR prediction, comorbid HCV (Pakistan)	Some concerns — single real-world comorbid cohort (n=221)	Low concern — clinical predictors specified	Low concern — SVR is an objective outcome	High concern — cross-validation plus SMOTE class-balancing; no external validation; calibration not reported	Some concerns — single-centre, single-country; feasibility in high-burden settings is itself the main contribution

Ratings are qualitative and illustrative, following the PROBAST+AI signalling-domain logic (Participants, Predictors, Outcome, Analysis, Applicability); they are not a completed, validated PROBAST+AI assessment. 2D-SWE, two-dimensional shear-wave elastography; AUC, area under the curve; DAA, direct-acting antiviral; HBV/HCV, hepatitis B/C virus; SMOTE, synthetic minority oversampling technique; SVR, sustained virological response. Both authors contributed equally to preparation and discussion of this illustrative synthesis; differences of interpretation were resolved through discussion and review of relevant evidence and scientific reporting guidance. The four additional reports [34-37] are summarized in Table 3 of the main manuscript but were not assigned new appraisal ratings in S1.

How this appraisal informed the narrative synthesis

The recurring "Analysis" and "Applicability" concerns identified here — internal-only validation, unaddressed leakage risk from random splitting of correlated data, and single-centre/single-country samples — directly informed the cautions expressed in Sections 3.2 (fibrosis staging), 3.4 (treatment-response prediction), and 3.8 (calibration, decision-curve analysis, and data leakage) of the main text, and motivated Dimension D1 (Validation rigour) and D3 (Data representativeness and bias) of the CRAVE-Hep framework (Table 5 of the main text).

Supplementary Table S2

Database-specific strategies and revision-stage repeat-search record

This supplement accompanies "Artificial Intelligence in Viral Hepatitis Care: A Narrative Review and a Preliminary Clinical-Readiness Framework (CRAVE-Hep)." Initial searching preceded peer review and used an intended publication window of 1 January 2018 to 31 January 2026. Following the reviewers' request, Scopus and Web of Science searches were repeated on 2 September 2026. Supplementary PubMed, Europe PMC, and Google Scholar searches were also executed on 2 September 2026. Source-specific publication filters are shown below. This is a purposive narrative review, not a systematic review.

Provenance and timing. The authors reported that Scopus and Web of Science were searched again during revision on 2 September 2026, returning 4,458 and 3,200 records, respectively. These figures describe the repeat searches, not historical yields from the initial search. The Scopus/Web of Science date and counts derive from the authors' clarification; PubMed/Europe PMC counts derive from recorded database responses, and the Scholar inspection is documented by its query/result log. Overlapping retrieval totals are not summed or converted into deduplicated, screened, or included-study counts.

S2A. Source-specific retrieval counts and available search strategies

Source	Query / scope and documentation	Filters and implementation	Retrieval information and provenance
Scopus	TITLE-ABS-KEY (("artificial intelligence" OR "machine learning" OR "deep learning" OR "neural network" OR radiomics OR "large language model") AND ("hepatitis B" OR "hepatitis C" OR "viral hepatitis" OR "liver fibrosis" OR cirrhosis OR "hepatocellular carcinoma")) AND PUBYEAR > 2017 AND PUBYEAR < 2027	English; Article (DOCTYPE="ar") as interface filters. PUBYEAR specifies calendar years 2018-2026. Repeat-search execution: 2 September 2026. The year clause is not a day-level publication cutoff.	4,458 records. Repeat-search execution date: 2 September 2026, following the reviewers' request for revision. Date and count reported by the authors. Retrieval total, not an included-study count.
Web of Science (Core Collection)	TS=(("artificial intelligence" OR "machine learning" OR "deep learning" OR "neural network" OR radiomics OR "large language model") AND ("hepatitis B" OR "hepatitis C" OR "viral hepatitis" OR "liver fibrosis" OR cirrhosis OR "hepatocellular carcinoma")) AND PY=(2018-2026)	English; Article (DT=Article) as interface filters. PY specifies calendar years 2018-2026. Repeat-search execution: 2 September 2026. The year clause is not a day-level publication cutoff.	3,200 records. Repeat-search execution date: 2 September 2026, following the reviewers' request for revision. Date and count reported by the authors. Retrieval total, not an included-study count.

