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REVIEW

Overcoming the barriers in the screening, diagnosis, and follow-up of patients with metabolic dysfunction–associated steatotic liver disease (MASLD) and metabolic dysfunction–associated steatohepatitis (MASH)

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Abstract

In 2024, a comprehensive framework for the screening, diagnosis, and management of metabolic dysfunction–associated steatotic liver disease (MASLD) was incorporated in the EASL-EASD-EASO clinical practice guidelines. However, physicians often face barriers applying these recommendations in routine clinical care, especially in the Southeastern Europe, Middle East, and Africa (SEEMEA) region. As a multidisciplinary group of physicians involved in MASLD and metabolic dysfunction-associated steatohepatitis (MASH) management, our objective is to provide a practice-oriented roadmap including practical and educational considerations beyond the hepatology field that could improve patient care and support implementation of clinical guidance within the SEEMEA region. This work is informed by a narrative review and expert input obtained through structured discussions, to examine the status quo and identify key gaps in the MASLD/MASH management, unravelling the patient journey from screening and diagnosis to treatment and follow-up. Furthermore, we advise on priorities on screening triggers and, considering the limited availability of vibration-controlled transient elastography (VCTE), discuss alternative approaches to achieve accurate and timely diagnosis. Finally, following the approval of resmetirom and semaglutide 2.4 mg for MASH treatment, we review the evolving pharmacotherapy landscape and propose a "blueprint" for a specialised MASLD clinic, suggesting mandatory and optional facilities for optimised care.

Keywords MASLD · MASH · Screening · Transient elastography · GLP-1RAs · SEEMEA

Abbreviations

2D-SWE	two-dimensional shear wave elastography
ACE	angiotensin-converting enzyme
ADA	American Diabetes Association
AE	adverse event
AFP	α-fetoprotein
ALT	alanine aminotransferase
APRI	aspartate aminotransferase to platelet ratio index
ARB	angiotensin receptor blocker
AST	aspartate aminotransferase
AUROC	area under the receiver operating characteristic curve
BMI	body mass index
cACLD	compensated advanced chronic liver disease
CAP	controlled attenuation parameter
CKD	chronic kidney disease
CSPH	clinically significant portal hypertension
CT	computed tomography
CVD	cardiovascular disease

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EASD	European Association for the Study of Diabetes
EASL	European Association for the Study of the Liver
EASO	European Association for the Study of Obesity
ECG	electrocardiogram
ELF	enhanced liver fibrosis
EMA	European Medicines Agency
F	fibrosis stage
F2	moderate fibrosis
F3	severe fibrosis
F4	cirrhosis
FAST	FibroScan-AST
FDA	US Food and Drug Administration
FGF21	fibroblast growth factor 21
FIB-4	fibrosis-4
GIP	glucose-dependent insulinotropic polypeptide
GLP-1	glucagon-like peptide-1
GLP-1RA	glucagon-like peptide 1 receptor agonist
HBV	hepatitis B virus
HCC	hepatocellular carcinoma
HCV	hepatitis C virus
HDL-C	high-density lipoprotein cholesterol
HFpEF	heart failure with preserved ejection fraction
HFrFF	heart failure with reduced ejection fraction
ILI	intensive lifestyle intervention
LMIC	low- and middle-income country
LSM	liver stiffness measurement
MACE	major adverse cardiovascular events
MAF-5	metabolic dysfunction–associated fibrosis 5
MASH	metabolic dysfunction–associated steatohepatitis
MASLD	metabolic dysfunction–associated steatotic liver disease
MAST	MRI-aspartate aminotransferase
MetALD	metabolic dysfunction– and alcohol-associated steatotic liver disease
MRE	magnetic resonance elastography
MRI	magnetic resonance imaging
NAFLD	nonalcoholic fatty liver disease
NAS	NAFLD Activity Score
NFS	nonalcoholic fatty liver disease fibrosis score
NIT	noninvasive test
PCP	primary care physician
pSWE	point shear wave elastography
SAE	serious adverse event
SAFE	steatosis-associated fibrosis estimator
SEEMEA	Southeastern Mediterranean, Middle East, and Africa
SGLT2i	sodium/glucose co-transporter-2 inhibitor
SLD	steatotic liver disease
SWE	shear wave elastography
T2D	type 2 diabetes
TE	transient elastography
UI	uncertainty interval
US	United States
VCTE	vibration-controlled transient elastography

