Child–Pugh Versus MELD Score for the Assessment of Prognosis in Liver Cirrhosis
A Systematic Review and Meta-Analysis of Observational Studies

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Abstract: Child–Pugh and MELD scores have been widely used for the assessment of prognosis in liver cirrhosis. A systematic review and meta-analysis aimed to compare the discriminative ability of Child–Pugh versus MELD score to assess the prognosis of cirrhotic patients. PubMed and EMBASE databases were searched. The statistical results were summarized from every individual study. The summary results under receiver operating characteristic curves, sensitivities, specificities, positive and negative likelihood ratios, and diagnostic odds ratios were also calculated. Of the 1095 papers initially identified, 119 were eligible for the systematic review. Study population was heterogeneous among studies. They included 269 comparisons, of which 44 favored MELD score, 16 favored Child–Pugh score, 99 did not find any significant difference between them, and 110 did not report the statistical significance. Forty-two papers were further included in the meta-analysis. In patients with acute-on-chronic liver failure, Child–Pugh score had a higher sensitivity and a lower specificity than MELD score. In patients admitted to ICU, MELD score had a smaller negative likelihood ratio and a higher specificity than Child–Pugh score. In patients undergoing surgery, Child–Pugh score had a higher specificity than MELD score. In other subgroup analyses, Child–Pugh and MELD scores had statistically similar discriminative abilities or could not be compared due to the presence of significant diagnostic threshold effects.

Although Child–Pugh and MELD scores had similar prognostic values in most of cases, their benefits might be heterogeneous in some specific conditions. The indications for Child–Pugh and MELD scores should be further identified.

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INTRODUCTION

Liver cirrhosis has a high morbidity and mortality, which is the 14th most common cause of death all over the world and the 4th in central Europe. It leads to 1.03 million deaths per year in the world,1 and 170,000 deaths per year in Europe.2 The prevalence of liver cirrhosis may be underestimated, because patients at the early phase of liver cirrhosis are often asymptomatic, and most of patients with liver cirrhosis are admitted due to its related complications. The 1-year mortality of liver cirrhosis varies greatly from 1% to 57% according to the complications.3 It is necessary to use the prognostic models to identify high-risk patients.

Child–Pugh score was firstly proposed by Child and Turcotte to predict the operative risk in patients undergoing portosystemic shunt surgery for variceal bleeding. The primary version of Child–Pugh score included ascites, hepatic encephalopathy (HE), nutritional status, total bilirubin, and albumin. Pugh et al4 modified the Child–Pugh classification by adding prothrombin time or international normalized ratio (INR) and removing nutritional status. Child–Pugh score has been widely used to assess the severity of liver dysfunction in clinical work.

Model for end-stage liver disease (MELD) score was initially created to predict the survival of patients undergoing transjugular intrahepatic portosystemic shunts (TIPS).5 The primary version of MELD score included the etiology of liver cirrhosis, but this variable was unnecessary.6 The present version of MELD score incorporated only 3 objective variables, including total bilirubin, creatinine, and INR. Currently, it has been used to rank the priority of liver transplantation (LT) candidates.

Child–Pugh and MELD scores have been widely used to predict the outcomes of cirrhotic patients. However, they have some drawbacks. First, 2 variables (i.e., ascites and HE) included in Child–Pugh score are subjective and may be variable according to the physicians’ judgment and the use of diuretics and lactulose. Second, INR, which is one component of both Child-Pugh and MELD scores, does not sufficiently reflect coagulopathy and consequently liver function in
Liver cirrhosis. Three, there is an interlaboratory variation in INR value.6

Until now, a large number of studies compared their discriminative abilities. But the results remained controversial. Some studies favored the Child–Pugh score, but the others were on the opposite side. The aim of this systematic review and meta-analysis was to compare the discriminative ability of Child–Pugh versus MELD score for the assessment of prognosis in cirrhotic patients.

METHODS

This work is registered on PROSPERO database (registration number: CRD42015019700). Because this work is a systematic review of literatures, the ethical approval and patient consent are not necessary.

Study Search and Selection

We searched the PubMed and EMBASE databases. The search terms were as follows: (“Child score” or “Child–Pugh score” or “Child–Turcotte–Pugh score”) and (“MELD score” or “model for end stage liver disease score”) and (“liver cirrhosis”). The last search was performed on April 20, 2015.

The inclusion criteria were as follows: patients had been definitely diagnosed as liver cirrhosis; both Child–Pugh and MELD scores were calculated; areas under receiver operating characteristic curve of Child–Pugh versus MELD scores were compared; and sensitivity, specificity, and number of patients with endpoint events were reported. We excluded the following papers: duplicated papers; case reports; reviews; letters; commentaries; corrections; and papers unrelated to comparison of Child–Pugh and MELD scores. We did not restrict the publication years or study design.

Data Extraction

We extracted the following data: First author, study design, regions of study, the number of patients and the number of patients analyzed, age, sex, study population, etiology of cirrhosis, proportion of hepatocellular carcinoma (HCC), endpoints, cut-off value, true positive value, false positive value, false negative value, and true negative value.

Quality Assessment

Quality Assessment of Diagnostic Accuracy Studies (QUADAS) 2, a revised version of QUADAS, was used for the quality assessment.2 We obtained the detailed information of the QUADAS 2 tool from the website (www.quadas.org). There are 4 key aspects incorporated: patient selection, index test, reference standard, and flow and timing. In the former 3 aspects, the risk of bias and applicability should be evaluated. In the last one, only the risk of bias should be evaluated. The risk of bias is judged as “low,” “high,” or “unclear.” If all the answers are “yes,” it should be judged as “low” risk. If any answer is “unclear,” it should be judged as “unclear” risk. If all answers are “no,” it should be judged as “high” risk. Similarly, the applicability is classified as “low concern,” “high concern,” or “unclear concern.” If the relevant information was not given, it would be classified as “unclear concern.”

Meta-Analysis

The true positive, false positive, false negative, and true negative values were extracted and entered into the Meta-DiSc software version 1.4. If the diagnostic threshold effect was not statistically significant (P > 0.05 in the Spearman correlation test), the diagnostic accuracy would be further evaluated by a random-effects model. The summary areas under receiver operating characteristic curves (AUSROCs) with standard errors (SEs) and Q indexes with SEs, summary sensitivities, specificities, PLRs, NLRs, or DORs. The heterogeneity among studies was evaluated by Chi-square test and inconsistency index. P < 0.1 and/or I² > 50% was suggestive of considerable heterogeneity.

RESULTS

Paper Selection

Overall, 1095 papers were identified via the 2 databases. According to the eligibility criteria, 119 papers were eligible for the systematic review (Figure 1).10–128

Description of Study Characteristics

The characteristics of the 119 papers were shown in Table 1. The countries included Austria (n = 1),11 Belgium (n = 2),40,52 China (n = 26),8,16,20,21,27,30,31,33,35,59,60,66,74,84,102,109,112,117,118 Cuba (n = 1),47 Czech Republic (n = 1),44 Egypt (n = 1),51 France (n = 6),55,37,41,71,77,124 Germany (n = 7),12,48,50,92,105,111 Greece (n = 1),82 Hungary (n = 1),51 India (n = 10),19,29,39,40,67,75,76,86,98,115 Iran (n = 1),57 Italy (n = 5),22,24,43,69 Ivory Coast (n = 1),13 Japan (n = 2),57,106 Mexico (n = 1),45 Nepal (n = 1),28 Pakistan (n = 2),62,97 Poland (n = 1),88 Portugal (n = 3),23,26,63 Serbia (n = 1),19 Singapore (n = 2),72,73 South Korea (n = 17),10,15,16,32,33,35,63,66,68–70,83,99,100,103 Spain (n = 7),14,58,89,90,94,95,116 Tunisia (n = 1),73 Tur- key (n = 3),80,107,108 UK (n = 3),34,42,110 and USA (n = 11),17,35,52,79,81,85,93,101,104,118,122 The total number of patients analyzed in the included studies was 29,414. The number of patients varied from 17 to 2271.

The characteristics of study population were heterogeneous among studies. According to the clinical presentations, etiology of liver diseases, patients’ conditions, and treatment options, they were mainly classified as follows: patients presenting with acute gastrointestinal bleeding (n = 12),10,14,15,26,45,57,69,81,88,89,94,107 patients presenting with ascites (n = 2),65,96 patients presenting with HE (n = 10),19,50,58,86,110,125 patients presenting with infection, sepsis, or spontaneous bacterial peritonitis (n = 5),30,62,72,73,116 patients admitted to intensive care unit (ICU) (n = 10),34,37,42,71,78,80,107,108,110,112 patients with trauma (n = 2),35,93 patients with viral hepatitis-related liver cirrhosis alone (n = 3),27,56,79 patients with alcohol-related liver cirrhosis alone (n = 5),19,61,70,75,120 patients undergoing TIPS (n = 8),11,31,44,91,92,101,113,123 patients undergoing LT (n = 10),23,38,41,48,67,87,88,105,115,122 patients undergoing abdominal, cardiac, or other surgery/procedure (n = 13),12,17,32,36,52,63,85,99,102,104,111,114,125 and unselected patients with liver cirrhosis (n = 43),13,15,16,20–22,24,25,28,29,33,39,43,46,47,49,51–53,55,59,60,64,66,68,74,76,77,82,83,90,95,97,98,100,103,106,118,121,124,126,127 in 57 studies, the information regarding the number of
patients with HCC was lacking; 12,13,17,19,23,28,30,32,34,35,37,39,40, 42–44,48,52,57,58,60,62,63,65,67,70,71,73,75–77,79–81,83,85,87,88,91–93,99, 100,104,105,110–116,120,121,125,126 and in 20 studies, 1.9% to 52.8% of included patients were diagnosed with HCC. 

**Description of Statistical Results**

Their statistical results were summarized in Table 2. There were 269 comparisons between MELD and Child–Pugh scores. Among 60 comparisons, a statistically significant difference ($P < 0.05$) was observed. In details, the superiority of MELD score over Child–Pugh score was observed in 44 comparisons; and the superiority of Child–Pugh score over MELD score was observed in 16 comparisons. Among 99 comparisons, no statistically significant difference ($P \geq 0.05$) was observed. Among 110 comparisons, the statistical significance was not reported.

**Study Quality**

The brief explanation of study quality was presented in Table 3. As for the risk of bias, 48 and 71 studies had low and unclear risks in the term of patient selection, respectively; 119 studies had low risks in the term of index tests; 117 and 2 studies had low and unclear risks in the term of reference standard, respectively; 91 and 28 studies had low and unclear risks in the term of flow and timing, respectively. As for the applicability concerns, 94 and 25 studies had low and high concerns in the term of patient selection, respectively; 2, 1, and 116 studies had low, unclear, and high concerns in the term of index test, respectively; and 1 study had the endpoint unrelated to prognosis. Finally, 42 papers were included (Figure 1). 12,14–16, 20–23,26–31,33–39,41,43–47,49–51,53–55,57–60,63,64,66,68–73,75,78,79,81– 83,85,86,88–90,92,93,95,96,99–101,103,105,106,113,114,118,120–124,126,128 because 76 studies were lacking of relevant data and 1 study had the endpoint unrelated to the prognosis. 12,14–16, 20–23,26–31,33–39,41,43–47,49–51,53–55,57–60,63,64,66,68–73,75,78,79,81– 83,85,86,88–90,92,93,95,96,99–101,103,105,106,113,114,118,120–124,126,128