Source	Query / scope and documentation	Filters and implementation	Retrieval information and provenance
PubMed/MEDLINE	("artificial intelligence"[tiab] OR "machine learning"[tiab] OR "deep learning"[tiab] OR "neural network"[tiab] OR radiomics[tiab] OR "large language model*"[tiab]) AND ("hepatitis B"[tiab] OR "hepatitis C"[tiab] OR "viral hepatitis"[tiab] OR "liver fibrosis"[tiab] OR cirrhosis[tiab] OR "hepatocellular carcinoma"[tiab]) AND ("2018/01/01"[dp] : "2026/01/31"[dp]) AND English[lang] AND journal article[pt]	NCBI ESearch; title/abstract terms; publication-date filter; English; journal article. All filters are in the query.	3,686 records; 3,686 identifiers downloaded. Current retrieval count, not an exhaustive screening count.
Europe PMC	TITLE_ABS:("artificial intelligence" OR "machine learning" OR "deep learning" OR "neural network" OR radiomics OR "large language model" OR "large language models") AND TITLE_ABS:("hepatitis B" OR "hepatitis C" OR "viral hepatitis" OR "liver fibrosis" OR cirrhosis OR "hepatocellular carcinoma") AND FIRST_PDATE:[2018-01-01 TO 2026-01-31] AND LANG:eng AND PUB_TYPE:"journal article"	Europe PMC REST API; TITLE_ABS; FIRST_PDATE; LANG:eng; journal article; synonym expansion off. Four pages of up to 1,000 records.	3,269 records downloaded: 3,255 MED, 13 AGR, 1 PMC source records. Current retrieval count before any cross-source deduplication.
Google Scholar	Six queries listed in S2B; first 10 results for each inspected by displayed relevance rank.	Years 2018-2026; relevance order; patents and citation-only entries excluded; English interface, not an English-only search filter.	60 entries inspected; 58 distinct linked records after removing two repeated URLs. Displayed estimates are not exact record counts.

Publication-date and document-type qualification. The Scopus PUBYEAR and Web of Science PY clauses specify calendar years 2018-2026; they do not encode a day-level cutoff. English and Article restrictions are reported as interface filters. The PubMed publication-date and Europe PMC first-publication-date clauses explicitly end on 31 January 2026; these are also different date fields, and Europe PMC may impute partial dates. Consequently, the database totals are not counts from identical publication intervals. Google Scholar used a year-level range. First-publication dates of newly retained reports were checked individually (34: 4 January 2019; 35: 5 May 2018; 36: 22 January 2022; 37: 7 March 2024). Unselected Scholar records were not all date-validated. Article-only filters do not explain every cited review or guideline; reference-list and targeted selection also contributed. Indexing alone does not certify eligibility.

S2B. Google Scholar query-level record

ID	Exact query	Displayed approximate total	Entries inspected
GS1	"machine learning" "hepatitis C"	19,300 (approximate)	10; ranks 1-10
GS2	"artificial intelligence" "viral hepatitis"	12,800 (approximate)	10; ranks 1-10
GS3	"deep learning" "liver fibrosis"	9,170 (approximate)	10; ranks 1-10
GS4	"machine learning" "hepatocellular carcinoma"	30,300 (approximate)	10; ranks 1-10
GS5	"large language model" hepatitis	3,540 (approximate)	10; ranks 1-10
GS6	radiomics hepatitis	9,880 (approximate)	10; ranks 1-10

Scholar estimates varied even when a filter was changed and are not treated as stable exportable totals. The six estimates must not be added: queries overlap. The 60-entry inspection is a deliberately bounded supplementary check, not screening of all Scholar results or a comprehensive search of the topic.

Selection and reference provenance

The revised manuscript cites 37 sources: 29 originally cited (1-17, 19-30), four added in the earlier revision (18, 31-33), and four added from this supplementary inspection (34-37). The four new reports were prioritized to strengthen underrepresented clinical examples: a large longitudinal HCV cohort (34), prospective multicentre fibrosis evidence (35), a large viral-hepatitis HCC-risk cohort (36), and a liver-specific evaluated RAG system (37). Their added factual claims were checked against primary abstract records, and full-text methods where accessible. They were not assigned new full-text systematic risk-of-bias ratings. S1 remains a five-study illustration, not an appraisal of all 37 sources.

Of 58 distinct Scholar records, four were selected as new citations and two corresponded to existing citations (7 and 15); 52 were not retained in this bounded supplementary selection. "Not prioritized" below is a narrative-selection decision, not a judgment that a study is invalid or ineligible. The log records first-pass AI-assisted relevance review and is not a substitute for final author checking. Reference 18 remains a separately disclosed post-cutoff targeted update; it was not selected through the new date-limited searches.

