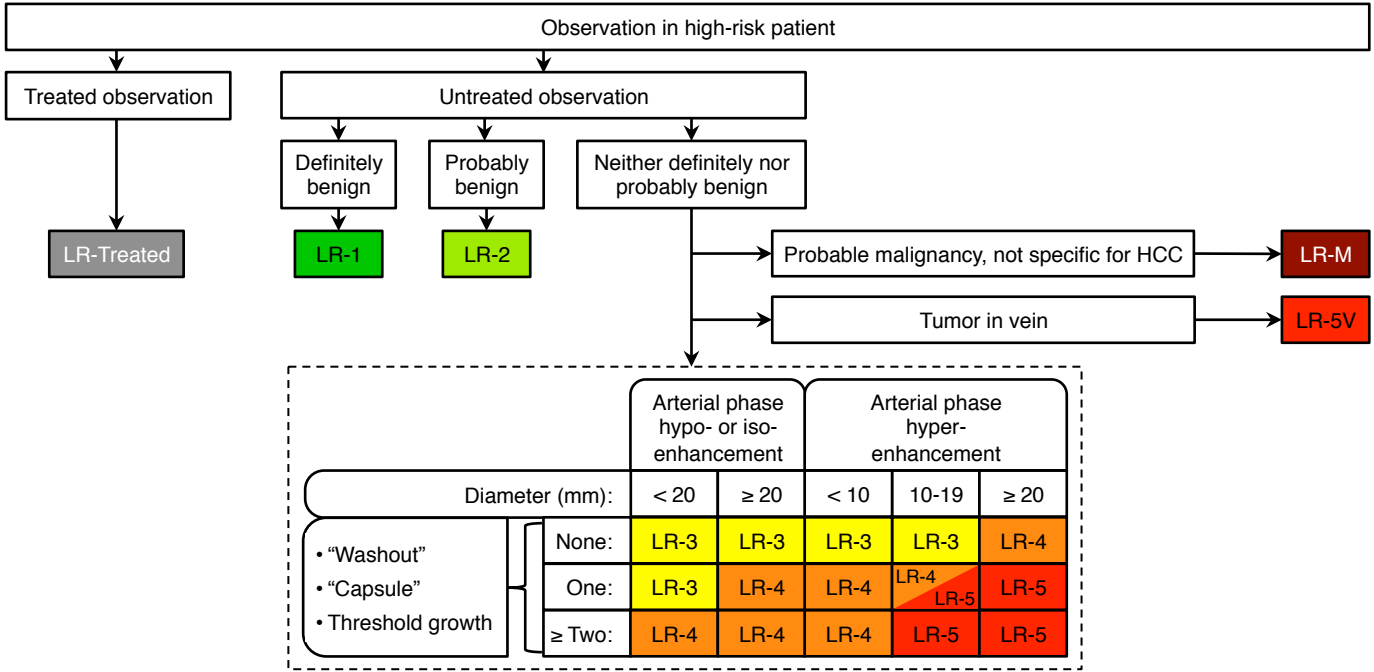
ALGORITHM



Apply ancillary features and then tie-breaking rules to adjust category

LR-4 / LR-5

Observations in this cell are categorized LR-4 except as follows:

- *LR-5g, if there is ≥ 50% diameter increase in ≤ 6 months. These observations are equivalent to OPTN 5A-g.*
- *LR-5us, if there is both "washout" and visibility as discrete nodules at antecedent surveillance ultrasound, per AASLD HCC criteria.*

TABLE

		Arterial phase hypo- or iso-enhancement		Arterial phase hyper-enhancement		
Diameter (mm):		< 20	≥ 20	< 10	10-19	≥ 20
•"Washout" •"Capsule" •Threshold growth	None:	LR-3	LR-3	LR-3	LR-3	LR-4
	One:	LR-3	LR-4	LR-4	LR-4 / LR-5	LR-5
	≥ Two:	LR-4	LR-4	LR-4	LR-5	LR-5