**Meta-Analysis**

As for the meta-analysis, 77 papers were excluded because 76 studies were lacking of relevant data and 1 study had the endpoint unrelated to the prognosis. Finally, 42 papers were included (Figure 1).
| First Author, year – Study Design | Regions | No. Total Pts/No. Pts Analyzed | Age, year | Male, % | Study Population | Etiology of Cirrhosis | HCC, % |
|---------------------------------|---------|-------------------------------|----------|----------|------------------|----------------------|-------|
| An (2014) – R                   | South Korea | 17/14 | Median: 62 (56–65.5) | 64.7% | Recurrent HE after embolization | HBV (52.9%) HCV (11.8%) Alcohol (29.4%) Others (5.9%) | 17.0% |
| Angermayr (2003) – R            | Austria | 475/475 | Mean ± SD: 56 ± 10.6 | NA | Elective TIPS | Virus (14.3%) Alcohol (67.4%) Cholestatic (1.1%) Others (5.9%) Missing data (12%) | 0.0% |
| Arif (2012) – R                 | Germany | 109/109 | Mean ± SD: women: 64.6 ± 10.8 men: 64.0 ± 10.6 | 75.2% | Patients who undergo heart surgery with cardiopulmonary bypass | Alcohol (55.0%) Cryptogenic (25.7%) Cardiac (6.4%) Viral (5.5%) PBC (2.8%) Other origin (4.6%) | NA |
| Attia (2008) – R                | Ivory Coast | 172/172 | Mean ± SD: 47.5 ± 13 | 69.8% | Black African patients with cirrhosis | HBV (45.3%) HCV (10%) Alcohol + HBV/HCV (23.8%) Unknown (20.9%) | NA |
| Augustin (2009) – P             | Spain | 164/164 | Median: 59 (48–70) | 68.0% | AVB | Alcohol (33%) Virus (48%) | 13.0% |
| Bae (2007) – R                  | South Korea | 71/71 | Mean ± SD: 56 ± 10 | 85.9% | First episode of VB | Alcohol (43.7%) Cryptogenic (5.6%) | 0.0% |
| Bang (2014) – P                 | South Korea | 1002/1002 | NA | NA | Patients with CLD who undergo HVPG measurement | Alcohol (40.5%) HBV (39.4%) HCV (8.8%) Others (11.3%) | 6.2% |
| Befeler (2005) – R              | USA | 53/53 | Mean: 52.6 (26–79) | 62.0% | Patients who undergo abdominal surgery | HVB/HCV (47%) Cryptogenic (19%) Alcohol (19) NASH (7%) PSC PBC (6%) BCS (2%) | NA |
| Benedeto-Stojanov (2009) – R    | Serbia | 100/100 | Mean: 57 (32–79) | 76.0% | Patients with complications of liver disease | HBV (7%) HCV (4%) Alcohol (88%) AHI (1%) | 0.0% |
| Blise (2007) – R                | India | 79/79 | Median: 42 (23–65) | 100.0% | Alcoholic cirrhotic patients | Alcohol (100%) | NA |
| Bie (2007) – R                  | China | 181/181 | Mean: 61 (23–76) | 77.9% | Decompensated liver cirrhosis | HBV (81%) HCV (4%) Alcohol (10%) PBC + Others (5.5%) | 0.0% |
| Bie (2009) – P                  | China | 160/160 | Mean ± SD: 52 ± 13 | 81.2% | Liver cirrhosis | HBV (80%) HCV (7%) Alcohol (7.5%) HBV + Alcohol (1.2%) HBV + HCV (1.2%) | 0.0% |
| Biselli (2015) – P              | Italy | 227/227 | Median: 56 (19–69) | 65.0% | MELD score <18 from Modena and Padua Centers (Training group) | HBV (8.3%) HCV (43%) Alcohol (24.9%) Viral + Alcohol (5.4%) Cryptogenic (5.4%) Others (6.9%) | 0.0% |
| Boim Ide (2008) – R             | Portugal | 232/232 | Mean ± SD: 46.4 ± 10.3 | 73.3% | Adult patients who undergo LT | HBV (11.6%) HCV (46.5%) HBV + HCV (1.6%) HBV + HDV (4.7%) HBV + HCV + HDV (0.8%) Alcohol (21.7%) HCV + Alcohol (7.0%) AHI (6.2%) | 0.0% |
| Botta (2003) – R                | Italy | 129/129 | Median: 50 (22–75) | 73.6% | Liver cirrhosis | HCV (51.1%) | NA |
| Bourlier (2009) – P             | France | 308/308 | Mean ± SD: 59.0 ± 10.9 | 64.0% | Liver cirrhosis | HBV (81.8%) Viral (11.4%) Others (6.8%) | 0.0% |
| Cerqueira (2012) – R            | Portugal | 102/102 | Mean ± SD: 55.4 ± 12.6 | 71.6% | First episode of oesophageal VB | DHCA (75.5%) Other (24.5%) | 0.0% |
| Chan (2006) – R                 | China | 506/480 | Mean ± SD: 54 ± 15 | 82.0% | Chronic hepatitis B-related complications | HBV (100%) | 28.0% |
| Chaurasia (2013) – P            | Nepal | 216/216 | Mean ± SD: 51.31 ± 11.5 | 65.30% | Decompensated cirrhosis | Alcohol (96.3%) HBV (2.3%) HCV (1.4%) | NA |
| First Author, year – Study Design | Regions | No. Total Pts/No. Pts Analyzed | Age, year | Male, % | Study Population | Etiology of Cirrhosis | HCC, % |
|----------------------------------|---------|------------------------------|----------|---------|------------------|----------------------|-------|
| Chawla (2011) – P                | India   | 102/102                      | Mean: 47.8 (45.5 – 50.1) | 87.3%   | Liver cirrhosis  | Alcohol (44.1%) HBV (13.7%) HCV (17.6%) BCS (2.9%) Cryptogenic (21.6%) | 0.0%  |
| Chen (2011) – R                  | China Taiwan | 81/81                         | Mean ± SD: 60 ± 12.8 | 67.9%   | SBE              | Alcohol (16.0%) HBV (42.0%) HCV (34.6%) Other + Unknown (7.4%) | NA    |
| Chen (2013) – R                  | China    | 124/124                      | Median: 46 (21–88) | 64.5%   | Patients with SPH who treated with TIPS | Alcohol (4.8%) HBV (79.8%) Other (9.7%) Unknown (5.7%) | 0.0%  |
| Cho (2011) – R                   | South Korea | 490/490                      | Median: 60 (18–86) | 65.1%   | Patients who undergo nonhepatic surgery under general anesthesia | HBV (65.7%) HCV (13.7%) Alcohol (5.9%) Cryptogenic (12.5%) Others (2.2%) | NA    |
| Choi (2009) – R                  | South Korea | 128/128                      | Mean ± SD: 54.2 ± 11.2 | 71.9%   | Liver cirrhosis  | HBV (65.7%) HCV (13.7%) Alcohol (5.9%) Cryptogenic (12.5%) | 0.0%  |
| Cholon gitas (2008) – R          | UK       | 128/128                      | Mean ± SD: 49 ± 11   | 60.0%   | Patients who were first admitted to ICU | Alcohol (63%) HBV/HCV (16.5%) Other (20.5%) | NA    |
| Cornelle (2011) – R              | USA      | 163/163                      | Mean ± SD: 51 ± 11.9 | 80.0%   | Trauma patients with liver dysfunction or cirrhosis | NA | NA |
| Costa (2009) – R                 | Portugal | 190/190                      | Mean ± SD: 61.4 ± 12 | 81.0%   | Surgery | Alcohol (87%) Viral (6%) Other (7%) | 18.0% |
| Das (2010) – R                   | France   | 138/138                      | NA                  | 68.0%   | ICU patients | Alcohol (78%) HBV/HCV (16%) | NA    |
| Degre (2004) – R                 | Belgium  | 131/131                      | NA                  | 82.4%   | Patients who undergo first LT | Alcohol (38.9%) Other (61.1%) | 19.1% |
| Dhiman (2014) – P                | India    | 50/50                        | Mean ± SD: 46 ± 13  | 86.0%   | Cirrhosis with AD | Alcohol (58%) HCV + Alcohol (10%) AHI (6%) HBV (6%) Wilson (6%) Cryptogenic (14%) Alcohol (72%) Alcohol + HBV/HCV (6%) HBV (5%) HCV (5%) AHI (4%) NASH/Cryptogenic (8%) | NA    |
| Dussia (2013) – P                | India    | 100/100                      | Median: 49 (38–55.7) | 87.0%   | ACLF            | Alcohol (40.2%) HBV (3.2%) HCV (6.3%) HCC (25.9%) Other (24.5%) | 25.9% |
| Ecochard (2011) – R              | France   | 560/560                      | Mean: 51.3 (20.2 – 70.9) | 70.7%   | LT              | Alcohol (80%) Nonalcoholic (20%) | NA    |
| Emerson (2014) – P               | UK       | 59/59                        | Mean ± SD: 51 ± 12  | 68.0%   | ICU patients | Viral (46.5%) Alcohol (24.8%) Other (28.7%) | NA    |
| Fede (2011) – R                  | Italy    | 101/101                      | Mean ± SD: 59.0 ± 1.9 | 59.4%   | Patients without infections or hemodynamic instability | Viral (15%) Alcohol (60%) PBC/PSC (2%) Cryptogenic (14%) BCS (7%) AHI (2%) | NA    |
| Fejfar (2006) – R                 | Czech Republic | 110/110                  | Mean: 55          | NA      | Patients who underwent TIPS for refractory ascites | Alcohol (73%) HBV/HCV (7%) AHI (3%) Other (17%) | 0.0%  |
| Flores-Rendon (2008) – R         | Mexico   | 212/212                      | Mean ± SD: 53 ± 12  | 68.0%   | Acute EVB       | HBV (10.3%) HCV (47.6%) Alcohol (24.1%) Alcohol + HBV/HCV (7.6%) Cryptogenic (4.1%) PBC (2.8%) AHI (1.4%) Others (2.1%) | 0.0%  |
| Giannini (2004) – P              | Italy    | 145/145                      | Median: 60 (51–69) | 73.0%   | Liver cirrhosis | HBV (12%) HCV (53%) Alcohol (17%) Alcohol + Viral infection (9%) Viral co-infection (HBV/HCV) (1%) Unknown (7%) NAFL (1%) | 0.0%  |
| Gomez (2009) – P                 | Cuba     | 172/170                      | Median: 56 (20–79) | 62.0%   | Liver cirrhosis | Alcohol (29.5%) Viral (28%) Other (20.2%) Malignancy (14.5%) Cholestatic (7.8%) | NA    |
| Gotthardt (2009) – R             | Germany  | 268/168                      | Mean: 50.5 (16–68) | 63.1%   | Listed for single-organ LTx for nonfulminant liver disease | Alcohol (29.5%) Viral (28%) Other (20.2%) Malignancy (14.5%) Cholestatic (7.8%) | NA    |
| First Author, year – Study Design | Regions | No. Total Pts/No. Pts Analyzed | Age, year | Male, % | Study Population | Etiology of Cirrhosis | HCC, % |
|----------------------------------|---------|-------------------------------|-----------|---------|-----------------|----------------------|-------|
| Gotzberger (2012) – P            | Germany | 44/44                          | Mean ± SD: Alive: 57 ± 10 Death: 62 ± 9 | 68.2%   | Liver cirrhosis | Alcohol abuse (65.9%) | 0.0%  |
| Grunhage (2008) – P              | Germany | 92/92                          | Median: 55 (19 – 76) | 66.0%   | Liver cirrhosis | HCV (22.7%) Wilson’s disease (2.3%) AIH (2.3%) PBC (2.3%) | 0.0%  |
| Hassan (2013) – R                | Egypt   | 1000/1000                      | Mean ± SD: 54.8 ± 8 | 68.0%   | Liver cirrhosis | Alcohol (59.8%) HBV (6.5%) HCV (8.7%) Wilson’s (4.3%) Alphal-antitrypsin deficiency (2.2%) PBC (1.1%) PSC (1.1%) | 18.0% |
| Hoteit (2008) – R                | USA     | 195/57                         | Mean ± SD: 57.1 ± 11.2 | 59.5%   | Surgery         | AIH (4.3%)                 | NA    |
| Huo (2005) – P                   | China Taiwan | 472/472                     | Mean ± SD: 65 ± 12 | 78.0%   | Liver cirrhosis (CTP > 7) | HBV (73%) Non-HBV (27%) | 0.0%  |
| Huo (2006) – P                   | China Taiwan | 436/436                     | Mean ± SD: 66 ± 12 | 77.0%   | Liver cirrhosis (CTP > 7) | HBV (72%) Non-HBV (28%) | 0.0%  |
| Huo (2005) – P/R                 | China Taiwan | 351                         | Mean ± SD: 67 ± 11 | 76.0%   | Liver cirrhosis (CTP > 7) | HBV (69%) HCV (13%) Alcohol (6%) HBV + HCV (5%) Cryptogenic (4%) Others (3%) | 0.0%  |
| Hyun (2012) – R                  | South Korea | 86/83                        | Mean ± SD: 54 ± 11 | 63.0%   | HBV-related decompensated cirrhotic patients (CTP > 7) who received antiviral therapy | HBV (100%) | 0.0%  |
| Ishizu (2014) – R                | Japan   | 148/148                        | NA         | NA      | Patients with AVB who were treated by endoscopic variceal ligation | NA | NA   |
| Jalal (2014) – P                 | Spain   | 275/275                        | Mean ± SD: 54.5 ± 12.1 | 64.0%   | ACLF: Derivation set | Alcohol (54.7%) HCV (14.9%) | NA |
| Jiang (2009) – R                 | China   | 188/188                        | Mean ± SD: Survival group: 61.56 ± 11.35 Death group: 62.68 ± 12.56 | 76.0%   | ACLF: External validation | Alcohol + HCV (10.8%) | NA   |
| Jiang (2013) – R                 | China   | 39/39                          | Mean ± SD: 45.6 ± 3.6 | 76.9%   | Liver cirrhosis | Alcohol + HCV (6.2%) | 0.0%  |
| Kalabay (2007) – P               | Hungary | 93/89                          | Mean ± SD: 54 ± 13 | 55.9%   | Alcoholic liver disease | Viral (88.39%) Alcohol (5.31%) PBC + Other (6.3%) | 0.0%  |
| Khan (2009) – R                  | Pakistan | 530/530                      | Mean ± SD: 53 ± 13 | 59.0%   | Infection (at admission or acquiring in hospital) | NA | NA   |
| Kim (2014) – R                   | South Korea | 79/79                        | Median: 59 (20 – 84) | 79.7%   | Patients who undergo elective extrahepatic surgery under general anesthesia | HBV (45.6%) HCV (11.4%) Alcohol (34.2%) Non-HBV/HCV (8.9%) | 0.0%  |
| Kim (2007) – R                   | South Korea | 355/355                      | Mean: 55.9 (21 – 92) | 74.9%   | Liver cirrhosis | HBV (40.0%) HCV (5.6%) Alcohol (49.9%) Unknown (4.5%) | 0.0%  |
| First Author, year | Study Design | No. Total Pts/No. Pts Analyzed | Age, year | Male, % | Study Population | Etiology of Cirrhosis | HCC, % |
|-------------------|--------------|-------------------------------|-----------|--------|------------------|-----------------------|-------|
| Kim (2014) – P    | South Korea  | 65/65                         | Mean ± SD: 55 ± 9.2 | 63.1%  | Cirrhotic patients with ascites | Viral hepatitis (26.1%) Alcohol (56.9%) Virus + Alcohol (9.3%) Others (7.7%) | NA |
