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### Recommended Citation

Yeung, Ho-Man () "Inpatient versus Outpatient MRI? Outcomes for Hospitalized patients with New Liver Masses," *Journal of Community Hospital Internal Medicine Perspectives*: Vol. 15: Iss. 1, Article 2.

DOI: 10.55729/2000-9666.1435

Available at: <https://scholarlycommons.gbmc.org/jchimp/vol15/iss1/2>

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# Inpatient Versus Outpatient MRI? Outcomes for Hospitalized Patients With New Liver Masses

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## Abstract

No guidelines exist to guide hospitalists on whether inpatient MRI should be pursued for incidental liver masses. Here, we compare outcomes between patients who receive an inpatient MRI and those who did not, following detection of suspicious liver masses during hospitalization. A retrospective study of hospitalized patients with new HCC from Jan 1st, 2020 through Dec 31st, 2021 was conducted. Patients for hospice or with known HCC were excluded. Out of 34 unique subjects, 22 received MRI inpatient (IP) and 12 did not (non-IP). Time to inpatient MRI averaged 2.2 days. Inpatient LOS between the two groups were similar (6 v 7 days). IP group had lower lost-to-follow-up rates (4% v 42%). Median time to cancer treatment was similar (31 v 34 days), however IP group had higher treatment rate (68% v 42%). Obtaining inpatient MRI may benefit select high-risk patients, with increased follow-up rate and treatment rate for HCC.

**Keywords:** Hepatocellular carcinoma, Incidental liver mass, Cirrhosis, MRI

## 1. Introduction

Incidental liver lesions are typically discovered during acute hospitalizations or in emergency settings. In 2017, the American College of Radiology Incidental Findings Committee published an algorithm for management of incidental liver masses based on clinical risk factors and radiographic appearances.<sup>1</sup> A triple-phase MRI study of the abdomen is frequently used when evaluating high risk liver masses. However, barriers exist for patients due to difficulty coordinating and timely schedule. For patients suspicious of hepatocellular carcinoma (HCC), early detection is essential as treatment options become limited in advanced stages. To date, there are no specific guidelines for inpatient physicians on whether an MRI should be pursued in an inpatient or outpatient setting. Here, we compare clinical outcomes between patients who receive an inpatient (IP) MRI and those who did not receive an inpatient MRI (non-IP), following detection of suspicious liver mass during hospitalization.

## 2. Methods

To determine the utilization and outcomes between patients who received inpatient MRI versus

those who did not, we designed a single-centered, retrospective study of hospitalized patients at Temple University Hospital over a two-year period, from January 1st, 2020 through December 31st, 2021. Patients were included if they have newly diagnosed HCC (ICD 10 code C22.0) and excluded by manual review if HCC is known from prior encounters or if the patient has alternative diagnoses. All patients had suspicious features on CT imaging and recommended for MRI of the liver by radiologists. Patients designated for hospice during hospitalization were excluded, as outpatient work up would be forgone. The outcome of interests included metastatic rate on initial presentation, LOS, mortality rates, time from discharged to treatment, time from admission to inpatient MRI, and overall follow up rate. Descriptive statistics were used in this study.

## 3. Results

A total of 34 unique subjects remained after review, with 22 receiving MRI as inpatient (IP) and 12 who did not receive an inpatient MRI (non-IP). Subjects were 80% male, 86% Black or Hispanic, 70% with new or known cirrhosis, 38% with chronic hepatitis C, 41% with current or past alcohol use disorder, 38% type 2 diabetes mellitus (Table 1). Of

Received 21 August 2024; revised 22 October 2024; accepted 30 October 2024.

Available online 6 January 2025

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<https://doi.org/10.55729/2000-9666.1435>

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Table 1. Patient demographics.

