

## **Supplementary material**

**Supplementary Figure 1** – The search used in PubMed and EMBASE databases.

("Compensated cirrho\*" OR "compensated liver cirrhosis"[Mesh]) AND ("prognos\*" OR "predict\*" OR "biomarkers"[MeSH Terms] OR biomarkers[Text Word]) AND (("Acute Kidney Injury\*" [Mesh] OR "Hepatorenal syndrome"[Mesh] OR "Acute Kidney Injury" OR "AKI" OR "Acute kidney disease" OR "AKD" "acute renal failure" OR "acute kidney failure" OR "hepatorenal syndrome" or HRS) OR ("Hepatic Encephalopathy"[Mesh] OR "hepatic encephalopathy" OR HE) OR ("Liver failure"[Mesh] OR "Acute-on-chronic liver failure"[Mesh] OR "Acute-on-chronic liver failure" OR "ACLF") OR ("Infection\*" [Mesh] OR "peritonitis"[Mesh] OR "infection\*" OR "bacteremi\*" OR "bacteraemi\*" OR "urinary tract infection\*" OR "UTI" OR "pneumonia" OR "spontaneous bacterial peritonitis" OR "SBP" OR "sepsis" OR "cellulitis" OR "soft tissue infection\*") OR ("gastrointestinal hemorrhage"[Mesh] OR "variceal bleed\*" OR "gastrointestinal hemorrhage" OR "gastrointestinal haemorrhage" OR "gastrointestinal bleed\*" OR "GI hemorrhage" OR "GI haemorrhage" OR "GI bleed\*") OR ("ascites"[Mesh] OR "ascitic fluid"[Mesh] OR "edema"[Mesh] OR "ascit\*") OR ("jaundice"[Mesh] OR "jaundice\*" OR "icter\*") OR ("clinical outcome" OR "disease course" OR "disease severity" or "complicat" or "decompensat\*") OR ("COVID-19"[All Fields] OR "COVID-19"[MeSH Terms] OR "SARS-CoV-2"[All Fields] OR "sars-cov-2"[MeSH Terms] OR "Severe Acute Respiratory Syndrome Coronavirus 2"[All Fields] OR "NCOV"[All Fields] OR "2019 NCOV"[All Fields]) OR ("pneumonia"[MeSH Terms] OR pneumonia[Text Word])) NOT REVIEW [Publication Type] NOT CONGRESS [Publication Type]

*\*PubMed search used MeSH terms whereas EMBASE search used Emtree terms.*

**Supplementary Table 1: Characteristics of all studies included in review, subclassified by biomarker category.** Biomarkers that predicted decompensation are highlighted in green, versus those that were not significant predictors which are highlighted in red. Median values are indicated with an \*.

Study	Publication year	Number of patients	Number of patients with biomarker and outcome	Biomarker(s) Significant predictors of decompensation or not significant predictors	Design	Male %	Age (y) mean or median	MELD mean or median	Follow-up time (months) mean or median
<i>BLOOD MARKERS</i>									
Allen, A.M. et al <sup>21</sup>	2022	5123	5123	Albumin Bilirubin Platelets INR Creatinine	Prospective cohort	47	52*	n/a	76.9*
Are, V.S. et al <sup>61</sup>	2021	162	162	ELF score (TIMP-1, PIINP and hyaluronic acid)	Phase 2 RCT	n/a	n/a	n/a	12.0
Bajaj, J.S. et al <sup>62</sup>	2023	157	72	Bacterial composition	Prospective cohort	n/a	59	8.9	14.3
Calzadilla-Bertot, L. et al <sup>63</sup>	2021	543	543	ABIDE score Albumin Bilirubin Platelets AST/ALT INR	Retrospective cohort	46	n/a	8.2	67.2*
Chen, Q. et al <sup>64</sup>	2023	688	688	Laminin Collagen IV Gamma GT Platelets	Retrospective cohort	60	52*	7*	22.0*
Cordova, C. et al <sup>65</sup>	1986	41	41	Prekallikrein	Prospective cohort	66	n/a	n/a	n/a
Fujiwara, N. et al <sup>66</sup>	2022	122	122	PLSec (VCAM-1, IGFBP-7, gp130, matrilysin, IL-6, CCL-21, angiogenin and protein S)	Prospective cohort	66	51*	n/a	66.0*
Garcia Garcia de Paredes, A. et al <sup>67</sup>	2021	105	105	Serum miR-181b-5p	RCT	60	65*	6.0*	36.0*
Gatselis, N.K. et al <sup>68</sup>	2020	632	632	Golgi protein-73	Retrospective cohort	60	57*	n/a	50.0*
Guéchet, J. et al <sup>19</sup>	2000	91	91	Serum hyaluronan Albumin Bilirubin Platelets ALP INR CP score	Retrospective cohort	70	56	n/a	38.0
Guha, I.N. et al <sup>69</sup>	2019	379	379	ALBI score MELD score	Prospective cohort	66	61*	7.50*	455.1*
Hartl, L. et al <sup>70</sup>	2021	663	307	Renin ProBNP Copeptin	Retrospective cohort	68	57	11.0	26.2*
Hsu, C.Y. et al <sup>71</sup>	2021	3722	3722	ALBI-FIB4 score MELD score	Retrospective cohort	55	59	9.6	17.2