1 Introduction

Among chronic noncommunicable diseases, metabolic dysfunction–associated steatotic liver disease (MASLD) and its progression to the more advanced stage, metabolic dysfunction–associated steatohepatitis (MASH), constitute a well-defined organ and systemic disease, fuelled by unhealthy diet, sedentary lifestyle, obesity, and aging populations [1–3]. Formerly referred to as nonalcoholic fatty liver disease (NAFLD) and nonalcoholic steatohepatitis (NASH), the terms MASLD and MASH were proposed by a recent international, multisocietal Delphi consensus. The updated nomenclature aims to highlight the metabolic nature of the disease, increase disease awareness, improve diagnosis, and reduce the stigma associated with the previous nomenclature [4]. Additionally, metabolic dysfunction– and alcohol-associated steatotic liver disease (MetALD) was introduced to better characterise individuals with steatotic liver disease (SLD) and moderate alcohol intake [4].

Globally, the prevalence of MASLD has increased from 25.3% during 1990–2006 to 38.0% in 2016–2019 [5]. Low- and lower-middle- income countries (LMICs) contribute to approximately 43% of the global disease burden [6]. This rise closely parallels the global epidemics of type 2 diabetes (T2D), obesity, and metabolic syndrome, reflecting the shared underlying pathophysiology [7–11]. Therefore, MASLD further increases the risk of cardiovascular disease (CVD) and mortality and substantially impairs patients' quality of life [12–15].

Recognising the increasing burden of MASLD, the three leading European associations in metabolic health —European Association for the Study of the Liver (EASL), European Association for the Study of Diabetes (EASD), and European Association for the Study of Obesity (EASO)— published the first joint clinical practice guidelines in 2024 for the screening, diagnosis and management of MASLD and MASH [1].

As the clinical framework for MASLD and MASH management continues to evolve, we structured our work around Hippocrates's quote: "*Declare the past*, *diagnose the present*, *foretell the future*." This quote highlights the need to consider the patient's clinical history, perform accurate diagnoses of health conditions, and monitor disease progression. Using the patient journey outlined in the above

guidelines as a foundation, and focusing on the Southeastern Europe, Middle East, and Africa (SEEMEA) region, this work explores additional practical considerations at each stage of the patient's journey, aiming to optimise MASLD/MASH care across this region.

2 Scope and methodology

This review manuscript was developed as a narrative synthesis, integrating findings from the published literature with expert insights gathered through structured discussion sessions to provide a practice-oriented roadmap. A targeted literature search was conducted using advanced search strategies across major databases (e.g., PubMed and Google Scholar) covering publications to date. Relevant articles were selected based on their scientific contribution, recency, and relevance to clinical insights, while allowing flexibility typical of a narrative review. The information was synthesised and interpreted in line with the evolving evidence base, placing current knowledge, clinical guidelines, and emerging therapeutic data within the broader context of MASLD/MASH management. The approach was descriptive and interpretive rather than systematic, allowing for a comprehensive examination of scientific developments, key challenges, and areas of ongoing investigation. Expert input was used to enrich the interpretation of the evidence, but achieving expert agreement to provide definite recommendations and prescribing clinical practice were out of scope for this manuscript. Therefore, enclosed recommendations should be interpreted as a conditional stance, based on an integrated, expert-informed perspective on the state of the science.

3 The burden of MASLD and MASH in SEEMEA

3.1 Epidemiology

A comprehensive epidemiological analysis indicates that SEEMEA subregions rank among the highest globally in estimated age-standardised MASLD prevalence and incidence rates(Fig. S1) [16]. In 2021, the Middle East and North Africa (MENA) region exhibited the highest estimated prevalence and incidence of MASLD, with 27,686 (95% uncertainty interval [UI]: 25,586–29,914) and 1,075 (95% UI: 1,049–1,103) cases per 100,000 population, respectively [16].

In nations across the three main subregions of SEEMEA (Southeastern Europe, the Middle East, and Africa) country-level evidence demonstrates substantial variation. Kuwait (32,312 cases per 100,000 population; 95% UI: 29,947–34,839), Egypt (31,668 cases per 100,000 population; 95% UI: 29,272–34,224), and Bosnia and Herzegovina (16,526 cases per 100,000 population; 95% UI: 15,127–18,017) showed the highest estimated prevalence of MASLD [16].

Globally, the burden is disproportionately higher among people with T2D, with MASLD rates reaching up to 65.0% in 2023 and approximately 31.6% of people living with MASH [8]. Consistent with the global burdens, the highest burdens of MASLD and T2D were observed in low-middle sociodemographic index countries [17]. Additional evidence-based estimates from global meta-analyses indicate that the highest regional estimated prevalence was observed in Eastern Europe and the Middle East, with reported values of 80.6% and 71.2%, respectively [9]. In patients with both T2D and obesity, Eastern Europe also entailed the highest estimated prevalence of MASLD (88%) [9].