| Koo (2013) – R    | South Korea  | 882/882                       | Mean ± SD: 57.5 ± 10.9 | 75.5%  | Liver cirrhosis | HBV (34.2%) HCV (7.3%) Alcohol (45.4%) AIH (1.5%) PBC (0.7%) PSC (0.3%) NAFLD (0.2%) Wilson’s disease (0.3%) Unknown (2.2%) | 0.0% |
| Krishnan (2013) – R | India        | 216/216                       | NA        | NA     | Single-organ LT for nonfulminant liver disease | NA | NA |
| Kwon (2014) – P   | South Korea  | 295/295                       | Mean ± SD: 53.8 ± 10.7 | 82.8%  | Advanced liver cirrhosis (CTP > 6) | NA | 37.3% |
| Lee (2002) – R    | South Korea  | 93/93                         | Mean ± SD: 55.5 ± 11.4 | 73.5%  | ICU patients | Alcohol (68%) HBV (4%) HCV (14%) Alcohol + Hepatitis (6%) Others (8%) Cryptogenic (43.9%) Alcohol (16.6%) HBV (25.9%) HCV (7.8%) AIH (2.9%) PBC (2.4%) BCS (0.5%) | 18.5% |
| Lee (2015) – R    | South Korea  | 345/345                       | NA        | 85.5%  | Acutely decompensated alcoholic cirrhosis | Alcohol (100%) | NA |
| Levesque (2012) – P | France      | 377/377                       | Mean ± SD: 55.5 ± 11.4 | 73.5%  | ICU patients | Alcohol (50.0%) HBV (27.6%) HCV (6.6%) Metabolic (1.3%) Cryptogenic (14.5%) | 0.0% |
| Lim (2011) – R    | Singapore   | 205/205                       | Mean ± SD: 64.0 ± 13.0 | 51.7%  | Patients admitted for sepsis | Alcohol (9.3%) HBV (61.3%) HCV (15.2%) Others (14.1%) Alcohol (100%) | 0.0% |
| Lim (2009) – R    | Singapore   | 208/208                       | Mean ± SD: 54.3 ± 11.5 | 78.5%  | Liver cirrhosis | Alcohol (9.3%) HBV (61.3%) HCV (15.2%) Others (14.1%) Alcohol (100%) | 0.0% |
| Lv (2009) – R     | China       | 256/256                       | Mean ± SD: 44.2 ± 9.8 | 99.1%  | Alcoholic liver disease | Alcohol (100%) | NA |
| Mallayappan (2013) – R/P | India   | 110 R/110                     | Mean ± SD: 43.8 ± 9.4 | 95.8%  | Alcoholic liver disease | Alcohol (100%) | NA |
| Mishra (2007) – P | India       | 96 P/96                       | Mean ± SD: 46.97 ± 12.96 | 75.0%  | Liver cirrhosis | Alcohol (50.0%) HBV (27.6%) HCV (6.6%) Metabolic (1.3%) Cryptogenic (14.5%) | 0.0% |
| Moreno (2013) – P | France      | 125/125                       | Mean ± SD: 57.9 ± 9.8 | 68.8%  | Liver cirrhosis | Alcohol (84.2%) | NA |
| Mouelhi (2010) – R | Tunisia     | 286/286                       | Mean ± SD: 59 ± 13  | 56.3%  | ICU patients | HCV (100%) | 17.1% |
| Nunes (2010) – P  | USA         | 303/303                       | Mean: 44       | 64.0%  | HCV-related liver disease | Alcohol (11.1%) HBV (35.8%) HCV (18.2%) Cryptogenic (22.2%) | NA |
| Olmez (2012) – P  | Turkey      | 201/201                       | Mean ± SD: 56.8 ± 14.1 | 64.7%  | ICU patients | Alcohol (11.1%) HBV (35.8%) HCV (18.2%) Cryptogenic (22.2%) | NA |
| Orloff (2012) – RCT | USA        | 211 (106EST/105PCS)/211       | NA        | 60.0%  | EVB | HBV (23%) HCV (17%) Alcohol (38%) PBC/PSC (7%) Unknown (15%) | 0.0% |
| Papatheodoridis (2005) – R | Greece | 102/102                      | Median: 61 (27–89) | 68.0%  | Decompensated cirrhosis | HBV (23%) HCV (17%) Alcohol (38%) PBC/PSC (7%) Unknown (15%) | NA |
| Park (2014) – P   | South Korea | 867/867                       | NA        | NA     | Patients with CLD who underwent HVPG measurement | HBV (40.2%) HCV (9.2%) Alcohol (39.7%) NASI (2.3%) Others (8.5%) | NA |
| Peng (2015) – R   | China       | 145/145                       | Mean ± SD: 56.77 ± 11.33 | 64.8%  | Acute UGIB | HBV (31.7%) HCV (7.6%) Alcohol (24.1%) HBV + Alcohol (2.1%) Unknown (24.1%) Others (9.7%) | 0.0% |
| Perkins (2004) – R | USA         | 33/33                         | Mean: 58     | 36.4%  | Patients who undergo cholecystectomy | NA | NA |
| First Author, year – Study Design | Regions | No. Total Pts/No. Pts Analyzed | Age, year | Male, % | Study Population | Etiology of Cirrhosis | HCC, % |
|----------------------------------|---------|-------------------------------|-----------|---------|------------------|----------------------|-------|
| Radha Krishna (2009) – R         | India   | 121/121                       | Mean ± SD: 36.3 ± 18.0 | 70.2%   | ACLF with acute viral hepatitis due to HAV or HEV | HBV (30%) HCV (4.1%) Alcohol (11%) HBV + Alcohol (2.5%) HCV + Alcohol (1%) | 0.0%  |
| Rahimi-Dehkordi (2014) – P       | Iran    | 257/257                       | Mean ± SD: 40.7 ± 13.45 | 54.1%   | Waiting for LT | HBV (18.7%) HCV (14.8%) Alcohol (0.4%) | NA    |
| Razejs-Wyszomirska (2009) – R    | Poland  | 48/48                         | Mean ± SD: Survivors: 53 ± 11 Nonsurvivors: 45 ± 9 | 62.5%   | OLT | Viral + Alcohol (37.5%) AIH (22.9%) | NA |
| Reverter (2014) – P              | Spain   | 178/178                       | Mean ± SD: 58.3 ± 12.4 | 73.0%   | Esophageal AVB | Alcohol (39%) HCV (32%) Virus + Alcohol (11%) | 10.0% |
| Ripoll (2007) – RCT              | Spain   | 213/213                       | Median: 54 (46–63) | 59.0%   | Compensated cirrhosis with portal hypertension but without varices | Alcohol (24%) Nonalcoholic (76%) HBV (4%) HCV (62%) | 9.0%  |
| Salerno (2002) – R               | Italy   | 140/138                       | Median: 60.5 (14–76) | 64.3%   | Elective TIPS | Viral (67%) Alcohol (20%) Cholestatic (2%) Other (11%) Virus (16.7%) Alcohol (69.1%) Cholestatic (4.3%) Other (9.9%) | NA |
| Schepke (2003) – P               | Germany | 162/162                       | Mean ± SD: 57.0 ± 10.4 | 64.2%   | TIPS | Viral (7.4%) HCV (39.7%) Alcohol (Intoxication: 41.7%; Dependence: 42.6%) HBV + HCV (4.4%) | NA |
| Seamon (2010) – R                | USA     | 68/68                         | Mean ± SD: 53.2 ± 8.9 | 83.8%   | Trauma patients with CLD | Alcohol (45.3%) Virus (31.3%) Alcohol + Virus (13.4%) Other (1%) | 11.4% |
| Sempere (2009) – R               | Spain   | 201/201                       | Mean ± SD: 59.48 ± 11.78 | 70.6%   | AVB | HBV (2.8%) HCV (28.3%) Alcohol (15.6%) Cryptogenic (9.9%) | 0.0%  |
| Serra (2004) – R                 | Spain   | 212/212                       | Mean ± SD: Death group: 68.8 ± 10 Alive group: 67.3 ± 12.5 | NA      | Decompensated cirrhosis | HBV (9.8%) HCV (21.3%) Alcohol (55.2%) | 29.9% |
| Serste (2012) – P                | Belgium | 174/174                       | Mean ± SD: 60.3 ± 11.6 | 79.9%   | Cirrhosis and refractory ascites | HBV (33%) HCV (54%) HBV + HCV (11%) | 0.0%  |
| Shajik (2010) – Descriptive       | Pakistan| 110/110                       | Mean ± SD: 46.76 ± 12.93 | 65.0%   | Decompensated cirrhosis | HBV (57.2%) HCV (10.2%) Alcohol (22.4%) Other (10.2%) | NA |
| Sharma (2010) – P                | India   | 200/200                       | Mean ± SD: 41.6 ± 11.7 | 79.5%   | Patients without recent UGIB or HE | Patients who undergo intraabdominal surgery under generalized anesthesia | NA |
| Song (2011) – R                  | South Korea | 98/98                     | Mean ± SD: 57.8 ± 10.5 | 81.6%   | NA | HBV (9.8%) HCV (21.3%) Alcohol (55.2%) | 29.9% |
| Song (2014) – R                  | South Korea | 946/946                  | Median: 54 (47–63) | 74.3%   | Cirrhosis with AD | HBV (33%) HCV (54%) HBV + HCV (11%) | 0.0%  |
| Stewart (2007) – R               | USA     | 223/223                       | Mean: 56 (45.4–64.6) | NA      | TIPS | HBV (57.2%) HCV (10.2%) Alcohol (22.4%) Other (10.2%) | NA |
| Su (2009) – R                    | China Taiwan | 46/46                      | Mean ± SD: 60.4 (49.5–69.2) | 26.1%   | NA | HBV (9.8%) HCV (21.3%) Alcohol (55.2%) | 29.9% |
| Suk (2014) – P                   | South Korea | 1002/1002                 | Mean ± SD: 53.3 ± 12.7 | 26.1%   | Patients with PBC who undergo biopsy | Patients with CLD who undergo HVPG measurement | NA |
| Peng et al.                      |         |                               |           |         |                               |                     |       |
| First Author, year – Study Design | Regions | No. Total Pts/No. Pts Analyzed | Age, year | Male, % | Study Population | Etiology of Cirrhosis | HCC, % |
|----------------------------------|---------|-----------------------------|-----------|--------|-----------------|----------------------|--------|
| Suman (2004) – R USA             | 44/44   | Mean ± SD: Death: 58.3 ± 11.7 No death: 64.6 ± 12.5 | 61.0%     | Patients with undergo cardiac surgery using CPB | HBV (6.8%) HCV (6.8%) AIH (6.8%) | NA |
| Tacke (2007) – R Germany         | 111/111 | Median: 46 (18–70)          | 59.5%     | CLD evaluated for potential LT | Viral (28.8%) Biliary/AIH (24.3%) | NA |
| Takaya (2012) – R Japan          | 108/108 | Mean ± SD: Child A: 66.4 ± 7.8 Child B: 63.6 ± 8.3 Child C: 64.7 ± 15.1 | 59.3%     | Liver disease | HBV (14.8%) HCV (62.0%) Alcohol (9.3%) | 52.8% |
| Tas (2012) – R Turkey            | 90/90   | Mean ± SD: 69 ± 5.919       | 57.8%     | ICU patients | HBV (32.2%) HCV (33.3%) Alcohol (10%) | 7.8% |
| Tas (2012) – R Turkey            | 106/106 | Mean: Discharged: 56 (40–80) Deceased: 55.5 (17–80) | 30.2%     | ICU patients | HBV (33%) HCV (20%) Alcohol (16%) | 1.9% |
| Teng (2014) – R China Taiwan     | 132/132 | Mean: 51.3 (46.3–64.2)     | 83.3%     | Acute GVB after emergent endoscopic NBC injection | HBV (18.2%) HCV/HCV (45.4%) | 25.8% |
| Theocharidou (2014) – R UK       | 635/635 | Mean ± SD: 50.5 ± 11.7      | 62.4%     | ICU patients | Alcohol (36.4%) Alcohol + HBV/ HCV (9.1%) | NA |
| Thielmann (2010) – R Germany     | 57/57   | Mean ± SD: 62 ± 10          | 67.0%     | Noncardiac liver cirrhosis, undergo open-heart surgery using CPB | Alcohol (29%) HBV (22%) Alcohol (20%) | NA |
| Tu (2011) – R China Taiwan       | 202/202 | Mean ± SD: 58 ± 14          | 75.7%     | ICU patients | HBV + Alcohol (9%) HCV + Alcohol (2%) | NA |
| Tzeng (2009) – R China Taiwan    | 107/107 | Mean ± SD: 55.50 ± 12.33    | 69.0%     | Emergent TIPS for uncontrolled VB | HBV + Alcohol + HCV (3%) | NA |
| Vanhuysse (2012) – R France      | 34/34   | Mean ± SD: 64.8 ± 12.8      | 76.5%     | Patients who underwent cardiac surgery | HBV + Alcohol + HCV (1%) | NA |
| Velayutham (2012) – R India      | 210/210 | Mean: 45.9                  | 76.2%     | Patients listed for single-organ LT for nonfulminant liver disease | Alcohol (24%) Viral hepatitis (B and/ or C) (68%) | NA |
| Viasus (2011) – R Spain          | 90/90   | Mean ± SD: 61.8 ± 13        | 80.0%     | Nonseverely immunosuppressed cirrhotic patients with pneumonia | Alcohol (58%) Viral hepatitis (21%) | NA |
| Wang (2014) – P China            | 429/429 | Mean ± SD: 48.9 ± 13.8      | 79.3%     | After cessation of AVB by endoscopic therapy within 48 hours of admission | Alcohol (38.9%) HCV (27.8%) Viral hepatitis + Alcohol (12.2%) | 0.0% |
| First Author, year – Design | Regions | No. Total Pts/No. Pts Analyzed | Age, year | Male, % | Study Population | Etiology of Cirrhosis | HCC, % |
|-----------------------------|---------|-------------------------------|-----------|---------|-----------------|----------------------|--------|
| Wiesner (2003) – P USA      | 2271/2271 | Mean: 50.7 (18–79)           | 67.8%     | Patients with CLD added to OPTN liver waiting list | HBV (5.8%) | NA               |
| Wu (2015) – P China        | 121/121  | Mean ± SD: 43.3 ± 12.0        | 79.3%     | ACHBLF: Training cohort                              | HBV (100%) | 0.0%             |
| Xie (2013) – R China      | 205/205  | Mean ± SD: 50.48 ± 11.15      | 99.5%     | ACHBLF: Validation cohort                            | HBV (100%) | 0.0%             |
| Zapata (2004) – R USA     | 26/26    | Mean ± SD: 46.9 ± 10.9        | 57.7%     | LT                                                | Alcohol (100%) | 0.0%             |
| Zhang (2014) – R China    | 159/159  | Mean ± SD: 52 ± 12            | 71.1%     | TIPS                                              | HBV (100%) | 0.0%             |
| Zhang (2012) – R China    | 160/160  | Mean ± SD: Survival group: 52.5 ± 9.0 Death group: 52.4 ± 11.5 | NA | Liver cirrhosis | HBV (54.5%) | 0.0%             |
| Zhang (2015) – R China    | 77/77    | Mean: 62.6 (34–89)            | 53.2%     | Patients with choledocholithiasis who undergo ERCP for the first time | HBV (91.0%) | 0.0%             |
| Zhang (2005) – R China    | 315/315  | Mean: Male: 52.9 Female: 60.9 | 67.3%     | Liver cirrhosis | HBV (67.0%) | 0.0%             |
| Zhang (2012) – R China    | 435/435  | Median: 56 (20–87)            | 77.5%     | Liver cirrhosis | HBV (67.0%) | 0.0%             |
| Zheng (2011) – R China    | 242/242  | Mean ± SD: 46.0 ± 12.9        | 81.0%     | Biliary cirrhosis                                  | HBV (100%) | 0.0%             |
### TABLE 2. Results of Comparison Between MELD and Child–Pugh Score: An Overview of Studies