S2C. Inspected Google Scholar result entries

Query-rank	Displayed title (truncation retained where present)	Disposition
GS1-1	Treatment response prediction in hepatitis C patients using machine learning techniques	Not prioritized for addition in this bounded narrative supplement.
GS1-2	Machine learning models to predict disease progression among veterans with hepatitis C virus	Selected: new Reference 34; large longitudinal clinical cohort.
GS1-3	Performance comparison of machine learning approaches on hepatitis C prediction employing data mining techniques	Not prioritized for addition in this bounded narrative supplement.
GS1-4	Hepatitis C virus data analysis and prediction using machine learning	Not prioritized for addition in this bounded narrative supplement.
GS1-5	Hepatitis C prediction using machine learning and deep learning-based hybrid approach with biomarker and clinical data	Not prioritized for addition in this bounded narrative supplement.
GS1-6	Diagnosing the stage of hepatitis C using machine learning	Not prioritized for addition in this bounded narrative supplement.
GS1-7	Comparison of machine learning classification methods in hepatitis C virus	Not prioritized for addition in this bounded narrative supplement.
GS1-8	Machine learning techniques to predictive in healthcare: hepatitis C diagnosis	Not prioritized for addition in this bounded narrative supplement.
GS1-9	Predicting infectious state of hepatitis c virus affected patient's applying machine learning methods	Not prioritized for addition in this bounded narrative supplement.
GS1-10	Machine learning model for hepatitis C diagnosis customized to each patient	Not prioritized for addition in this bounded narrative supplement.

Query-rank	Displayed title (truncation retained where present)	Disposition
GS2-1	Harnessing the potential of artificial intelligence in managing viral hepatitis	Not prioritized for addition in this bounded narrative supplement.
GS2-2	An explainable artificial intelligence framework for the deterioration risk prediction of hepatitis patients	Not prioritized for addition in this bounded narrative supplement.
GS2-3	Opportunities and challenges for the application of artificial intelligence paradigms into the management of endemic viral infections: The example of chronic hepatitis …	Not prioritized for addition in this bounded narrative supplement.
GS2-4	Machine learning for prediction of viral hepatitis: A systematic review and meta-analysis	Not prioritized for addition in this bounded narrative supplement.
GS2-5	Artificial intelligence for hepatitis evaluation	Not prioritized for addition in this bounded narrative supplement.
GS2-6	Artificial intelligence for mechanistic understanding of hepatitis B virus	Not prioritized for addition in this bounded narrative supplement.
GS2-7	Harnessing artificial intelligence and machine learning for accelerating drug repurposing in hepatitis B virus therapy	Not prioritized for addition in this bounded narrative supplement.
GS2-8	Artificial Intelligence Transforming Hepatitis Diagnosis, Treatment, and its Research Frontiers	Not prioritized for addition in this bounded narrative supplement.
GS2-9	A new tool for the diagnosis and management of viral hepatitis: artificial intelligence	Already cited: Reference 7.
GS2-10	Resource management through artificial intelligence in screening programs—key for the successful elimination of hepatitis C	Not prioritized for addition in this bounded narrative supplement.
GS3-1	Deep learning Radiomics of shear wave elastography significantly improved diagnostic performance for assessing liver fibrosis in chronic hepatitis B: a prospective …	Selected: new Reference 35; prospective multicentre fibrosis evidence.
GS3-2	Deep learning for staging liver fibrosis on CT: a pilot study	Not prioritized for addition in this bounded narrative supplement.
GS3-3	Deep learning for noninvasive liver fibrosis classification: A systematic review	Not prioritized for addition in this bounded narrative supplement.
GS3-4	Development and validation of a deep learning system for staging liver fibrosis by using contrast agent–enhanced CT images in the liver	Not prioritized for addition in this bounded narrative supplement.
GS3-5	Deep learning enables automated scoring of liver fibrosis stages	Already cited: Reference 15.
GS3-6	Deep learning with ultrasonography: automated classification of liver fibrosis using a deep convolutional neural network	Not prioritized for addition in this bounded narrative supplement.

Query-rank	Displayed title (truncation retained where present)	Disposition
GS3-7	A Deep Learning Model Based on High-Frequency Ultrasound Images for Classification of Different Stages of Liver Fibrosis	Not prioritized for addition in this bounded narrative supplement.
GS3-8	Fully automated prediction of liver fibrosis using deep learning analysis of gadoxetic acid–enhanced MRI	Not prioritized for addition in this bounded narrative supplement.
GS3-9	Liver fibrosis staging by deep learning: a visual-based explanation of diagnostic decisions of the model	Not prioritized for addition in this bounded narrative supplement.
GS3-10	Liver fibrosis stage classification in stacked microvascular images based on deep learning	Not prioritized for addition in this bounded narrative supplement.
GS4-1	Feature reduction for hepatocellular carcinoma prediction using machine learning algorithms	Not prioritized for addition in this bounded narrative supplement.
GS4-2	A novel machine learning approach for early detection of hepatocellular carcinoma patients	Not prioritized for addition in this bounded narrative supplement.
GS4-3	Early diagnosis of hepatocellular carcinoma using machine learning method	Not prioritized for addition in this bounded narrative supplement.
GS4-4	Using machine learning to predict response to image-guided therapies for hepatocellular carcinoma	Not prioritized for addition in this bounded narrative supplement.
GS4-5	A machine learning model to predict hepatocellular carcinoma response to transcatheter arterial chemoembolization	Not prioritized for addition in this bounded narrative supplement.
GS4-6	Machine-learning approach for the development of a novel predictive model for the diagnosis of hepatocellular carcinoma	Not prioritized for addition in this bounded narrative supplement.
GS4-7	A Liver Stiffness–Based Etiology-Independent Machine Learning Algorithm to Predict Hepatocellular Carcinoma	Not prioritized for addition in this bounded narrative supplement.
GS4-8	Personalized surveillance for hepatocellular carcinoma in cirrhosis–using machine learning adapted to HCV status	Not prioritized for addition in this bounded narrative supplement.
GS4-9	Machine learning prediction models for diagnosing hepatocellular carcinoma with HCV-related chronic liver disease	Not prioritized for addition in this bounded narrative supplement.
GS4-10	Novel machine learning models outperform risk scores in predicting hepatocellular carcinoma in patients with chronic viral hepatitis	Selected: new Reference 36; large clinical HCC-risk cohort.
GS5-1	Development of a liver disease-specific large language model chat interface using retrieval augmented generation	Selected: new Reference 37; evaluated liver-specific RAG prototype.