Beyond clinical implications, MASLD, and specifically its progression to MASH, poses a significant financial burden across SEEMEA. In Europe, the economic burden of MASH ranges from €8.5 to €19.5 billion [18–20]. In Saudi Arabia, United Arab Emirates, and Kuwait, MASH-related costs account for approximately 6–8% of national healthcare spending [21]. Importantly, these costs may be amplified by comorbidities, such as CVD [18].

3.2 The unmet needs in care

Despite the advancements in clinical guidelines, people with MASLD/MASH in LMICs, and even in high-income countries within the SEEMEA region, receive suboptimal care [21–23]. Barriers persist, including limited healthcare resources, low adherence to clinical guidelines, diagnostic challenges, poor coordination between specialists, scarcity of specialised clinics, gaps in clinical education, inadequate public awareness, and lack of reimbursement schemes [22, 24–28].

In the MENA region, 73.1% of clinicians report the absence of a national MASLD strategy, and while 60% endorse multidisciplinary care, their implementation remains inconsistent [27]. Specialised MASLD clinics are almost non-existent, with fewer than 1% of patients using them as their first point of contact for MASLD, highlighting a substantial care gap [27].

Insufficient adherence to guideline recommendations was revealed by a survey investigating the real-world use of non-invasive tests (NITs) across 43 countries, including 17 countries from SEEMEA. Approximately one in three healthcare professionals (HCPs) were not following any guideline-recommended algorithm, while one in two had not used FIB-4

or vibration-controlled transient elastography (VCTE) as a first- and second-line NIT, respectively [28].

Beyond the use of NITs, diagnostic challenges may occur from the advancements in disease classification. Although many national societies across SEEMEA have endorsed the new nomenclature, this transition may lead to coding-related challenges [29–31]. In addition, it may contribute to misclassification of MetALD as MASLD, as MetALD diagnosis relies on self-reported alcohol intake, which is frequently underestimated [4, 31, 32]. Alcohol use becomes increasingly stigmatised as consumption rises, and in regions where alcohol is prohibited, such as parts of the Middle East, under-reporting is particularly common [33, 34]. However, under-reporting is also well documented in European countries; past-week unrecorded alcohol use was estimated at 12.1%, with Greece reporting the highest level at 27% [35].

Finally, limited access to effective treatment options and lack of robust data on the cost-effectiveness of the available therapies are major obstacles in the management of MASLD/MASH in SEEMEA. Until 2024, weight loss was the cornerstone of MASLD/MASH management, but the conditional approval of resmetirom and semaglutide 2.4 mg for adults with noncirrhotic MASH and moderate to advanced fibrosis, has marked a major shift in the therapeutic landscape [1, 36–38].

The cost-effectiveness of both therapies in MASH was assessed as adjuncts to intensive lifestyle interventions (ILIs) across 12 countries with diverse healthcare systems, economic contexts, and epidemiological profiles, including five in the SEEMEA region (Italy, Saudi Arabia, South Africa, Spain, and Tanzania) [39]. In this analysis, the standard of care demonstrated the lowest average cost-effectiveness ratios in all SEEMEA countries except Saudi Arabia, while ILIs alone were cost-effective in all countries assessed [39]. Overall, semaglutide was cost-effective in more countries than resmetirom [39]. In the included SEEMEA countries, semaglutide was not cost-effective in Tanzania, whereas resmetirom was not cost-effective in South Africa and Tanzania [39].

Among populations with obesity and CVD but without MASH, a US-based study indicated that semaglutide is associated with a gain of 0.22 quality-adjusted life years (QALYs) at substantial lifetime cost. Importantly, cost savings in this analysis were driven by the avoidance of cardiometabolic diseases such as T2D, chronic kidney disease (CKD), and cardiovascular events, highlighting the potential for broader health system value [40]. Nonetheless, these findings require confirmation in SEEMEA regional settings, specifically within the context of MASLD/MASH care. Despite these potential benefits, the World Health Organisation emphasised that without deliberate policy measures such as pricing strategies, pooled procurement, and voluntary licensing to improve affordability and supply, access to glucagon-like peptide 1 receptor agonists (GLP-1RAs) is likely to remain limited in many regions and may further exacerbate health inequities, particularly in LMICs [41].