| First Author, year – Study Design | Study Population | Endpoint | Diagnostic Accuracy of Child–Pugh Score (95% CI) | Diagnostic Accuracy of MELD Score (95% CI) | P Value |
|-----------------------------------|------------------|----------|-----------------------------------------------|------------------------------------------|---------|
| An (2014) – R                     | Recurrent HE after embolization | 2-year mortality | AUC = 0.99 (NA) | AUC = 1.0 (NA) | >0.05 |
| Angermayr (2003) – R              | Elective TIPS     | 1-month mortality | AUC = 0.78 (NA) | AUC = 0.73 (NA) | >0.05 |
| Arif (2012) – R                   | Patients who undergo heart surgery with cardiopulmonary bypass | 30-day mortality | AUC = 0.60 ± 0.064 (NA) | AUC = 0.71 ± 0.06 (NA) | <0.05 |
| Attia (2008) – R                  | Black African patients with cirrhosis | 3-month mortality | AUC = 0.72 (0.64–0.80) | AUC = 0.75 (0.62–0.88) | 0.68 |
| Augustin (2009) – P               | AVB               | 6-week mortality | AUC = 0.69 (0.75–0.87) | AUC = 0.77 (0.69–0.87) | 0.67 |
| Bae (2007) – R                    | First episode of VB | 6-month mortality | AUC = 0.75 (0.67–0.83) | AUC = 0.74 (0.65–0.83) | NA |
| Bang (2014) – P                   | Patients with CLD who undergo HVPG measurement | Prediction of HCC | AUC = 0.681 (NA) | AUC = 0.659 (NA) | NA |
| Befeler (2005) – R                | Patients who undergo abdominal surgery | Poor outcome | AUC = 0.83 (NA) | AUC = 0.826 (NA) | NA |
| Benedeto-Stojanov (2009) – R      | Patients with complications of liver disease | 15-month mortality | AUC = 0.89 (0.88–0.90) | AUC = 0.87 (NS) | <0.001 |
| Bhise (2007) – R                  | Alcoholic cirrhotic patients | 1-year mortality | AUC = 0.74 (0.65–0.83) | AUC = 0.74 (0.65–0.83) | NA |
| Bie (2007) – R                    | Decompensated cirrhosis | 6-month mortality | AUC = 0.71 (0.54–0.872) | AUC = 0.71 (0.66–0.872) | NA |
| Bie (2009) – P                    | Liver cirrhosis    | 3-month mortality | AUC = 0.60 (0.54–0.658) | AUC = 0.60 (0.47–0.759) | 0.68 |
| Biselli (2015) – P                | MELD score <18 from Modena and Padua Centers (Training group) | 3-month mortality | AUC = 0.888 (0.882–0.893) | AUC = 0.592 (0.586–0.598) | 0.68 |
|                                   |                   | 6-month mortality | AUC = 0.809 (0.805–0.814) | AUC = 0.648 (0.643–0.653) | 0.68 |
|                                   |                   | 12-month mortality | AUC = 0.775 (0.772–0.778) | AUC = 0.651 (0.647–0.655) | 0.68 |
|                                   |                   | MELD score <18 from Bologna (Validation group) | 3-month dropout | AUC = 0.659 (0.653–0.666) | NA |
|                                   |                   | 6-month dropout | AUC = 0.687 (0.681–0.692) | AUC = 0.582 (0.575–0.588) | 0.68 |
|                                   |                   | 12-month dropout | AUC = 0.687 (0.681–0.693) | AUC = 0.582 (0.575–0.588) | NA |
| First Author, year – Study Design | Study Population | Endpoint | Diagnostic Accuracy of Child–Pugh Score (95% CI) | Diagnostic Accuracy of MELD Score (95% CI) | P Value |
|----------------------------------|------------------|----------|-------------------------------------------------|-------------------------------------------|---------|
| Boin Ide (2008) – R             | Adult patients who undergo LT 10-year mortality | NA (NA) | NA (NA) | NA | NA |
| Botta (2003) – R                | Liver cirrhosis 6-month mortality | AUC = 0.824 (NA) | AUC = 0.796 (NA) | NA | NA |
| Bourisier (2009) – P            | Whole liver cirrhosis 6-month mortality | AUC = 0.882 ± 0.03 (NA) | AUC = 0.866 ± 0.03 (NA) | 0.305 |
| Cerqueira (2012) – R            | First episode of EVB In-hospital mortality | AUC = 0.719 (0.585–0.853) | AUC = 0.760 (0.644–0.876) | 0.0876 |
| Chan (2006) – R                 | Chronic HBV 3-month mortality | AUC = 0.75 (0.70–0.80) | AUC = 0.65 (0.59–0.71) | <0.0001 |
| Non-HCC, Cirrhotic              | 1-year mortality | AUC = 0.77 (0.72–0.81) | AUC = 0.63 (0.58–0.68) | <0.0001 |
| Non-HCC without lamivudine      | 3-month mortality | AUC = 0.79 (0.75–0.87) | AUC = 0.76 (0.76–0.80) | 0.03 |
| HCC                             | 1-year mortality | AUC = 0.80 (0.73–0.87) | AUC = 0.77 (0.68–0.87) | 0.032 |
| Chaurasia (2013) – P            | Decompensated cirrhosis 1-month mortality | AUC = 0.875 (0.794–0.932) | AUC = 0.920 (0.849–0.964) | 0.044 |
| Non-HCC, noncirrhotic           | 3-month mortality | AUC = 0.884 (0.806–0.939) | AUC = 0.967 (0.911–0.992) | 0.05 |
| Alcohol-related                 | 6-month mortality | AUC = 0.908 (0.835–0.956) | AUC = 0.977 (0.925–0.996) | 0.05 |
| Nonalcoholic                    | 1-month mortality | AUC = 0.875 (0.742–0.954) | AUC = 0.944 (0.832–0.990) | 0.29 |
| Non-HCC, noncirrhotic           | 3-month mortality | AUC = 0.874 (0.741–0.954) | AUC = 0.955 (0.847–0.993) | 0.18 |
| Alcohol-related                 | 6-month mortality | AUC = 0.904 (0.779–0.971) | AUC = 0.993 (0.908–0.990) | 0.08 |
| Nonalcoholic                    | 1-month mortality | AUC = 0.851 (0.732–0.932) | AUC = 0.910 (0.804–0.969) | 0.62 |
| Non-HCC, noncirrhotic           | 3-month mortality | AUC = 0.896 (0.786–0.961) | AUC = 0.980 (0.901–0.997) | 0.15 |
| Alcohol-related                 | 6-month mortality | AUC = 0.911 (0.805–0.970) | AUC = 0.972 (0.890–0.996) | 0.22 |
| Chen (2011) – R                 | SBE In-hospital mortality | AUC = 0.744 (NA) | AUC = 0.720 (NA) | NA |
| Chen (2013) – R                 | Patients with SPH who treated with TIPS 1-year mortality – Overall | AUC = 0.764 (NA) | AUC = 0.654 (NA) | NA |
| Cho (2011) – R                  | Patients who undergo nonhepatic surgery under general anesthesia 1-year mortality – Na < 138 | AUC = 0.663 (NS) (NA) | AUC = 0.564 (NS) (NA) | NA |
| Choi (2009) – R                 | Liver cirrhosis 3-month mortality | AUC = 0.859 (NA) | AUC = 0.761 (NA) | 0.027 |
| Cholongitas (2008) – R          | Patients who were first admitted to ICU ICU or 6-weeks mortality – Scores calculated at 24 h | AUC = 0.75 (NA) | AUC = 0.78 (NA) | NA |
| First Author, year – Study Design | Study Population | Endpoint | Diagnostic Accuracy of Child–Pugh Score (95% CI) | Diagnostic Accuracy of MELD Score (95% CI) | P Value |
|-----------------------------------|------------------|----------|-----------------------------------------------|-------------------------------------------|---------|
| Corneille (2011) – R R           | Trauma patients with liver dysfunction or cirrhosis | ICU or 6-weeks mortality – Scores calculated at 48 h | AUC = 0.78 (NA) | AUC = 0.86 (NA) | NA |
| Costa (2009) – R R               | Surgery          | In-hospital mortality | AUC = 0.639 (NA) | AUC = 0.725 (NA) | 0.38 |
| Das (2010) – R R                 | ICU patients     | Peri-operative mortality – Overall | AUC = 0.72 (0.61–0.83) | AUC = 0.76 (0.64–0.89) | >0.05 |
| Corneille (2011) – R R           | Trauma patients with liver dysfunction or cirrhosis | Peri-operative mortality – Elective surgery | AUC = 0.54 (NS) (0.24–0.84) | AUC = 0.61 (NS) (0.27–0.94) | NA |
| Costa (2009) – R R               | Surgery          | In-hospital mortality – Scores calculated on day 1 | AUC = 0.76 (NA) | AUC = 0.77 (NA) | NA |
| Costa (2009) – R R               | Surgery          | In-hospital mortality – Scores calculated after 3 days | AUC = 0.69 (NA) | AUC = 0.67 (NA) | NA |
| Degre (2004) – R R               | Patients who undergo first LT | 3-month mortality | AUC = 0.726 ± 0.084 (NA) | AUC = 0.704 ± 0.084 (NA) | >0.05 |
| Dhiman (2014) – P R              | Cirrhosis with AD | 28-day mortality | AUC = 0.739 (NA) | AUC = 0.710 (NA) | NA |
| Duseja (2013) – P R              | ACLF             | Short-term mortality | AUC = 0.61 (0.49–0.73) | AUC = 0.67 (0.56–0.78) | >0.05 |
| Ecochard (2011) – R R            | LT               | Mortality before LT | AUC = 0.70 (0.64–0.77) | AUC = 0.66 (0.59–0.72) | NA |
| Ecochard (2011) – R R            | LT               | Mortality after LT | AUC = 0.645 (0.37–0.52) | AUC = 0.42 (0.35–0.49) | NA |
| Ecochard (2011) – R R            | LT               | Short-term mortality after LT | AUC = 0.78 (0.72–0.84) | AUC = 0.73 (0.66–0.80) | NA |
| Emerson (2014) – P R             | ICU patients     | ICU mortality | AUC = 0.70 (0.55–0.85) | AUC = 0.74 (0.61–0.88) | NA |
| Fede (2011) – R R                | Patients without infections or hemodynamic instability | Adrenal insufficiency | AUC = 0.78 (NA) | AUC = 0.75 (NA) | NA |
| Fejfar (2006) – R R              | Patients who underwent TIPS for refractory ascites | 1-month mortality | AUC = 0.62± (NA) | AUC = 0.73 (NA) | NA |
| Fejfar (2006) – R R              | Patients who underwent TIPS for refractory ascites | 3-month mortality | AUC = 0.67 (NA) | AUC = 0.73 (NA) | NA |
| Fejfar (2006) – R R              | Patients who underwent TIPS for refractory ascites | 1-year mortality | AUC = 0.61 (NA) | AUC = 0.66 (NA) | >0.05 |
| Flores- Rendon (2008) – R R      | Acute EVB        | 5-day failure to control bleeding | AUC = 0.693 (NS) (0.561–0.825) | AUC = 0.679 (NS) (0.495–0.863) | >0.05 |
| Giannini (2004) – P P            | Liver cirrhosis  | In-hospital mortality | AUC = 0.809 (0.710–0.907) | AUC = 0.88 (0.77–0.99) | <0.05 |
| Giannini (2004) – P P            | Liver cirrhosis  | Mortality related to EVB | AUC = 0.794 (0.676–0.913) | AUC = 0.905 (0.801–1.00) | >0.05 |
| Giannini (2004) – P P            | Liver cirrhosis  | 3-month mortality | AUC = 0.757 (0.679–0.825) | AUC = 0.947 (0.897–0.977) | 0.012 |
| Giannini (2004) – P P            | Liver cirrhosis  | 3-month mortality – Excluding serum creatinine levels ≥1.2 mg/dL | AUC = 0.787 (0.697–0.861) | AUC = 0.933 (0.867–0.972) | >0.05 |
| Gomez (2009) – P P               | Liver cirrhosis  | 12-week mortality | AUC = 0.82 (0.71–0.89) | AUC = 0.82 (0.71–0.89) | >0.05 |
| Gomez (2009) – P P               | Liver cirrhosis  | 52-week mortality | AUC = 0.84 (0.76–0.91) | AUC = 0.82 (0.73–0.89) | >0.05 |
| Gotthardt (2009) – R R           | Listed for single-organ LTxs for nonfulminant liver disease | 104-week mortality | AUC = 0.86 (0.78–0.91) | AUC = 0.82 (0.74–0.90) | >0.05 |
| Gotzberger (2012) – P P           | Liver cirrhosis  | Mortality or removed for poor condition | AUC = 0.73 (NA) | AUC = 0.68 (NA) | 0.091 |
| Grunhage (2008) – P P            | Liver cirrhosis  | Death or 6-month survival | AUC = 0.677 (0.518–0.837) | AUC = 0.724 (0.575–0.873) | NA |
| Hassan (2013) – R R              | Liver cirrhosis  | 6-month mortality | AUC = 0.72 (NA) | AUC = 0.78 (NA) | >0.05 |
| Hassan (2013) – R R              | Liver cirrhosis  | 15-month mortality | AUC = 0.68 (NA) | AUC = 0.78 (NA) | >0.05 |
| Hassan (2013) – R R              | Liver cirrhosis  | 24-month mortality | AUC = 0.70 (NA) | AUC = 0.79 (NA) | >0.05 |
| Hoteit (2008) – R R              | Surgery          | 1-year mortality | AUC = 0.658 (NA) | AUC = 0.725 (NA) | <0.05 |
| Hoteit (2008) – R R              | Surgery          | Death or hepatic decompensation (30 postprocedure days) | AUC = 0.696 ± 0.070 (NA) | AUC = 0.755 ± 0.066 (NA) | 0.2 |
| First Author, year – Study Design | Study Population | Endpoint | Diagnostic Accuracy of Child–Pugh Score (95% CI) | Diagnostic Accuracy of MELD Score (95% CI) | P Value |
|----------------------------------|------------------|----------|-----------------------------------------------|------------------------------------------|---------|
| Huo (2005) – P                   | Liver cirrhosis (CTP ≥ 7) | 3-month mortality | AUC = 0.635 (NA) | AUC = 0.785 (NA) | >0.1   |
|                                  |                   | 6-month mortality | AUC = 0.607 (NA) | AUC = 0.714 (NA) | >0.1   |
|                                  |                   | 9-month mortality | AUC = 0.594 (NA) | AUC = 0.689 (NA) | >0.1   |
|                                  |                   | 12-month mortality | AUC = 0.592 (NA) | AUC = 0.681 (NA) | >0.1   |
|                                  | Subgroup: MELD score >14 | 3-month mortality | AUC = 0.543 (NA) | AUC = 0.715 (NA) | 0.02   |
|                                  |                   | 6-month mortality | AUC = 0.536 (NA) | AUC = 0.705 (NA) | 0.003  |
|                                  |                   | 9-month mortality | AUC = 0.507 (NA) | AUC = 0.737 (NA) | <0.001 |
|                                  |                   | 12-month mortality | AUC = 0.526 (NA) | AUC = 0.716 (NA) | <0.001 |
| Huo (2006) – P                   | Liver cirrhosis (CTP ≥ 7) | 3-month mortality | AUC = 0.809 (0.769–0.845) | AUC = 0.872 (0.836–0.901) | 0.069   |
|                                  |                   | 6-month mortality | AUC = 0.756 (0.713–0.796) | AUC = 0.837 (0.799–0.871) | 0.008   |
| Huo (2005) – P/R                 | Liver cirrhosis (CTP ≥ 7) | 6-month mortality | AUC = 0.528 (0.475–0.581) | AUC = 0.718 (0.668–0.765) | 0.004   |
|                                  |                   | 12-month mortality | AUC = 0.528 (0.472–0.583) | AUC = 0.744 (0.693–0.791) | <0.001  |
| Hyun (2012) – R                  | HBV-related decompensated cirrhotic patients (CTP ≥ 7) who received antiviral therapy | 6-month mortality | AUC = 0.913 (Score calculated at admission) (0.838–0.988) | AUC = 0.977 (Score calculated at 3-month) (0.940–1.014) | NA      |
| Ishizu (2014) – R                | Patients with AVB who were treated by endoscopic variceal ligation | 30-day mortality | NA (NA) | NA (NA) | NA      |
| Jalan (2014) – P                 | ACLF: Derivation set | 1-month mortality | AUC = 0.668 (0.610–0.726) | AUC = 0.687 (0.635–0.738) | NA      |
|                                  |                   | 3-month mortality | AUC = 0.655 (0.605–0.705) | AUC = 0.659 (0.615–0.710) | NA      |
|                                  |                   | 6-month mortality | AUC = 0.642 (0.593–0.691) | AUC = 0.652 (0.607–0.697) | NA      |
|                                  |                   | 1-year mortality | AUC = 0.636 (0.588–0.683) | AUC = 0.638 (0.595–0.682) | NA      |
|                                  | ACLF: External validation | 1-month mortality | AUC = 0.653 (0.603–0.704) | AUC = 0.645 (0.593–0.697) | NA      |
|                                  |                   | 3-month mortality | AUC = 0.647 (0.599–0.695) | AUC = 0.635 (0.585–0.684) | NA      |
| Jiang (2009) – R                 | Liver cirrhosis | 3-month mortality | AUC = 0.818 (0.747–0.889) | AUC = 0.804 (0.730–0.878) | >0.05   |
| Jiang (2013) – R                 | Liver cirrhosis | Nonsufficient visualization of the biliary tree 20min after Gd-EOB-DT-PA | AUC = 0.78 (NA) | AUC = 0.86 (NA) | NA      |
| Kalabay (2007) – P               | Alcoholic liver disease | 1-year mortality | AUC = 0.865 ± 0.040 (0.787–0.943) | AUC = 0.739 ± 0.052 (0.637–0.871) | NA      |
|                                  |                   | 1–12-month mortality | AUC = 0.855 ± 0.050 (0.757–0.953) | AUC = 0.740 ± 0.058 (0.626–0.854) | NA      |
| Khan (2009) – R                  | Infection (at admission or acquiring in hospital) | In-hospital mortality | AUC = 0.67 (NA) | AUC = 0.68 (NA) | NA      |
| First Author, year – Study Design | Study Population | Endpoint | Diagnostic Accuracy of Child–Pugh Score (95% CI) | Diagnostic Accuracy of MELD Score (95% CI) | P Value |
|----------------------------------|------------------|----------|-----------------------------------------------|-------------------------------------------|---------|
| Kim (2014) – R                   | Patients who undergo elective extrahepatic surgery under general anesthesia | Operative mortality | NA (NA)                                        | NA (NA)                                    | NA      |
| Kim (2007) – R                   | Liver cirrhosis   | Overall mortality | NA (NA)                                        | NA (NA)                                    | NA      |
| Kim (2014) – P                   | Cirrhotic patients with ascites | 1-year mortality | AUC = 0.777 (0.635–0.883)                      | AUC = 0.769 (0.627–0.877)                  | NA      |