N = 34	
Male (%)	27 (80%)
Age, median	64
Race	
White	5 (15%)
Black	18 (54%)
Hispanic	11 (32%)
Medical history	
Chronic hepatitis B	1 (3%)
Chronic hepatitis C	13 (38%)
Alcohol use disorder	14 (41%)
Type 2 diabetes mellitus	13 (38%)
Cirrhosis	24 (70%)
Metastatic status	12 (35%)
Inpatient consult to hepatology	24 (70%)
Discharge appointment request	23 (67%)

the 24 patients with cirrhosis, only 16 (67%) received IP MRI. 12 (35%) of the patients had metastatic disease upon presentation. None of 34 patients met Milan criteria, therefore not candidates for transplantation, and only 1 patient was treated with curative intent. Two patients were later transitioned to hospice by their oncologists after treatment failure. As described in Table 2, time from admission to inpatient MRI averaged 2.2 days, 86% of IP MRI were completed within the first 3 days of hospitalization. Only 7 of 12 (58%) patients in the non-IP group obtained follow-up MRI after discharge. The IP group were ordered hepatology appointment request upon discharge more often compared to non-IP group (82% v 44%). IP group had fewer patients lost to follow up (4% v 42%). Inpatient LOS between the two groups were similar (6 days v 7 days). Overall, survival beyond 1 year was poor, with only 11 (50%) patients in the IP group and 5 (42%) in non-IP group (however, the same 5 patients were also lost to follow up). 72% of all deaths

occurred within 90 days after discharge. Median time from discharge to any cancer treatment is similar between the two groups (31 days v 34 days), however more patients in the IP group received cancer treatment after discharge (68% v 42%). HCC treatment included nivolumab (n = 7), atezolizumab/bevacizumab (n = 4), transarterial chemoembolization (n = 5), local radiation (n = 5), and microwave ablation (n = 2).

#### 4. Discussion

HCC has high mortality rates and overall poor clinical outcome. Despite consensus on management of liver masses, there is no guidance on whether inpatient versus outpatient MRI should be pursued in hospitalized patients. Based on our preliminary finding, patients who received IP MRI exhibited higher rates of cancer treatment, fewer lost to follow up, and higher discharge appointment request. Surprisingly, IP MRI did not overall increase inpatient LOS. Obtaining an inpatient MRI prior to discharge may benefit select patients, particularly in at-risk patients with medical complexity, resulting in increased follow up rate and cancer treatment rate for HCC. Similar reports of decompensated cirrhosis patients suggested difficulty with follow-up due to medical acuity competing with risk of readmission and mortality.<sup>2,3</sup>

This report has several limitations: 1) This is a single institution experience within a safety-net hospital composed of a relatively small sample size, which reduces the generalizability to other institutions. 2) Despite manual review and exclusion, the retrospective design inherently comes with weaknesses compared to a prospective design. For example, it may be possible that some confounding factors were not captured. Propensity score matching with a large sample size would alleviate that limitation. 3) The result of this study does not imply the case-by-case judgment of physicians. For example, a physician's assurance of whether the patient can obtain an outpatient MRI or their severity of disease (e.g. MELD score) may skew our result. 4) Lastly, although patients in the non-IP group were found to have lower hepatology referral rates and higher lost-to-follow-up rates, it is unknown if some patients experienced common outpatient issues related to MRI availability, insurance coverage, or claustrophobia. Despite these limitations, this study addresses an important gap in the literature and contributes to the discussion of HCC management and need for inpatient MRI. Further research on this topic is necessary.

Table 2. Patient outcomes for IP vs non-IP MRI.

	All	IP MRI	Non-IP MRI
N=	34	22	12
Average time to MRI		2.2 days	
Lost to follow up	6 (18%)	1 (4%)	5 (42%)
Median LOS	6 days	6 days	7 days
Total death	18 (52%)	11 (50%)	7 (58%)
In-hospital death	4 (22%)	2 (17%)	2 (28%)
Death <90d post discharge	9 (50%)	6 (54%)	3 (43%)
Death 90-365d post discharge	5 (28%)	3 (27%)	2 (28%)
Received treatment	20 (58%)	15 (68%)	5 (42%)
Median time to Tx	33.5 days	31 days	34 days
Survival >1 year	16 (47%)	11 (50%)	5 (42%), also lost to follow up

## Funding

Publication of this article was funded in part by the Temple University Libraries Open Access Publishing Fund.

## Conflict of interest

The author declared no conflict of interest.

## Acknowledgements

The author has no acknowledgements.

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