				CP score					
Innes, H. et al <sup>72</sup>	2022	1196	907	ALBI-FIB4 score MELD score	Prospective cohort	73	56	9.8	26.4
Merchante, N. et al <sup>73</sup>	2018	282	282	Bacterial translocation CP score	Retrospective analysis of two prospective cohorts	81	45*	8.0*	51.0*
Navadurong, H. et al <sup>74</sup>	2023	123	123	ALBI	Retrospective cohort	59	64	8.7*	36.0*
Qamar, A.A. et al <sup>75</sup>	2009	213	213	Hematologic indices	Retrospective cohort nested in RCT	n/a	n/a	n/a	54.9*
Saeki, C. et al <sup>76</sup>	2023	148	148	Insulin-like growth factor 1 Albumin	Retrospective cohort	65	69*	8.0*	57.1*
Schneider, A.R.P. et al <sup>55</sup>	2022	6049	6049	EPOD score Albumin Bilirubin Platelets	Retrospective cohort	55	61*	9.0*	60.0*
Schwarzer, R. et al <sup>77</sup>	2020	194	194	VITRO score (von Willebrand, platelets) MELD score	Prospective cohort	56	56*	9.0*	45.0*
Tornai, D. et al <sup>78</sup>	2021	244	101	Serum ferritin	Retrospective cohort	47	54*	9.0*	24.0
Wong, Y.J. et al <sup>79</sup>	2022	633	633	CHESS-ALARM score	Retrospective cohort	69	53	7.0	39.0*
Yuan, L. et al <sup>26</sup>	2019	164	83	ALT	Retrospective cohort	87	40	n/a	n/a
<b>HVPG</b>									
Colecchia, A. et al <sup>23</sup>	2014	122	92	HVPG Spleen stiffness Platelets MELD score AST/ALT	Prospective cohort	69	57*	9.0*	24.0
Jindal, A. et al <sup>40</sup>	2020	741	741	HVPG	Retrospective cohort	71	n/a	10.4	19.2
Joly, J.G. et al <sup>41</sup>	1971	38	38	HVPG	Prospective cohort	90	46	n/a	n/a
Pérez-Latorre, L. et al <sup>33</sup>	2014	60	60	HVPG Liver stiffness	Retrospective cohort	72	46*	n/a	42.0*
Rincón, D. et al <sup>24</sup>	2013	145	145	HVPG Albumin Platelets MELD score	Retrospective cohort	77	51*	9.0*	27.0*
Ripoll, C. et al <sup>25</sup>	2007	213	213	HVPG Albumin Platelets AST/ALT MELD score CP score	Retrospective cohort nested in RCT	59	54*	8.0*	51.1*
Turco, L. et al <sup>42</sup>	2018	151	151	HVPG	Prospective cohort	68	60	8.0	18.4
<b>LIVER STIFFNESS</b>									
Asesio, N. et al <sup>22</sup>	2022	455	455	Liver stiffness Albumin Bilirubin Platelets INR	Retrospective cohort	72	58*	n/a	n/a