In response to these challenges, we propose that timely and coordinated action are essential to improve guideline implementation and applicability, treatment access, diagnostic pathways, and care for the growing population living with MASLD and MASH.

4 The status quo in screening and diagnosis of MASLD and MASH

The lack of high-quality prevalence and incidence data for MASLD and MASH remains a significant challenge, largely due to the absence of clear and harmonised screening protocols across countries [42]. Therefore, current estimates must be interpreted with caution, given the variability in study methodologies and population characteristics [42].

The 2024 EASL-EASD-EASO guidelines provide detailed recommendations on target populations and screening workflows. In summary, screening for MASLD with liver fibrosis is recommended for people with T2D, with abdominal obesity and at least one other cardiometabolic comorbidity, or with persistently abnormal liver tests [1]. Additionally, screening could also be done in the first-degree relatives of patients with MASLD and advanced fibrosis, since genetic risk variants contribute to liver disease among families [43, 44].

In the diagnostic process, other potential causes of steatosis or liver injury should be thoroughly examined [1]. To avoid MetALD misclassification clinicians should assess alcohol consumption history using validated tools if indicated [1]. Consumption above accepted thresholds may point to alcohol-related liver disease or a mixed aetiology [1]. Other potential causes of liver fat accumulation or liver injury include drug-induced liver injury, monogenic diseases, and other less common aetiologies [1]. Importantly, unlike the old nomenclature “NAFLD”, MASLD may be diagnosed in the presence of concurrent hepatitis B or C virus infections [45]. This becomes especially relevant in SEEMEA regions such as African and Eastern Mediterranean countries with a high prevalence of viral hepatitis [46, 47]. Co-occurrence of MASLD and viral hepatitis may reach endemic levels in areas where both conditions are highly prevalent; therefore, accurate diagnosis is essential to provide targeted therapy for both diseases and decrease the risk of adverse outcomes (Fig. 1) [48].

*Conditional/accelerated approvals based on trials with intermediate histological endpoints; confirmation with