LR-4 / LR-5

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CATEGORIES

LR-1 **Definitely Benign**	**Concept:** 100% certainty observation is benign. **Definition:** Observation with imaging features diagnostic of a benign entity, or definite disappearance at follow up in absence of treatment.
LR-2 **Probably Benign**	**Concept:** High probability observation is benign. **Definition:** Observation with imaging features suggestive but not diagnostic of a benign entity.
LR-3 **Intermediate probability for HCC**	**Concept:** Both HCC and benign entity have moderate probability. **Definition:** Observation that does not meet criteria for other LI-RADS categories.
LR-4 **Probably HCC**	**Concept:** High probability observation is HCC but there is not 100% certainty. **Definition:** Observation with imaging features suggestive but not diagnostic of HCC.
LR-5 **Definitely HCC**	**Concept:** 100% certainty observation is HCC. **Definition:** Observation with imaging features diagnostic of HCC or proven to be HCC at histology.
LR-5V **Definitely HCC with Tumor in Vein**	**Concept:** 100% certainty that observation is HCC invading vein. **Definition:** Observation with imaging features diagnostic of HCC invading vein.
LR-M **Probably Malignant, not specific for HCC**	**Concept:** Observation is probably malignant, but imaging features are not specific for HCC. **Definition:** Observation with imaging features suggestive of non-HCC malignancy.
LR-Treated **Treated Observation**	**Concept:** A loco-regionally treated observation. **Definition:** Observation of any category that has undergone loco-regional treatment.

Benign and Probably Benign Entities

Definite benign entities (examples)

- Cyst
- Hemangioma
- Vascular anomaly
- Perfusion alteration
- Hepatic fat deposition or sparing
- Hypertrophic pseudomass
- Confluent fibrosis
- Focal scar
- Observation that spontaneously disappears

Probable benign entities (examples)

Probable

- Cyst
- Hemangioma
- Vascular anomaly
- Perfusion alteration
- Hepatic fat deposition or sparing
- Hypertrophic pseudomass
- Confluent fibrosis
- Focal scar
- LR-2 cirrhosis-associated nodule*

**LR-2 cirrhosis-associated nodule*

- *Diameter < 20mm AND*
- *Homogeneous AND*
- *Iso-enhancement to background cirrhotic nodules in all phases AND*
- *Differ from background nodules (≥ 1 of following):*
  - *Distinctly larger than background nodules (but still < 20mm)*
  - *Mild to moderate CT hyper-attenuation*
  - *Mild to moderate T1 hyper-intensity*
  - *Mild T2 or T2* hypo-intensity*
  - *Moderate or marked T2 or T2* hypo-intensity*

HCC vs. Non-HCC

The following imaging features, if present, help in differential diagnosis of HCC vs. Non-HCC Malignancy (e.g., ICC)

Features that favor HCC

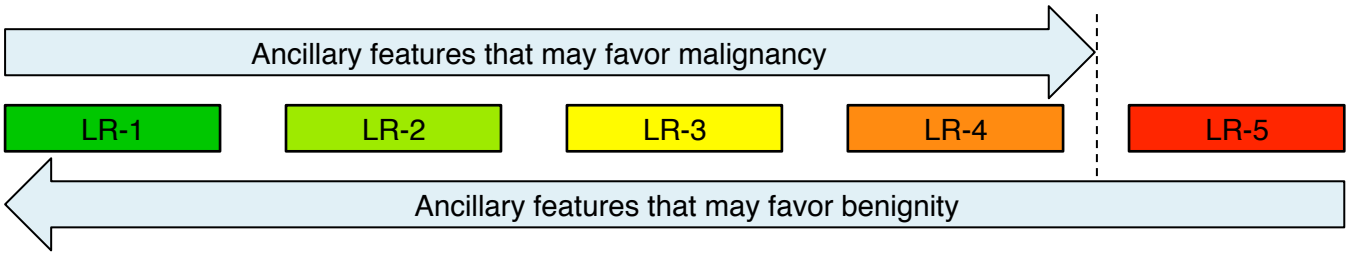
- Diffuse arterial-phase hyper-enhancement
- Diffuse washout appearance
- Capsule appearance
- Distinctive rim
- Intra-lesional fat
- Nodule-in-nodule architecture
- Diffuse T1 hyper-intensity
- Diffuse hepatobiliary phase hyper-intensity