Dillon, A. et al <sup>80</sup>	2018	244	244	Liver stiffness Albumin Platelets INR MELD score	Prospective cohort	32	56	7.5*	35.5*
Gidener, T. et al <sup>81</sup>	2021	829	194	Liver stiffness	Retrospective cohort	37	64*	n/a	60.0*
Gidener, T. et al <sup>82</sup>	2022	1269	277	Liver stiffness MELD score CP score	Retrospective cohort	57	57*	8.0*	122.5*
Jindal, A. et al <sup>30</sup>	2022	626	626	Liver stiffness Albumin	Prospective cohort	72	51	n/a	26.0*
Kim, B.K. et al <sup>28</sup>	2012	217	217	Liver stiffness Platelets	Prospective cohort	65	50	n/a	42.1*
Merchante, N. et al <sup>29</sup>	2012	239	239	Liver stiffness MELD score CP score	Prospective cohort	90	44*	7.0*	20.7*
Merchante, N. et al <sup>31</sup>	2017	446	446	Liver stiffness	Prospective cohort	88	49*	7.0*	49.0*
Merchante, N. et al <sup>32</sup>	2015	275	275	Liver stiffness	Prospective cohort	89	44*	7.0*	32.0*
Semmler, G. et al <sup>34</sup>	2022	1173	755	Liver stiffness	Retrospective cohort	n/a	n/a	n/a	55.4*
Wang, J.H. et al <sup>83</sup>	2014	220	220	Liver stiffness Bilirubin AST/ALT	Prospective cohort	61	57*	n/a	36.9*
Zarski, J.P. et al <sup>35</sup>	2020	219	219	Liver stiffness	Retrospective case-control	64	58*	n/a	68.4
<i>PHYSIOLOGICAL</i>									
Berzigotti, A. et al <sup>43</sup>	2011	161	161	BMI	Prospective RCT	59	54	8.7	59.0*
Gomez, E.V. et al <sup>84</sup>	2014	402	402	Mean Arterial Pressure (MAP) Platelets AST/ALT INR	Prospective cohort	39	59*	9.0*	35.9*
Henrique, D.M.N. et al <sup>46</sup>	2021	55	55	6-minute-walk-test CP score	Prospective cohort	65	56	n/a	12.0
Siramolpiwat, S. et al <sup>44</sup>	2021	152	152	LFI Albumin Bilirubin MELD score CP score	Prospective cohort	57	63	9.2	14.9
Wang, S. et al <sup>45</sup>	2022	822	214	LFI	Prospective cohort	66	55	n/a	14.4*
<i>IMAGING</i>									
Berzigotti, A. et al <sup>36</sup>	2008	127	127	Spleen size Albumin	Retrospective cohort	60	59	10.0	53.0
Elkassam, A.A. et al <sup>37</sup>	2022	191	191	Liver surface nodularity	Retrospective cohort	65	n/a	n/a	51.6*
Fallahzadeh, M.A. et al <sup>85</sup>	2021	70	35	Hepquant-SHUNT test	Prospective cohort	66	57*	6.0*	50.4*
Kondo, T. et al <sup>20</sup>	2016	236	110	Portal haemodynamics Albumin AST/ALT MELD score	Retrospective cohort	55	67*	10.0*	33.2*

Kwon, J.H. et al <sup>27</sup>	2021	1027	1027	Liver-to-spleen volume ratio MELD score CP score	Retrospective cohort	66	51	<10.0	116.0*
Lee, M.H. et al <sup>86</sup>	2013	107	107	201Tl heart-liver radioactivity uptake ratio Platelets	Retrospective cohort	75	55	n/a	45.5*
Smith, A.D. et al <sup>38</sup>	2017	830	326	Liver surface nodularity	Retrospective cohort	66	53*	8.5*	50.7*
Tae, H.-J. et al <sup>87</sup>	2014	209	209	Thalium Shunt Index	Prospective cohort	n/a	n/a	n/a	49.6*
Tapper, E.B. et al <sup>88</sup>	2020	274	111	Subcutaneous fat density MELD score	Prospective cohort	56	58	11.3	60.6*
Yang, W. et al <sup>89</sup>	2021	292	197	T2 mapping (gadoteric acid-enhanced MRI) Albumin MELD score	Retrospective cohort	80	63	7.9	18.7
Yu, Q. et al <sup>39</sup>	2022	689	689	Spleen volume	Retrospective cohort	64	54	6.7	37.6*
<i>MISCELLANEOUS</i>									
Boonpiraks K. et al <sup>90</sup>	2024	457	457	Diabetes CP score MELD	Retrospective cohort	59	64	9.9	54.0
Calvaruso, V. et al <sup>91</sup>	2015	118	118	Collagen proportionate area (CPA) Albumin Platelets	Prospective cohort	58	57	n/a	72.0*
Jain, D. et al <sup>92</sup>	2021	168	168	Thick fibrous septa Albumin Bilirubin Platelets INR Creatinine MELD score CP score	Retrospective cohort	76	49	8.8	50.0*
Lisotti, A. et al <sup>93</sup>	2016	154	154	ICG-R15 Platelets	Prospective cohort	66	60*	8.0*	39.0*
Yoo, H. et al <sup>94</sup>	2024	101	101	CPA INR APRI	Retrospective cohort	53	51	9.2	60.0*

**Supplementary Table 2 – Explanation of constituents of different scoring systems**

Scoring models	Constituents
ABIDE	INR, AST/ALT ratio, type 2 diabetes, presence of oesophageal varices, total bilirubin
ALBI	Bilirubin, albumin
ALBI-FIB4	ALBI score, AST, ALT, platelets
CHESS-ALARM	Age, gender, platelets, liver stiffness measurement
CTP	Ascites, bilirubin, albumin, PT, and encephalopathy
ELF	Tissue inhibitor matrix metalloproteinase 1 (TIMP-1), procollagen type III aminoterminal peptide (PIIINP) and hyaluronic acid
EPOD	Platelet count, albumin, bilirubin concentration
MELD	Bilirubin, serum creatinine and INR
VITRO	Von Willebrand factor antigen, platelets