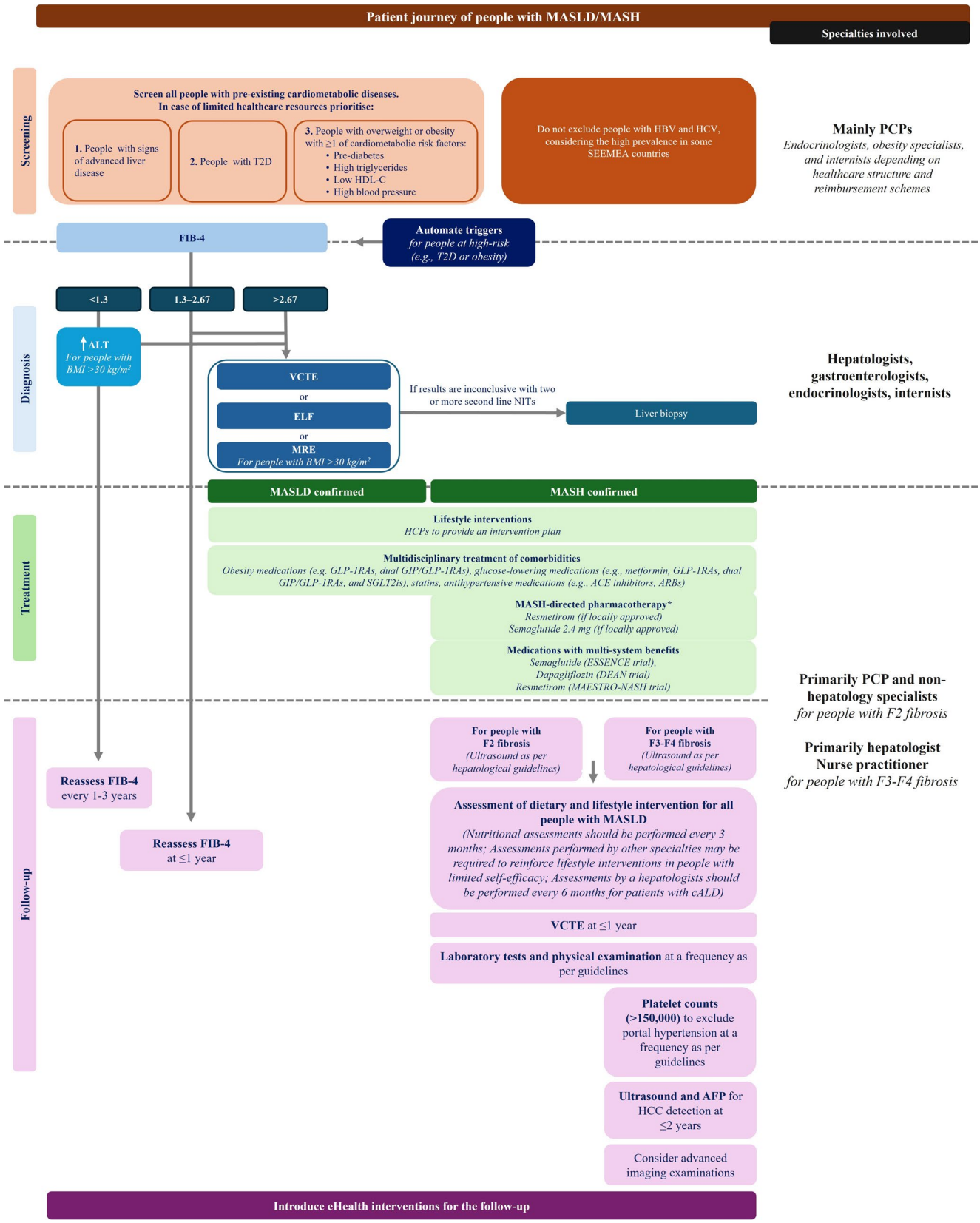

Fig. 1 The patient journey of people with MASLD/MASH; a clinical perspective.

longer-term outcome data is required. ACE, angiotensin-converting enzyme; AFP,α-fetoprotein; ALT, alanine aminotransferase; ARB, angiotensin receptor blocker; BMI, body mass index; ELF, enhanced liver fibrosis; F, fibrosis stage; F2, moderate fibrosis; F3, severe fibrosis; F4, cirrhosis; FIB-4, fibrosis-4; GIP, glucose-dependent insulinotropic polypeptide; GLP-1RA, glucagon-like peptide 1 receptor agonist; HBV, hepatitis B virus; HDL-C, high-density lipoprotein cholesterol; HCV, hepatitis C virus; MASH, metabolic dysfunction–associated steatohepatitis; MASLD, metabolic dysfunction–associated steatotic liver disease; MRE, magnetic resonance elastography; NIT, noninvasive test; PCP, primary care physician; SEEMEA, Southern Mediterranean, Middle East, and Africa; SGLT2i, sodium/glucose co-transporter-2 inhibitor; SWE, shear wave elastography; T2D, type 2 diabetes; VCTE, vibration-controlled transient elastography

Within the clinical workflow, the fibrosis-4 (FIB-4) score is recommended as the primary first-line NIT to assess the risk for advanced fibrosis and liver-related outcomes in individuals with metabolic risk factors or signs of SLD [1]. The FIB-4 scores of 1.3–2.67 may trigger further diagnostic evaluation or direct hepatology referral if>2.67 [1]. Alternative first-line NITs to evaluate the presence of fibrosis are the aspartate aminotransferase (AST) to platelet ratio index (APRI) and the NAFLD fibrosis score (NFS), both included in the 2024 EASL-EASD-EASO guidelines (Table 1) [1]. Similar to FIB-4, both APRI and NFS reflect hepatocyte stress and hypersplenism, while NFS also mirrors the metabolic burden by incorporating measures of fasting plasma glucose and BMI [1]. While NFS screening may not be cost-effective, APRI represents the simplest screening option and may be considered in resource-limited settings, though it may not be suitable for identifying significant fibrosis when used alone [1, 49, 50].

All of these NITs are considered to have similar prognostic accuracy of liver-related events, and the FIB-4 is the most widely validated option, however they show several limitations [1, 51]. FIB-4 should be interpreted within the clinical context, incorporating risk factors, extrahepatic confounders of the laboratory values, and the patient's age, since the discriminatory performance of the index diminishes in individuals older than 65 years [1, 52, 53]. Evidence indicates that one fourth of patients classified as low risk by FIB-4 were found on biopsy to have significant fibrosis (≥F2) [51]. Accuracy may be further reduced in individuals with obesity or T2D, two groups in whom fibrosis risk is particularly high [1, 51]. For instance, the negative predictive value of FIB-4 in identifying advanced liver fibrosis using VCTE as reference is lower in T2D [54]. Although NFS is also being used, as reported by 9–23% of clinicians across SEEMEA, it may have inferior diagnostic performance to FIB-4, especially in individuals with comorbid T2D [27, 28, 55]. Overall, both FIB-4 and NFS demonstrate moderate accuracy in identifying fibrosis stages ≥F3 with area under the receiver operating characteristic curve (AUROCs) of 0.77 and 0.75, respectively [1]. Furthermore, their reliance on aminotransferase levels introduces variability, as alanine aminotransferase (ALT) and AST can fluctuate with metabolic status, alcohol use, drug exposure, or intercurrent illness [56, 57]. Considering these limitations, intensive research to identify more accurate NITs is currently underway in various screening settings (from population screening to different levels of healthcare). This work has led to the development of novel risk scores, including the LiverRisk score, metabolic dysfunction–associated fibrosis 5 (MAF-5), steatosis-associated fibrosis estimator (SAFE), the FibroScan-AST (FAST) score and MRI-AST (MAST) score [58–61].