| Koo (2013) – R                   | Liver cirrhosis   | 3-month mortality | AUC = 0.831 (NA)                              | AUC = 0.844 (NA)                           | >0.05   |
| Koo (2013) – R                   | Liver cirrhosis   | Excluding CTP class A 3-month mortality | AUC = 0.765 (NA)                              | AUC = 0.795 (NA)                           | NA      |
| Kim (2014) – P                   | Cirrhotic patients with ascites | 1-year mortality | AUC = 0.943 (NA)                              | AUC = 0.947 (NA)                           | NA      |
| Kwon (2014) – P                  | Single-organ LT for nonfulminant liver disease | 3-month mortality | NA (NA)                                        | NA (NA)                                    | <0.001 MELD was better |
| Lee (2002) – R                   | Advanced liver cirrhosis (CTP > 6) | 6-week mortality | AUC = 0.648 (0.569–0.727)                      | AUC = 0.691 (0.619–0.764)                  | NA      |
| Lee (2015) – R                   | Acutely decompensated alcoholic cirrhosis | 4-week mortality | AUC = 0.705 (0.638–0.773)                      | AUC = 0.804 (0.747–0.861)                  | NA      |
| Krishnan (2013) – R              | Single-organ LT for nonfulminant liver disease | 6-month mortality | NA (NA)                                        | NA (NA)                                    | >0.05   |
| Levesque (2012) – P              | ICU patients      | ICU mortality | AUC = 0.79 (0.74–0.84)                         | AUC = 0.82 (NA)                            | NA      |
| Lim (2011) – R                   | Patients admitted for sepsis | In-hospital mortality | AUC = 0.934 (0.902–0.966)                      | AUC = 0.751 (0.671–0.831)                  | NA      |
| Lim (2009) – R                   | Patients admitted for sepsis | 1-month mortality | AUC = 0.933 (NA)                              | AUC = 0.757 (NA)                           | NA      |
| Lv (2009) – R                    | Liver cirrhosis   | 1-month mortality | AUC = 0.722 (0.692–0.752)                      | AUC = 0.819 (0.753–0.885)                  | <0.01   |
| Low MELD group (≤17)             | 1-month mortality | AUC = 0.721 (0.689–0.753)                      | AUC = 0.820 (0.756–0.884)                  | <0.01   |
| High MELD group (>17)            | 1-month mortality | AUC = 0.754 (NA)                              | AUC = 0.608 (NA)                            | <0.01   |
| Mallaiyappan (2013) – R/P        | Alcoholic liver disease | 1-month mortality | AUC = 0.67 (0.57–0.77)                         | AUC = 0.72 (0.62–0.81)                     | >0.05   |
| Alcoholic liver disease          | 3-month mortality | AUC = 0.70 (0.60–0.80)                         | AUC = 0.73 (0.64–0.83)                      | >0.05   |
| High MELD group (>17)            | 3-month mortality | AUC = 0.70 (0.60–0.80)                         | AUC = 0.73 (0.64–0.83)                      | >0.05   |
| Alcoholic liver disease          | 3-month mortality | AUC = 0.57 (0.45–0.67)                         | AUC = 0.80 (0.72–0.89)                      | <0.0058 |
| First Author, year – Study Design | Study Population | Endpoint | Diagnostic Accuracy of Child–Pugh Score (95% CI) | Diagnostic Accuracy of MELD Score (95% CI) | P Value |
|----------------------------------|------------------|----------|-----------------------------------------------|---------------------------------------------|---------|
| Mishra (2007) – P                | Liver cirrhosis  | 6-month mortality | AUC = 0.51 (0.39 – 0.63) | AUC = 0.89 (0.82 – 0.95) | <0.0001 |
| Moreno (2013) – P               | Liver cirrhosis | 6-month mortality | AUC = 0.804 (NA) | AUC = 0.764 (NA) | >0.05 |
| Mouelhi (2010) – R             | ICU patients    | 1-year mortality | AUC = 0.86 (0.71 – 0.86) | AUC = 0.80 (0.70 – 0.86) | NA |
| Nunes (2010) – P               | HCV-related liver disease | 1-year mortality | AUC = 0.80 (NA) | AUC = 0.94 (NA) | <0.05 |
|                               |                  | 3-year mortality | AUC = 0.83 (0.77 – 0.98) | AUC = 0.84 (0.67 – 0.93) | NA |
|                               |                  | 5-year mortality | AUC = 0.84 (0.72 – 0.94) | AUC = 0.84 (0.74 – 0.90) | NA |
| Olmez (2012) – P              | ICU patients    | 3-year mortality | AUC = 0.72 (0.704 – 0.810) | AUC = 0.78 (0.714 – 0.843) | NA |
| Orloff (2012) – RCT            | EVB             | 6-month mortality | AUC = 0.62 (NA) | AUC = 0.53 (NA) | 0.089 |
|                               |                  | 1-year mortality | AUC = 0.58 (NA) | AUC = 0.50 (NA) | 0.490 |
|                               |                  | Hospital readmission – Overall | AUC = 0.61 (NA) | AUC = 0.47 (NA) | 0.009 |
|                               |                  | Hospital readmission – EST arm | AUC = 0.59 (NA) | AUC = 0.46 (NA) | 0.012 |
| Papatheodoridis (2005) – R     | Decompensated cirrhosis | 6-month mortality | AUC = 0.71 (NA) | AUC = 0.77 (NA) | 0.18 |
|                               |                  | 12-month mortality | AUC = 0.68 (NA) | AUC = 0.78 (NA) | 0.09 |
|                               |                  | 24-month mortality – Overall | AUC = 0.70 (NA) | AUC = 0.79 (NA) | 0.27 |
|                               |                  | 24-month mortality – Unadjusted for GGT | AUC = 0.65 (NA) | AUC = 0.73 (NA) | >0.05 |
|                               |                  | 24-month mortality – Adjusted for GGT | AUC = 0.77 (NA) | AUC = 0.81 (NA) | >0.05 |
| Park (2014) – P               | Patients with CLD who underwent HVPG measurement | Mortality | AUC = 0.766 (NA) | AUC = 0.733 (NA) | NA |
| Peng (2015) – R               | Acute UGIB      | In-hospital mortality | AUC = 0.796 (0.721 – 0.858) | AUC = 0.810 (0.736 – 0.870) | 0.7241 |
| Perkins (2004) – R            | Patients who undergo cholecystectomy | Postoperative morbidity (90-day) | AUC = 0.839 (NA) | AUC = 0.938 (NA) | >0.05 |
| Radha Krishna (2009) – R      | ACLF with acute viral hepatitis due to HAV or HEV | 3-month mortality | AUC = 0.631 (0.538 – 0.734) | AUC = 0.941 (0.897 – 0.985) | <0.05 |
| Rahimi-Dehkordi (2014) – P    | Waiting for LT | 9-month mortality or removal from the waiting list due to poor condition | AUC = 0.75 (NA) | AUC = 0.69 (NA) | 0.065 |
| Raseja-Wyszonimiska (2009) – R | OLT             | Early mortality | AUC = 0.758 | AUC = 0.655 (NS) | NA |
| Reverter (2014) – P           | Esophageal AVB  | 6-week mortality | AUC = 0.740 (0.639 – 0.841) | AUC = 0.795 (0.689 – 0.901) | 0.2179 |
| Ripoll (2007) – RCT           | Compensated cirrhosis with portal hypertension but without varices | Developed decompensation | AUC = 0.61 (0.52 – 0.71) | AUC = 0.64 (0.55 – 0.72) | NA |
| Salerno (2002) – R            | Elective TIPS   | 3-month mortality | AUC = 0.70 (0.52 – 0.89) | AUC = 0.84 (0.74 – 0.94) | 0.038 |
| First Author, year – Study Design | Study Population | Endpoint | Diagnostic Accuracy of Child–Pugh Score (95% CI) | Diagnostic Accuracy of MELD Score (95% CI) | P Value |
|----------------------------------|-----------------|----------|-----------------------------------------------|---------------------------------|---------|
| Schepke (2003) – P TIPS          | TIPS for the treatment of intestinal bleeding. | 6-month mortality | AUC = 0.69 (0.56–0.83) | NA (NA) | AUC = 0.84 (0.71–0.98) | NA |
|                                  |                 | 12-month mortality | AUC = 0.66 (0.54–0.78) | NA (NA) | AUC = 0.71 (0.58–0.84) | 0.07 |
|                                  |                 | 3-month mortality | AUC = 0.72 (0.60–0.84) | NA (NA) | AUC = 0.71 (0.56–0.86) | <0.05 |
|                                  |                 | 1-year mortality | AUC = 0.67 (0.57–0.76) | NA (NA) | AUC = 0.73 (0.64–0.82) | <0.05 |
|                                  |                 | 3-year mortality | AUC = 0.73 (0.63–0.84) | NA (NA) | AUC = 0.74 (0.64–0.84) | <0.05 |
| Seamon (2010) – R Trauma patients with CLD | In-hospital mortality – CTP score | 6-week mortality | AUC = 0.75 (0.60–0.91) | NA (NA) | AUC = 0.61 (NS) (0.44–0.79) | <0.05 |
|                                  |                 | In-hospital mortality – CTP class | AUC = 0.76 (0.64–0.89) | NA (NA) | AUC = 0.61 (NS) (0.44–0.79) | <0.05 |
|                                  |                 | Hepatic complication – CTP score | AUC = 0.80 (0.61–0.98) | NA (NA) | AUC = 0.74 (NS) (0.49–0.99) | <0.05 |
|                                  |                 | Hepatic complication – CTP class | AUC = 0.79 (0.63–0.95) | NA (NA) | AUC = 0.61 (NS) (0.49–0.99) | <0.05 |
| Sempere (2009) – R AVB           | 6-week mortality | AUC = 0.762 (0.682–0.842) | NA (NA) | AUC = 0.804 (0.728–0.881) | <0.05 |
|                                  | 3-month mortality | AUC = 0.760 (0.684–0.836) | NA (NA) | AUC = 0.794 (0.720–0.868) | <0.05 |
|                                  | 1-year mortality | AUC = 0.741 (0.668–0.814) | NA (NA) | AUC = 0.766 (0.697–0.835) | <0.05 |
|                                  | 36-week mortality | AUC = 0.717 (0.645–0.788) | NA (NA) | AUC = 0.737 (0.667–0.808) | <0.05 |
| Serra (2004) – R Decompensated cirrhosis | In-hospital mortality | 3-month mortality | AUC = 0.628 (0.527–0.729) | NA (NA) | AUC = 0.757 (0.655–0.858) | >0.05 |
| Serste (2012) – P Cirrhosis and refractory ascites | Decompensated cirrhosis | 2-year mortality | AUC = 0.89 (0.85–0.94) | NA (NA) | AUC = 0.58 (0.49–0.67) | <0.0001 |
| Shaikh (2010) – Descriptive Prolong hospitalization for more or less than 14 days or in-hospital mortality | Decompensated cirrhosis | 3-month mortality | AUC = 0.631 (0.531–0.795) | NA (NA) | AUC = 0.706 (0.629–0.783) | >0.05 |
| Sharma (2010) – P Patients without recent UGIB or HE | Minimal HE | AUC = 0.585 (0.503–0.667) | NA (NA) | AUC = 0.743 (0.670–0.816) | <0.05 |
| Song (2011) – R Patients who undergo intraabdominal surgery under generalized anesthesia | Mortality | AUC = 0.71 (0.62–0.83) | NA (NA) | AUC = 0.82 (0.69–0.93) | <0.05 |
| Song (2014) – R AD | 1-month mortality | AUC = 0.769 (NA) | NA (NA) | AUC = 0.837 (NA) | 0.016 |
| Stewart (2007) – R TIPS | 3-month mortality | AUC = 0.784 (NA) | NA (NA) | AUC = 0.813 (NA) | NA |
|                                  | 1-year mortality | AUC = 0.67 (NA) | NA (NA) | AUC = 0.75 (NA) | NA |
|                                  | 3-month mortality | AUC = 0.79 (NA) | NA (NA) | AUC = 0.80 (NA) | NA |
| First Author, year – Study Design | Study Population | Endpoint | Diagnostic Accuracy of Child–Pugh Score (95% CI) | Diagnostic Accuracy of MELD Score (95% CI) | P Value |
|----------------------------------|------------------|----------|-----------------------------------------------|--------------------------------------------|---------|
| Su (2009) – R                    | Patients with PBC who undergo biopsy | 1-year mortality | AUC = 0.79 (NA) | AUC = 0.80 (NA) | NA |
|                                 |                  | Advanced fibrosis | AUC = 0.608 (NS (0.393–0.823) | AUC = 0.617 (NS (0.392–0.842) | NA |
| Suk (2014) – P                   | Patients with CLD who undergo HVPG measurement | Develop HCC | AUC = 0.681 (NA) | AUC = 0.659 (NA) | NA |
| Suman (2004) – R                 | Patients with undergo cardiac surgery using CPB | Mortality | AUC = 0.84 ± 0.09 (NA) | AUC = 0.87 ± 0.09 (NA) | 0.72 |
| Tacke (2007) – R                 | CLD evaluated for potential LT | Hepatic decompensation | NA (NA) | NA (NA) | NA |
| Takaya (2012) – R                | Liver disease | Development of UGIB | AUC = 0.584 (NA) | AUC = 0.577 (NA) | NA |
| Suman (2004) – R                 | Patients with undergo cardiac surgery using CPB | 1-year mortality | AUC = 0.769 (0.658–0.881) | AUC = 0.805 (0.695–0.915) | <0.05 |
| Tacke (2007) – R                 | CLD evaluated for potential LT | 2-year mortality | AUC = 0.752 (0.645–0.859) | AUC = 0.805 (0.702–0.907) | >0.05 |
| Tas (2012) – R                   | ICU patients | ICU mortality | AUC = 0.687 (0.573–0.801) | AUC = 0.766 (0.659–0.872) | NA |
| Tas (2012) – R                   | ICU patients | 6-week mortality | AUC = 0.848 (0.755–0.942) | AUC = 0.794 (0.690–0.897) | NA |
| Teng (2014) – R                  | Acute GVB after emergent endoscopic NBC injection | In-hospital mortality – Overall | NA (NA) | NA (NA) | NA |
| Theocharidou (2014) – R          | ICU patients | In-hospital mortality – Training group | AUC = 0.668 (NA) | AUC = 0.787 (NA) | NA |
|                                |                  | In-hospital mortality – Validation group | AUC = 0.707 (NA) | AUC = 0.749 (NA) | NA |
|                                |                  | In-hospital mortality – 2005–2012 year group | AUC = 0.68 (NA) | AUC = 0.73 (NA) | NA |
| Thielmann (2010) – R             | Noncardiac LC, undergo open-heart surgery with the use of CPB | In-hospital mortality | AUC = 0.757 ± 0.070 (0.623–0.890) | AUC = 0.851 ± 0.050 (0.745–0.956) | 0.17 |
| Tu (2011) – P                    | ICU patients | In-hospital mortality | AUC = 0.714 ± 0.053 (0.611–0.817) | AUC = 0.865 ± 0.037 (0.792–0.938) | NA |
| Tzeng (2009) – R                 | Emergent TIPS for uncontrolled VB | 1-month mortality | AUC = 0.74 (0.65–0.82) | AUC = 0.78 (0.69–0.85) | >0.05 |
| Vanhuysse (2012) – R             | Patients who underwent cardiac surgery | 2-month mortality | AUC = 0.71 (0.62–0.80) | AUC = 0.78 (0.69–0.86) | >0.05 |
|                                | Patients listed for single-organ LT for nonfulminant liver disease | 1-year mortality | AUC = 0.73 (0.64–0.81) | AUC = 0.74 (0.65–0.82) | >0.05 |
| Velayutham (2012) – R            | Patients who underwent cardiac surgery | Operative mortality | AUC = 0.658 ± 0.10 (NA) | AUC = 0.691 ± 0.11 (NA) | 0.8 |
|                                |                      | Mortality or severe deterioration | NA (NA) | NA (NA) | >0.05 |
| Viasus (2011) – P                | Nonseverely immunosuppressed cirrhotic patients with pneumonia | 30-day mortality or ICU admission | AUC = 0.761 (0.655–0.848) | AUC = 0.832 (0.736–0.904) | NA |
| Wang (2014) – P                  | After cessation of AVB by endoscopic therapy within 48 hours of admission | 3-month rebleeding | AUC = 0.69 (0.64–0.73) | AUC = 0.77 (0.73–0.81) | <0.0001 |
|                                |                      | 1-year rebleeding | AUC = 0.65 (0.60–0.70) | AUC = 0.80 (0.76–0.84) | <0.0001 |
|                                |                      | 3-month rebleeding – associated mortality | AUC = 0.66 (0.61–0.70) | AUC = 0.75 (0.70–0.79) | 0.0003 |
| First Author, year – Study Design | Study Population | Endpoint | Diagnostic Accuracy of Child–Pugh Score (95% CI) | Diagnostic Accuracy of MELD Score (95% CI) | P Value |
|----------------------------------|----------------|----------|-----------------------------------------------|------------------------------------------|---------|
| Wiesner (2003) – P | Patients with CLD added to OPTN liver waiting list | 1-year rebleeding – associated mortality | AUC = 0.68 (0.63–0.72) | AUC = 0.78 (0.74–0.82) | <0.0001 |
| Wu (2015) – P | ACHBLF: Training cohort | 3-month mortality | AUC = 0.76 (0.74–0.79) | AUC = 0.83 (0.81–0.84) | <0.001 |
| Xie (2013) – R | Alcoholic liver disease | In-hospital mortality | NA | NA | NA |
| Xiong (2004) – R | Liver cirrhosis | 3-month mortality | AUC = 0.74 (0.65–0.835) | AUC = 0.826 (0.752–0.900) | <0.05 |
| Zapata (2004) – R | LT | 3-month mortality | AUC = 0.74 (0.58–0.90) | AUC = 0.75 (0.687–0.830) | >0.05 |
| Zhang (2014) – R | TIPS | 3-month mortality | AUC = 0.70 (0.55–0.86) | AUC = 0.76 (0.64–0.89) | 0.258 |
| Zhang (2012) – R | Liver cirrhosis | 3-month mortality | AUC = 0.770 (0.648–0.891) | AUC = 0.689 (0.585–0.781) | NA |
| Zhang (2015) – R | Patients with choledocholithiasis who undergo ERCP for the first time | Incidence of complications – Overall | NA (NA) | AUC = 0.75 (0.63–0.87) | NA |
| Zhang (2005) – R | Liver cirrhosis | 3-month mortality | AUC = 0.74 (0.69–0.85) | AUC = 0.83 (0.76–0.90) | <0.05 |
| Zhang (2012) – R | Liver cirrhosis | 6-month mortality | AUC = 0.718 (NA) | AUC = 0.708 (NA) | NA |