Query-rank	Displayed title (truncation retained where present)	Disposition
GS5-2	Large language models for clinical decision support in gastroenterology and hepatology	Not prioritized for addition in this bounded narrative supplement.
GS5-3	The impact of access to clinical guidelines on LLM-based treatment recommendations for chronic hepatitis B	Not prioritized for addition in this bounded narrative supplement.
GS5-4	Exploring the performance of large language models on hepatitis B infection-related questions: A comparative study	Not prioritized for addition in this bounded narrative supplement.
GS5-5	Assessing ChatGPT as a medical consultation assistant for chronic hepatitis B: cross-language study of English and Chinese	Not prioritized for addition in this bounded narrative supplement.
GS5-6	Large Language Model Agent-Based Framework for automated Treatment Prescription in Patients with Chronic Hepatitis C Virus Infection	Not prioritized for addition in this bounded narrative supplement.
GS5-7	Large language models in hepatology: A systematic review	Not prioritized for addition in this bounded narrative supplement.
GS5-8	Evaluating large language models' performance in answering common questions on drug-induced liver injury	Not prioritized for addition in this bounded narrative supplement.
GS5-9	Codesigning a Nurse-Led, Large Language Model-Empowered Agent to Increase Hepatitis B Screening and Vaccination for Inclusion Health Populations: A …	Not prioritized for addition in this bounded narrative supplement.
GS5-10	Large Language Models for Diagnosis and Prognosis of Chronic Liver Diseases: A Systematic Review	Not prioritized for addition in this bounded narrative supplement.
GS6-1	Deep learning Radiomics of shear wave elastography significantly improved diagnostic performance for assessing liver fibrosis in chronic hepatitis B: a prospective …	Duplicate linked record: GS3-1.
GS6-2	Artificial intelligence for hepatitis evaluation	Duplicate linked record: GS2-5.
GS6-3	A radiomics nomogram for preoperative prediction of microvascular invasion risk in hepatitis B virus-related hepatocellular carcinoma	Not prioritized for addition in this bounded narrative supplement.
GS6-4	Deep learning radiomics model accurately predicts hepatocellular carcinoma occurrence in chronic hepatitis B patients: a five-year follow-up	Not prioritized for addition in this bounded narrative supplement.
GS6-5	MRI-based machine-learning radiomics of the liver to predict liver-related events in hepatitis B virus-associated fibrosis	Not prioritized for addition in this bounded narrative supplement.
GS6-6	Systematic review: radiomics for the diagnosis and prognosis of hepatocellular carcinoma	Not prioritized for addition in this bounded narrative supplement.
GS6-7	A radiomics model of liver CT to predict risk of hepatic encephalopathy secondary to hepatitis B related cirrhosis	Not prioritized for addition in this bounded narrative supplement.

Query-rank	Displayed title (truncation retained where present)	Disposition
GS6-8	Radiomics machine-learning signature for diagnosis of hepatocellular carcinoma in cirrhotic patients with indeterminate liver nodules	Not prioritized for addition in this bounded narrative supplement.
GS6-9	Radiomics nomograms based on R2* mapping and clinical biomarkers for staging of liver fibrosis in patients with chronic hepatitis B: a single-center retrospective …	Not prioritized for addition in this bounded narrative supplement.
GS6-10	Evaluating microvascular invasion in hepatitis B virus-related hepatocellular carcinoma based on contrast-enhanced computed tomography radiomics and …	Not prioritized for addition in this bounded narrative supplement.

Technical references: Europe PMC REST service and search help (https://europepmc.org/RestfulWebService; https://europepmc.org/help); Google Scholar search help (https://scholar.google.com/intl/us/scholar/help.html). Raw API responses and browser-visible query/result records were preserved with execution timestamps during revision.