In second-line fibrosis assessment, the most widely used and validated NIT is VCTE, and hepatology referral is recommended if liver stiffness measurement (LSM) is 8 kPa or higher [1, 62]. Alternative second-line guideline-recommended NITs include magnetic resonance elastography (MRE), shear wave elastography (SWE), and enhanced liver fibrosis (ELF) test [1].

The applicability of these NITs' may vary per region availability, time and cost constraints and patient characteristics (Table 1). In the MENA region, 26.2% of providers reported limited access to VCTE [27]. In addition to accessibility constraints, VCTE is limited in its ability to confirm the presence of cirrhosis in patients with high LSM due to VCTE's low positive predictive value [63]. Since up to one-third of patients with high LSM show normal results on repeat testing, re-examination can help avoid unnecessary liver biopsies [64]. Moreover, VCTE shows limited accuracy in patients with dual etiologies such as viral hepatitis and MASLD, particularly when assessing intermediate stages of fibrosis, a limitation that is particularly relevant for some SEEMEA regions [65].

MRE shows the highest diagnostic accuracy and can detect earlier stages of fibrosis (F2–F4) [1, 66–68]. However, it remains a more expensive option than VCTE and is restricted to specialised centres [66, 67, 69, 70]. In low-resource settings, SWE offers a potential alternative as it can be integrated into routine ultrasound examinations when the system is equipped with the appropriate software, whereas VCTE requires a dedicated device [62, 71]. Compared with VCTE, two-dimensional SWE (2D-SWE) offers a larger region of interest that can be adjusted in size and location chosen by the operator, while point-SWE (pSWE) shows higher applicability in obesity and ascites [62]. However, SWE techniques are generally more time-consuming than VCTE and highly operator-dependent, requiring trained

Table 1 First- and second-line NITs, including alternatives to VCTE and special considerations

First-line NITs		
Test	Cut-off for further diagnostic evaluation [1]	Clinical considerations
FIB-4	≥1.3 in individuals≤65 years or ≥2.0 in individuals>65 years	• Reflects hepatocyte stress and hypersplenism [1] • Widely available, extensively used and well established [1] • Moderate accuracy in identifying fibrosis stages≥F3, with an AUROC of 0.77 [1] • The most cost-effective for fibrosis stages ≥F3 [160] • Applicable in patients with obesity [67] • Reduced accuracy in patients with T2D [161] • Given the potential for underestimation of fibrosis in patients with T2D, VCTE or ELF may be considered as a secondary assessment in this patient population [148]
APRI	1.5	• Reflects hepatocyte stress and hypersplenism [1] • Simplest screening option with widespread availability and may be considered in cases of resource-limited settings [50] • Cost-effective [162] • Not suitable for identifying significant fibrosis when used alone [49] • AUROC of 0.78 for the detection of fibrosis stages F3–F4 from the lower stages F1–F2 [163] • Applicable in patients with obesity, with greater accuracy compared with FIB-4 and NFS [164] • Low sensitivity and negative predictive value to detect advanced fibrosis in patients with T2D [165]
NFS	0.676	• Reflects hepatocyte stress and hypersplenism and also mirrors the metabolic burden [1] • Moderate accuracy in identifying fibrosis stages ≥F3, with an AUROC of 0.75 [1] • Lower diagnostic performance compared with FIB-4 in MASLD subgroups, especially in comorbid T2D [55] • May not be cost-effective [1] • Widely available [67] • Applicable in patients with obesity [67] • Inadequate for the screening of advanced liver fibrosis in patients with T2D [166]
Second-line NITs		
Ultrasound-based techniques		
Test	**Cut-off for specialist referral**	**Clinical considerations**
pSWE	Lack of well-established cut-offs [167]	• Less used and validated than VCTE [28, 62] • May be integrated in conventional ultrasound devices provided availability of adequate software [62, 71] • Similar accuracy to VCTE [67, 168]
2D-SWE	≥10.5 kPa[1]	• More time consuming than VCTE [72] • Variability among ultrasound platforms [74] • Must be performed by trained sonographers or physicians, while VCTE requires limited training [73] • Strong diagnostic performance in advanced fibrosis stages, with an AUROC of 0.93 and 0.91 for fibrosis stages ≥F3 for pSWE and 2D-SWE, respectively [1, 75, 169, 170] • Direct head-to-head comparisons between the pSWE and 2D-SWE are needed to establish which method provides greater accuracy across different stages of fibrosis [75] • SWE-based techniques are more cost-effective for identifying fibrosis stages ≥F2 than NFS and FIB-4 [160] • pSWE shows higher applicability in patients with obesity compared with VCTE [62] • 2D-SWE is applicable in patients with T2D [171]
MRE	≥3.14 kPa[1]	• Less used and validated than VCTE [28, 62] • Superior diagnostic accuracy than VCTE, pSWE, and 2D-SWE, with an AUROC of 0.94 for fibrosis stages ≥F3 [66, 67, 172] • Routine use is limited to specialised centres [69] • More expensive than VCTE [66, 69, 70] • Accuracy not impacted by obesity or hepatic inflammation [67] • May be used to detect earlier stages of fibrosis than VCTE and SWE [1] • Access remains limited [67, 173]
Blood test		