**Diagnostic Accuracy of Child–Pugh Score**:
- HBV-associated: AUC = 0.68 (0.63–0.72)
- 1-year rebleeding – associated mortality: AUC = 0.78 (0.74–0.82)

**Diagnostic Accuracy of MELD Score**:
- 3-month mortality: AUC = 0.76 (0.74–0.79)
- 1-year rebleeding: AUC = 0.83 (0.81–0.84)

**P Value**:
- <0.0001
- <0.001
- >0.05
| First Author, year – Study Design | Study Population | Endpoint | Diagnostic Accuracy of Child–Pugh Score (95% CI) | Diagnostic Accuracy of MELD Score (95% CI) | P Value |
|----------------------------------|------------------|----------|-----------------------------------------------|---------------------------------------------|---------|
| Zheng (2011) – R                 | Suspected ACHBLF | 3-month mortality – Internal cohort | AUC = 0.718 (0.657–0.774) | AUC = 0.694 (0.632–0.752) | NA |
|                                  |                  | 3-month mortality – External cohort | AUC = 0.601 (0.532–0.668) | AUC = 0.775 (0.712–0.830) | NA |

ACHBLF = acute-on-chronic hepatitis B liver failure, ACLF = acute-on-chronic liver failure, AD = acute decompensation, AUC = area under the curve, AVB = acute variceal bleeding, CI = confidence interval, CLD = chronic liver disease, CPB = cardiopulmonary bypass, CTP = Child–TURCOTTE–Pugh, EPCS = emergency direct portacaval shunt, ERCP = endoscopic retrograde cholangiopancreatography, EST = endoscopic sclerotherapy, EVB = esophageal variceal bleeding, GGT = gamma-glutamyl-transpeptidase, GVB = gastric variceal bleeding, HAV = hepatitis A virus, HBV = hepatitis B virus, HCC = hepatocellular carcinoma, HCV = hepatitis C virus, HE = hepatic encephalopathy, HEV = hepatitis E virus, HVPG = hepatic venous pressure gradient, ICU = intensive care unit, LC = liver cirrhosis, LT = liver transplantation, MELD = model for end-stage liver disease, NA = not available, NBC = N-butyl cyanoacrylate, NS = not significant, OLT = orthotopic liver transplantation, P = prospective, PBC = primary biliary cirrhosis, PSE = portal-systemic encephalopathy, R = retrospective, RCT = randomized controlled trials, SBE = spontaneous bacterial empyema, SD = standard deviation, SPH = symptomatic portal hypertension, TIPS = transjugular intrahepatic portosystemic shunt, UGIB = upper gastrointestinal bleeding, VB = variceal bleeding.