Features that favor non-HCC malignancy (e.g., ICC)

- Rim or peripheral arterial-phase hyper-enhancement
- Peripheral washout appearance
- Progressive central enhancement
- Portal venous and delayed phase central enhancement
- Target appearance at DWI or in hepatobiliary phase
- Liver surface retraction
- Biliary dilation

Ancillary features that may favor malignancy may be applied to upgrade category by one or more categories (up to but not beyond LR-4). They cannot be used to upgrade category to LR-5. Absence of these features should not be used to downgrade the LR category.

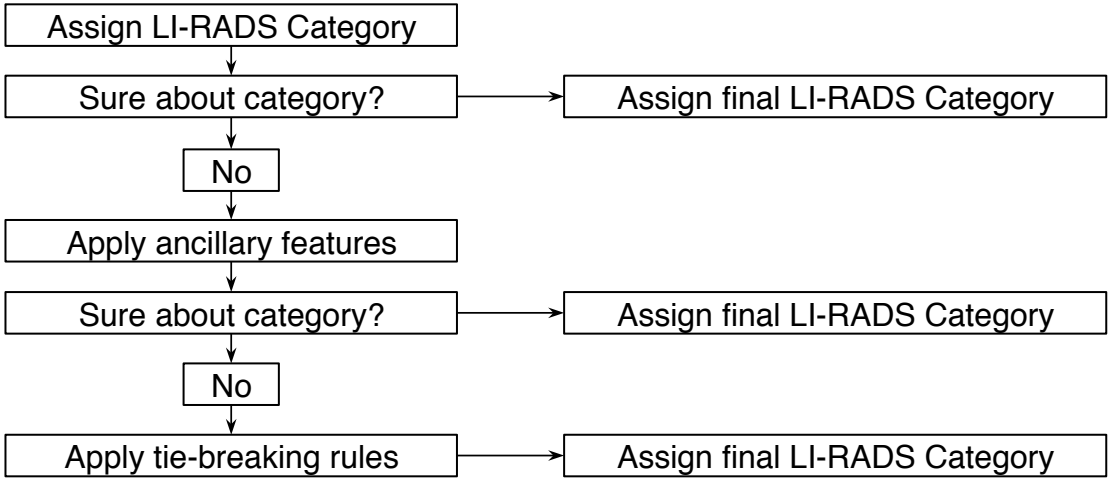
- Mild-moderate T2 hyper-intensity
- Restricted diffusion
- Corona enhancement
- Mosaic architecture
- Nodule-in-nodule architecture
- Intra-lesional fat
- Lesional iron sparing
- Lesional fat sparing
- Blood products
- Diameter increase less than threshold growth
- Distinctive rim
- Hepatobiliary phase hypo-intense rim
- Hepatobiliary phase hypo-intensity



Ancillary features that may favor benignity may be applied to downgrade category by one or more categories. Absence of these features should not be used to upgrade the LR category.

- Undistorted vessels
- Homogeneous marked T2 hyper- or hypo-intensity
- Parallels blood pool enhancement
- Diameter reduction
- Diameter stability ≥ 2 years
- Hepatobiliary phase iso-intensity

Adjusting Category



Tie-Breaking Rules

Tie-breaking rules: If, after application of ancillary features, a radiologist is still unsure about the final category for an observation, tie-breaking rules should be applied. The tie-breaking rules move observations to a category with a lower degree of certainty.