Table 1 (continued)

First-line NITs		
Test	Cut-off for specialist referral	Clinical considerations
ELF	≥9.8[1]	• Similar accuracy to VCTE when used as a second-line NIT [81], with an AUROC of 0.83 for predicting the diagnosis of advanced fibrosis [174] • More cost-effective than VCTE [79] • Applicable in patients with T2D [175] • Applicable in patients with obesity [176]

2D-SWE, two-dimensional shear wave elastography; APRI, aspartate aminotransferase to platelet ratio index; AUROC, area under the receiver operating characteristic curve; ELF, enhanced liver fibrosis; FIB-4, fibrosis-4 index; MRE, magnetic resonance elastography; NFS, nonalcoholic fatty liver disease fibrosis score; NIT, noninvasive test; pSWE, point shear wave elastography; T2D, type 2 diabetes; VCTE, vibration-controlled transient elastography

sonographers for image acquisition and experienced personnel for accurate interpretation. In addition, variability may be encountered across different ultrasound platforms and the measurements can be confounded by multiple technical and non-fibrous tissue-related factors [71–74]. Moreover, although SWE demonstrates strong diagnostic performance in identifying advanced fibrosis, its diagnostic accuracy may be lower when distinguishing intermediate fibrosis stages, thereby limiting its utility for nuanced staging in MASLD [1, 75, 76].

Regarding the patient's clinical profile, selecting the most suitable imaging technique may be challenging in people with obesity [66, 77]. Both VCTE and SWE showed contradicting results in people with a BMI of >30 kg/m^2, with some studies reporting better performance rates for VCTE and others for SWE [66, 71, 77]. As a consequence, the reliability of ultrasound-based techniques for the detection of fibrosis in this patient population is considered low to date [1]. On the other hand, MRE is not affected by body habitus, indicating a more suitable alternative for people with a BMI of >30 kg/m^2 compared with VCTE [66, 67].

The presence of obesity may also affect the reliability of the suggested sequential use of NITs in the 2-tier FIB-4/VCTE approach [65, 78]. In an Italian prospective multicentre study enrolling 800 participants with T2D, increased levels of ALT and elevated BMI were independently associated with a two- and three-fold higher probability, respectively, of having LSM≥8.0 kPa despite FIB-4 being lower than 1.3 [78].

Unlike MRE and SWE, ELF is a blood-based method measuring collagen-related constituents and can serve as an alternative to imaging for detecting advanced hepatic fibrosis [1]. ELF has been shown to be more cost-effective than VCTE when used as a second-line NIT, particularly since VCTE may not be readily available in resource-limited settings [79, 80]. The sequential use of FIB-4 with 2D-SWE or ELF (with adjusted ELF threshold of <9.8) has been validated in a prospective multicentre study in people with T2D and/or obesity and MASLD. Both combinations were shown as good alternatives to FIB-4/VCTE but could lead to higher referral rates (Fig. 1) [81].