\(^6\) 0.62 was recorded in the table, but 0.63 was recorded in the abstract.
\(^1\) >0.05 was recorded in the figure, but <0.05 was recorded in the article.
\(^{11}\) 0.809 was recorded in the article, 0.808 was recorded in the table.
\(^1\) 0.78 was recorded in the table, but 0.74 was recorded in the abstract.
\(^5\) 0.72 was recorded in the table, but 0.724 was recorded in the discussion.
\(^7\) 0.78 was recorded in the table, but 0.790 was recorded in the discussion.
\(^{11}\) 36-week mortality was recorded in the original paper, but it should be revised as 36-month mortality.
\(^{11}\) 0.74 was recorded in the table, but 0.78 was recorded in the abstract.
\(^{11}\) 0.89 was recorded in the table, but 0.88 was recorded in the article.
| First Author, year – Study Design | Patient Selection | Index Test | Reference Standard | Flow and Timing | Applicability Concerns |
|----------------------------------|------------------|-----------|--------------------|----------------|-----------------------|
| An (2014) – R                     | LR               | LR        | LR                 | UR             | LC                    |
| Angermayr (2003) – R              | UR               | LR        | LR                 | UR             | LC                    |
| Arif (2012) – R                   | UR               | LR        | LR                 | LR             | LC                    |
| Attia (2008) – R                  | UR               | LR        | LR                 | LR             | HC                    |
| Augustin (2009) – P               | LR               | LR        | LR                 | LR             | LC                    |
| Bae (2007) – R                    | UR               | LR        | LR                 | LR             | LC                    |
| Bang (2014) – P                   | UR               | LR        | LR                 | UR             | LC                    |
| Befeler (2005) – R                | UR               | LR        | LR                 | UR             | LC                    |
| Benedeto-Stojanov (2009) – R      | UR               | LR        | LR                 | LR             | HC                    |
| Bie (2007) – R                    | UR               | LR        | LR                 | LR             | LC                    |
| Bie (2009) – P                    | UR               | LR        | LR                 | LR             | LC                    |
| Biselli (2015) – P                | LR               | LR        | LR                 | UR             | LC                    |
| Boin Ide (2008) – R               | UR               | LR        | LR                 | LR             | LC                    |
| Botta (2003) – R                  | LR               | LR        | LR                 | LR             | HC                    |
| Boursier (2009) – P               | LR               | LR        | LR                 | LR             | HC                    |
| Cerqueira (2012) – R              | UR               | LR        | LR                 | LR             | LC                    |
| Chan (2006) – R                   | LR               | LR        | LR                 | LR             | LC                    |
| Chaurasia (2013) – P              | LR               | LR        | LR                 | LR             | HC                    |
| Chawla (2011) – P                 | LR               | LR        | LR                 | LR             | LC                    |
| Chen (2011) – R                   | UR               | LR        | LR                 | LR             | LC                    |
| Chen (2013) – R                   | UR               | LR        | LR                 | LR             | LC                    |
| Cho (2011) – R                    | UR               | LR        | LR                 | LR             | LC                    |
| Choi (2009) – R                   | UR               | LR        | LR                 | LR             | LC                    |
| Cholongitas (2008) – R            | LR               | LR        | LR                 | LR             | LC                    |
| Corneille (2011) – R              | UR               | LR        | LR                 | LR             | LC                    |
| Costa (2009) – R                  | UR               | LR        | LR                 | LR             | LC                    |
| Das (2010) – R                    | UR               | LR        | LR                 | LR             | LC                    |
| Degre (2004) – R                  | LR               | LR        | LR                 | LR             | LC                    |
| Dhiman (2014) – P                 | UR               | LR        | LR                 | LR             | LC                    |
| Duseja (2013) – P                 | LR               | LR        | LR                 | LR             | LC                    |
| Ecochard (2011) – R               | LR               | LR        | LR                 | LR             | LC                    |
| Emerson (2014) – P                | LR               | LR        | LR                 | LR             | LC                    |
| Fede (2011) – R                   | LR               | LR        | LR                 | LR             | LC                    |
| Fejfar (2006) – R                 | UR               | LR        | LR                 | LR             | LC                    |
| Flores-Rendon (2008) – R          | UR               | LR        | LR                 | LR             | LC                    |
| Giannini (2004) – P               | UR               | LR        | LR                 | LR             | LC                    |
| Gomez (2009) – P                  | LR               | LR        | LR                 | UR             | HC                    |
| Gotthardt (2009) – R              | LR               | LR        | LR                 | UR             | LC                    |
| Gotzberger (2012) – P             | LR               | LR        | LR                 | LR             | HC                    |
| Grunhage (2008) – P               | UR               | LR        | LR                 | LR             | HC                    |
| Hassan (2013) – R                 | LR               | LR        | LR                 | LR             | HC                    |
| Hoteit (2008) – R                 | UR               | LR        | LR                 | UR             | LC                    |
| Huo (2005) – P                    | UR               | LR        | LR                 | LR             | LC                    |
| Huo (2006) – P                    | UR               | LR        | LR                 | LR             | LC                    |
| Huo (2005) – P/R                  | UR               | LR        | LR                 | LR             | LC                    |
| Hyun (2012) – R                   | LR               | LR        | LR                 | UR             | LC                    |
| Ishizu (2014) – R                 | UR               | LR        | LR                 | LR             | LC                    |
| Jalan (2014) – P                  | UR               | LR        | LR                 | LR             | LC                    |
| Jiang (2009) – R                  | UR               | LR        | LR                 | LR             | HC                    |
| Jiang (2013) – R                  | UR               | LR        | LR                 | LR             | HC                    |
| Kalabay (2007) – P                | UR               | LR        | LR                 | LR             | LC                    |
| Khan (2009) – R                   | UR               | LR        | LR                 | LR             | LC                    |
| Kim (2014) – R                    | UR               | LR        | LR                 | UR             | LC                    |
| Kim (2007) – R                    | UR               | LR        | LR                 | LR             | HC                    |
| First Author, year – Study Design | Risk of Bias (LR/UR/HR) | Applicability Concerns (LC/UC/HC) |
|----------------------------------|--------------------------|----------------------------------|
| Kim (2014) – P                   | LR LR LR LR LR           | LC HC HC                          |
| Koo (2013) – R                   | UR LR LR LR LR           | HC HC HC                          |
| Krishnan (2013) – R              | LR LR LR LR UR           | LC HC HC                          |
| Kwon (2014) – P                  | UR LR LR LR LR           | LC HC HC                          |
| Lee (2002) – R                   | UR LR LR LR LR           | LC HC HC                          |
| Lee (2015) – R                   | UR LR LR LR LR           | LC HC HC                          |
| Levesque (2012) – P              | LR LR LR LR LR           | LC HC HC                          |
| Lim (2011) – R                   | UR LR LR LR LR           | LC HC HC                          |
| Lim (2009) – R                   | UR LR LR LR LR           | LC HC HC                          |
| Lv (2009) – R                    | UR LR LR LR LR           | HC HC HC                          |
| Malliyappan (2013) – R/P         | UR LR LR LR LR           | LC HC HC                          |
| Mishra (2007) – P                | UR LR LR LR LR           | HC HC HC                          |
| Moreno (2013) – P                | LR LR LR LR LR           | LC HC HC                          |
| Mouelhi (2010) – R               | UR LR LR LR LR           | LC HC HC                          |
| Nunes (2010) – P                 | UR LR LR LR UR           | LC HC HC                          |
| Olmez (2012) – P                 | UR LR UR LR LR           | LC HC HC                          |
| Oroff (2012) – R/CT              | LR UR LR LR LR           | LC HC HC                          |
| Papatheodoridis (2005) – R       | UR LR LR LR LR           | LC HC HC                          |
| Park (2014) – P                  | UR LR LR LR UR           | HC HC HC                          |
| Peng (2015) – R                  | UR LR LR LR LR           | LC HC HC                          |
| Perkins (2004) – R               | UR LR LR LR LR           | LC HC HC                          |
| Radha Krishna (2009) – R         | UR LR LR LR LR           | LC HC HC                          |
| Rahimi-Dekordi (2014) – P        | UR LR LR LR LR           | LC HC HC                          |
| Raszeja-Wyszomirska (2009) – R   | LR LR LR LR LR           | LC HC HC                          |
| Reverter (2014) – P              | UR LR LR LR LR           | LC HC HC                          |
| Ripoll (2007) – R/CT             | LR LR LR LR LR           | LC HC HC                          |
| Salerno (2002) – R               | LR LR LR LR UR           | LC HC HC                          |
| Schepke (2003) – P               | LR LR LR LR LR           | LC HC HC                          |
| Seamon (2010) – R                | LR LR LR LR LR           | LC HC HC                          |
| Sempere (2009) – R               | UR LR LR LR LR           | LC HC HC                          |
| Serra (2004) – R                 | LR LR LR LR LR           | LC HC HC                          |
| Serste (2012) – P                | LR LR LR LR LR           | LC HC HC                          |
| Shahal (2010) – Descriptive      | LR LR LR LR LR           | LC HC HC                          |
| Sharma (2010) – P                | LR LR LR LR LR           | LC HC HC                          |
| Song (2011) – R                  | UR LR LR LR LR           | LC HC HC                          |
| Song (2014) – R                  | LR LR LR LR LR           | LC HC HC                          |
| Stewart (2007) – R               | UR LR LR LR LR           | HC HC HC                          |
| Su (2001) – R                    | LR LR LR LR LR           | LC HC HC                          |
| Sut (2014) – P                   | UR LR UR LR LR           | LC HC HC                          |
| Suman (2004) – R                 | UR LR LR LR LR           | LC HC HC                          |
| Tacke (2007) – R                 | LR LR LR LR UR           | LC HC HC                          |
| Takaya (2012) – R                | UR LR LR LR UR           | HC HC HC                          |
| Tas (2012) – R                   | UR LR LR LR LR           | LC HC HC                          |
| Tas (2012) – R                   | UR LR LR LR LR           | LC HC HC                          |
| Teng (2014) – R                  | UR LR LR LR LR           | LC HC HC                          |
| Theocharidou (2014) – R          | LR LR LR LR LR           | LC HC HC                          |
| Thielmann (2010) – R             | LR LR LR LR LR           | LC HC HC                          |
| Tu (2011) – P                    | LR LR LR LR LR           | LC HC HC                          |
| Tzeng (2009) – R                 | LR LR LR LR LR           | LC HC HC                          |
| Vanhuysse (2012) – R             | UR LR LR LR LR           | LC HC HC                          |
| Velayutham (2012) – R            | LR LR LR LR LR           | LC HC HC                          |
| Viasus (2011) – P                | LR LR LR LR LR           | LC HC HC                          |
| Wang (2014) – P                  | LR LR LR LR LR           | LC HC HC                          |
| Wiesner (2003) – P               | UR LR LR LR LR           | LC HC HC                          |
| Wu (2015) – P                    | UR LR LR LR LR           | LC HC HC                          |
| Xie (2013) – R                   | LR LR UR LR LR           | LC HC HC                          |
| Xiong (2004) – R                 | UR LR LR LR LR           | HC HC HC                          |
| Zapata (2004) – R                | LR LR LR LR LR           | LC HC HC                          |
Meta-analyses were performed according to the clinical presentations, etiology of liver diseases, patients’ conditions, treatment options, and endpoints (Table 4).

Subgroup Analysis According to the Clinical Presentations

Two studies were eligible for the subgroup meta-analysis to compare the diagnostic accuracy of Child–Pugh versus MELD score in patients with ACLF. The mean AUSROC of MELD score was larger than that of Child–Pugh score. There was not statistically significant diagnostic threshold effect in the meta-analysis of Child–Pugh or MELD score. The 95% CIs of DORs, NLRs, and PLRs were overlapped between them. But the 95% CIs of sensitivities and specificities were not overlapped. Child–Pugh score had a higher summary sensitivity than MELD score, but MELD score had a higher summary specificity than Child–Pugh score.

Four studies were eligible for the subgroup meta-analysis to compare the diagnostic accuracy of Child–Pugh versus MELD score in patients with UGIB. The mean AUSROC of MELD score was larger than that of Child–Pugh score. There was a statistically significant diagnostic threshold effect in the meta-analysis of Child–Pugh or MELD score. The 95% CIs of DORs, NLRs, PLRs, and specificities were overlapped between them. But the 95% CIs of specificities were not overlapped. Child–Pugh score had a higher summary specificity than MELD score.

Subgroup Analysis According to the Etiology of Liver Diseases

Two studies were eligible for the subgroup meta-analysis to compare the diagnostic accuracy of Child–Pugh versus MELD score in patients with alcohol alone related liver cirrhosis. The mean AUSROC of MELD score was larger than that of Child–Pugh score. There was not statistically significant diagnostic threshold effect in the meta-analysis of Child–Pugh or MELD score. The 95% CIs of DORs, NLRs, PLRs, and specificities were overlapped between them.

Two studies were eligible for the subgroup meta-analysis to compare the diagnostic accuracy of Child–Pugh versus MELD score in patients with hepatitis B virus alone related liver cirrhosis. The mean AUSROC of MELD score was larger than that of Child–Pugh score. There was a statistically significant diagnostic threshold effect in the meta-analysis of Child–Pugh or MELD score.

Subgroup Analysis According to the Patients’ Conditions

Six studies were eligible for the subgroup meta-analysis to compare the diagnostic accuracy of Child–Pugh versus MELD score in patients admitted to ICU. The mean AUSROC of MELD score was larger than that of Child–Pugh score. There was not statistically significant diagnostic threshold effect in the meta-analysis of Child–Pugh or MELD score. The 95% CIs of DORs, PLRs, and specificities were overlapped between them. But the 95% CIs of PLRs and sensitivities were not overlapped. MELD score had a higher summary specificity than Child–Pugh score.

Four studies were eligible for the subgroup meta-analysis to compare the diagnostic accuracy of Child–Pugh versus MELD score in LT candidates. The mean AUSROC of MELD score was larger than that of Child–Pugh score. There was no statistically significant diagnostic threshold effect in the meta-analysis of Child–Pugh or MELD score. The 95% CIs of DORs, PLRs, and specificities were overlapped between them. But the 95% CIs of specificities were not overlapped. Child–Pugh score had a higher summary specificity than MELD score.

Subgroup Analysis According to the Treatment Options

Five studies were eligible for the subgroup meta-analysis to compare the diagnostic accuracy of Child–Pugh versus MELD score in patients who underwent surgery. The mean AUSROC of Child–Pugh score was larger than that of MELD score. There was no statistically significant diagnostic threshold effect in the meta-analysis of Child–Pugh or MELD score. The 95% CIs of DORs, NLRs, PLRs, and specificities were overlapped between them. But the 95% CIs of specificities were not overlapped. Child–Pugh score had a higher summary specificity than MELD score.
### TABLE 4. Results of Meta-Analyses

| Subgroup                                      | No. Total Studies | No. Groups Analyzed | Prognostic Index | AUC ± SE | Threshold Analysis (P Value) | Diagnostic OR (95% CI) | Negative LR (95% CI) | Positive LR (95% CI) | Sensitivity (95% CI) | Specificity (95% CI) |
|-----------------------------------------------|-------------------|---------------------|------------------|----------|-----------------------------|-------------------------|----------------------|----------------------|----------------------|----------------------|
| **Subgroup according to clinical presentations** |                   |                     |                  |          |                             |                         |                      |                      |                      |                      |
| ACLF                                          | 2                 | 3                   | Child            | 0.5278 ± 0.0954 | 0.667 | 4.68 (1.63–13.45)          | 0.36 (0.16–0.83)       | 1.66 (1.37–2.01) | 0.81 (0.73–0.87) | 0.51 (0.43–0.58)    |
| MELD                                          | 2                 | 3                   | Child            | 0.7247 ± 0.0418 | 0.667 | 5.20 (3.13–8.64)          | 0.51 (0.41–0.64)       | 2.59 (1.31–4.43) | 0.63 (0.54–0.71) | 0.77 (0.70–0.83)    |
| **Subgroup according to etiology of liver diseases** |               |                     |                  |          |                             |                         |                      |                      |                      |                      |
| Alcohol                                       | 2                 | 4                   | Child            | 0.8317 ± 0.0406 | 0.600 | 9.18 (5.25–18.30)         | 0.34 (0.24–0.50)       | 3.21 (2.44–4.22) | 0.74 (0.63–0.83) | 0.76 (0.71–0.82)    |
| MELD                                          | 2                 | 3                   | Child            | 0.7445 ± 0.0203 | 0.058 | 4.76 (3.56–6.37)          | 0.50 (0.42–0.60)       | 2.26 (1.79–2.86) | 0.67 (0.62–0.71) | 0.63 (0.60–0.65)    |
| **Subgroup according to patient conditions**   |                   |                     |                  |          |                             |                         |                      |                      |                      |                      |
| ICU                                           | 6                 | 6                   | Child            | 0.7531 ± 0.0313 | 0.872 | 4.97 (3.04–8.14)          | 0.48 (0.36–0.65)       | 2.26 (1.81–2.83) | 0.66 (0.61–0.71) | 0.70 (0.66–0.75)    |
| LT candidates                                 | 4                 | 4                   | Child            | 0.8062 ± 0.0466 | 0.600 | 10.89 (4.36–27.21)        | 0.32 (0.22–0.47)       | 3.42 (2.01–5.80) | 0.76 (0.69–0.83) | 0.76 (0.72–0.79)    |
| **Subgroup according to treatment options**    |                   |                     |                  |          |                             |                         |                      |                      |                      |                      |
| Surgery                                       | 5                 | 6                   | Child            | 0.8342 ± 0.0322 | 0.468 | 11.10 (6.01–20.49)        | 0.38 (0.19–0.75)       | 3.71 (2.29–6.03) | 0.70 (0.61–0.79) | 0.82 (0.79–0.84)    |
| MELD                                          | 0.8545 ± 0.0384  | 0.784               | 6.66 (6.66–13.86)| 0.29 (0.39–0.35)| 2.67 (2.19–3.26)| 0.80 (0.76–0.84)| 0.70 (0.66–0.75)|                      |                      |                      |
| TIPS                                          | 2                 | 2                   | Child            | 0.8062 ± 0.0466 | 0.600 | 10.89 (4.36–27.21)        | 0.32 (0.22–0.47)       | 3.42 (2.01–5.80) | 0.76 (0.69–0.83) | 0.76 (0.72–0.79)    |
| **Subgroup according to endpoints**            |                   |                     |                  |          |                             |                         |                      |                      |                      |                      |
| In-hospital mortality                         | 5                 | 5                   | Child            | 0.7051 ± 0.0345 | 0.037 | 11.01 (6.01–20.49)        | 0.38 (0.19–0.75)       | 3.71 (2.29–6.03) | 0.70 (0.61–0.79) | 0.82 (0.79–0.84)    |
| MELD                                          | 0.7437 ± 0.1444  | 0.505               | 8.17 (3.68–18.14)| 0.32 (0.20–0.51)| 2.59 (1.31–4.43)| 0.75 (0.71–0.79)| 0.66 (0.62–0.69)|                      |                      |                      |
| 3-month mortality                             | 8                 | 9                   | Child            | 0.7093 ± 0.0255 | 0.025 | 11.01 (6.01–20.49)        | 0.38 (0.19–0.75)       | 3.71 (2.29–6.03) | 0.70 (0.61–0.79) | 0.82 (0.79–0.84)    |
| MELD                                          | 0.7936 ± 0.0254  | 0.010               | 11.01 (6.01–20.49)| 0.38 (0.19–0.75)| 3.71 (2.29–6.03) | 0.70 (0.61–0.79) | 0.82 (0.79–0.84) |                      |                      |                      |
| 6-month mortality                             | 7                 | 7                   | Child            | 0.8867 ± 0.0228 | 0.008 | 11.01 (6.01–20.49)        | 0.38 (0.19–0.75)       | 3.71 (2.29–6.03) | 0.70 (0.61–0.79) | 0.82 (0.79–0.84)    |
| MELD                                          | 0.8896 ± 0.0343  | 0.760               | 21.67 (7.45–63.03)| 0.23 (0.11–0.46)| 4.47 (3.00–6.66)| 0.73 (0.67–0.79)| 0.81 (0.79–0.84)|                      |                      |                      |
| 12-month mortality                            | 8                 | 8                   | Child            | 0.7421 ± 0.0270 | 0.233 | 5.12 (3.52–7.82)          | 0.50 (0.39–0.64)       | 2.54 (1.86–3.46) | 0.58 (0.54–0.63) | 0.72 (0.69–0.75)    |
| MELD                                          | 0.7420 ± 0.0375  | 0.139               | 5.12 (3.52–7.82) | 0.50 (0.39–0.64) | 2.54 (1.86–3.46) | 0.58 (0.54–0.63) | 0.72 (0.69–0.75) |                      |                      |                      |

ACLF = acute-on-chronic liver failure, AUC = area under the curve, CI = confidence interval, HBV = hepatitis B virus, ICU = intensive care unit, LR = likelihood ratio, LT = liver transplantation, MELD = model for end-stage liver disease, NA = not available, OR = odds ratio, SE = standard error, TIPS = transjugular intrahepatic portosystemic shunt, VB = variceal bleeding.
Two studies were eligible for the subgroup meta-analysis to compare the diagnostic accuracy of Child–Pugh versus MELD score in patients who underwent TIPS. Because only 2 comparisons were eligible for the subgroup meta-analysis, the mean AUSROC of Child–Pugh and MELD scores could not be calculated. The 95% CIs of DORs, NLRs, PLRs, sensitivities, and specificities were overlapped between them.

Subgroup Analysis According to the Endpoints

Five studies were eligible for the subgroup meta-analysis to compare the diagnostic accuracy of Child–Pugh versus MELD score for predicting the in-hospital mortality. The mean AUSROC of MELD score was larger than that of Child–Pugh score. There was a statistically significant diagnostic threshold effect in the meta-analysis of Child–Pugh score. DOR, NLR, PLR, sensitivity, or specificity of Child–Pugh score was not calculated.

Eight studies were eligible for the subgroup meta-analysis to compare the diagnostic accuracy of Child–Pugh versus MELD score for predicting the 3-month mortality. The mean AUSROC of MELD score was larger than that of Child–Pugh score. There were statistically significant diagnostic threshold effects in the meta-analyses of Child–Pugh and MELD scores. DORs, NLRs, PLRs, sensitivities, or specificities of Child–Pugh and MELD scores were not calculated.

Seven studies were eligible for the subgroup meta-analysis to compare the diagnostic accuracy of Child–Pugh versus MELD score for predicting the 6-month mortality. The mean AUSROC of MELD score was larger than that of Child–Pugh score. There was a statistically significant diagnostic threshold effect in the meta-analysis of Child–Pugh score. DOR, NLR, PLR, sensitivity, or specificity of Child–Pugh score was not calculated.

Eight studies were eligible for the subgroup meta-analysis to compare the diagnostic accuracy of Child–Pugh versus MELD score for predicting the 12-month mortality. The mean AUSROC of MELD score was larger than that of MELD score. There was no statistically significant diagnostic threshold effect in the meta-analysis of Child–Pugh or MELD score. The 95% CIs of DORs, NLRs, PLRs, sensitivities, and specificities were overlapped between them.

DISCUSSION

To our knowledge, this is the most comprehensive review to evaluate the diagnostic accuracy of Child–Pugh and MELD scores in patients with liver cirrhosis. Indeed, several previous narrative reviews regarding their prognostic values had been published by top experts. By comparison, our study employed a systematic search strategy to maximize the number of relevant papers. Several additional strengths included: the study and patient characteristics were systematically analyzed; the study quality was carefully evaluated; the clinical significance of Child–Pugh and MELD scores was further subdivided according to the different study population; and the meta-analysis was employed to synthesize the statistical results. Some remarkable findings should be summarized as follows.

First, in patients with ACLF, Child–Pugh score had a significantly higher specificity than MELD score, because the 95% CIs were not overlapped among them and the lower limit of 95% CI of MELD score was higher than the upper limit of 95% CI of Child–Pugh score (0.73 < 0.71); by contrast, MELD score had a significantly higher specificity than Child–Pugh score, because the 95% CIs were not overlapped among them and the lower limit of 95% CI of MELD score was higher than the upper limit of 95% CI of Child–Pugh score (0.70 > 0.58). These findings suggested that Child–Pugh score might have a better discriminative ability to predict the probability of developing some endpoint events in patients with ACLF, and that MELD score might have a better discriminative ability to predict the probability of free of developing some endpoint events in such patients.

Second, in patients admitted to ICU, MELD score had a significantly smaller NLR than Child–Pugh score, because the 95% CIs were not overlapped among them and the upper limit of 95% CI of MELD score was smaller than the lower limit of 95% CI of Child–Pugh score (0.35 < 0.36). MELD score also had a significantly higher sensitivity than Child–Pugh score, because the 95% CIs were not overlapped among them and the lower limit of 95% CI of MELD score was higher than the upper limit of 95% CI of Child–Pugh score (0.76 > 0.71). These findings suggested that MELD score might have a better discriminative ability to predict the probability of developing some endpoint events in such patients.

Third, in patients undergoing surgery, Child–Pugh score had a significantly higher specificity than MELD score, because the 95% CIs were not overlapped among them and the lower limit of 95% CI of Child–Pugh score was higher than the upper limit of 95% CI of MELD score (0.79 < 0.73). These findings suggested that Child–Pugh score might have a better discriminative ability to predict the probability of free of developing some endpoint events in such patients.

Fourth, Child–Pugh and MELD scores had statistically similar discriminative abilities in some subgroups (i.e., patients with alcohol alone related liver cirrhosis, LT candidates, patients undergoing TIPS, and 12-month mortality as the endpoint).

Fifth, because of statistically significant diagnostic threshold effects, DORs, NLRs, PLRs, sensitivities, or specificities could not be compared in some subgroups (i.e., patients with acute gastrointestinal bleeding, patients with hepatitis B virus alone related liver cirrhosis, in-hospital mortality as the endpoint, 3-month mortality as the endpoint, and 6-month mortality as the endpoint). Our study had 2 major limitations. First, although a great number of papers were included in the systematic review, not all included studies were eligible for our meta-analysis. Additionally, in some subgroup analyses, DORs, NLRs, PLRs, sensitivities, or specificities were not available. Thus, the combination of data from some selected papers could result in the potential bias. Second, the cut-off values of Child–Pugh and MELD scores for the assessment of prognosis were different among included studies. Therefore, we could not obtain any accurate thresholds for identifying the high-risk or low-risk patients.

In conclusion, we provided an overview regarding the comparison of Child–Pugh and MELD scores for the assessment of prognosis in liver cirrhosis. Both of them had similar prognostic significance in most of cases. However, given their distinctive benefits for some specific conditions, further studies might be necessary to clarify the candidates who should use Child–Pugh or MELD score for the assessment of prognosis and the timing when we should use Child–Pugh or MELD score for the assessment of prognosis. New scores should also be proposed to more accurately assess the prognosis of patients with liver disease based on prospective studies.
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