Beyond fibrosis, hepatic steatosis is a hallmark characteristic of MASLD and MASH. VCTE with associated controlled attenuation parameter (CAP) analysis is considered a reliable method to estimate the degree of hepatic steatosis [1]. CAP values allow for steatosis severity categorisation into S1 (CAP score of 248 dB/m), S2 (CAP score of 268 dB/m), and S3 (CAP score of 280 dB/m) [1]. However, the routine use of CAP is constrained by uncertainty around optimal cut-off values for distinguishing steatosis grades, as well as by the influence of key covariates that can further compromise measurement reliability [82]. However, as VCTE is recommended as a second-line NIT in the diagnostic algorithm of the 2024 EASL-EASD-EASO guidelines [1], a more accessible and versatile test may be beneficial for the early identification of steatosis. In this context, the 2024 Latin American guidelines for the management of MASLD recommend conventional ultrasonography as the first-line screening tool for hepatic steatosis [43]. This technique has several limitations, including low sensitivity in detecting low-to-mild hepatic steatosis, qualitative grading of steatosis, and reduced performance in people with obesity [83, 84]. As it is based on the subjective observation of liver echogenicity, it shows high operator dependence and intra- and inter observer variability [83–85]. Despite these, its widespread availability, low cost, lack of ionising radiation, and ease of use support its role in initial screening for hepatic steatosis [43, 83, 84].

While NITs may be sufficient to guide treatment decisions, VCTE or alternative NITs may still result in uninterpretable, unreliable, or discordant results [23, 66, 86, 87]. Liver biopsy is still considered the gold standard for the definitive diagnosis of steatohepatitis and can be used, when necessary, to exclude other aetiologies of liver disease [88]. However, it is an invasive procedure that only assesses a small section of the liver, limiting the dynamic

evaluation, and sampling errors and interobserver variability can occur [88, 89].

Timely screening and diagnosis of MASH are crucial to prevent adverse outcomes [90]. From a patient's perspective, although a positive diagnosis may initially cause anxiety, evidence suggests that diagnosed patients often engage in lifestyle changes and achieve meaningful weight loss, which is generally associated with improvements in hepatic steatosis and fibrosis [91–93]. Furthermore, growing evidence supports the cost-effectiveness of screening high-risk MASLD populations [79, 94].

4.1 Areas for consideration to optimise screening and diagnosis: An author's position

Accurate prevalence and incidence data are crucial for policymakers, therefore implementing standardised screening and diagnostic protocols is urgently needed. While no gold-standard NIT is currently available, and with new NITs in development, accuracy and cost-benefit profiles will need to be determined and compared with FIB-4 before their implementation into referral strategies. For now, in the SEEMEA region, screening and diagnosis practices should align with the guidelines wherever feasible. Areas for consideration to optimise screening and diagnosis in people with MASLD could include:

1) **Primary care to lead the identification of patients with MASLD/MASH**, especially in countries with universal healthcare coverage. In regions with underdeveloped primary care infrastructures or with reimbursement schemes working based on fee-for-service or pay-for-performance systems, screening could be incorporated into reimbursed cardiometabolic evaluations performed by specialists, including endocrinologists, diabetologists, obesity experts, cardiologists, nephrologists, or internists.
2) **MASLD screening to be embedded in cardiometabolic risk assessment** for all people with cardiometabolic diseases. In resource-limited settings, screening may prioritise people with obesity and T2D, considering the significantly high prevalence of MASLD and MASH in this population.
3) **Case finding initiatives to be considered for people at risk of progressive fibrosis or cirrhosis**, such as for males aged ≥50 years and females postmenopause.
4) **In individuals with elevated ALT and obesity**, a relevant false-negative rate of FIB-4 has been observed, as indicated by increased LSM values [78]. **Incorporating this consideration into referral algorithms** may improve early detection and reduce underdiagnosis, **particularly in patients classified as low risk by FIB-4 <1.3**, with expedited referral guided by careful clinical evaluation.
5) **For people at high risk of MASLD and advanced fibrosis**, **automated screening systems should be integrated in countries with established electronic health systems**. These include: FIB-4 score calculations and reminder notifications to further accelerate and upscale screening strategies at a national level.
6) **The regional capacity of the healthcare system needs to be factored into the selection of appropriate NIT combination.** In regions where VCTE is not widely available, the focus should be on increasing access to VCTE or suitable alternatives, prioritising ELF and MRI, and considering SWE when other options are not available.
7) **In cases where two or more second-line NITs do not provide clear results**, **liver biopsy may be considered**, **if feasible**, considering the patient's clinical profile.

While adhering to effective national screening strategies is crucial, this must be paired with appropriate specialists' referrals and equal access to therapeutic interventions.

5 The status-quo in the management of MASLD and MASH

The management of MASLD/MASH is undergoing a paradigm shift driven by advances in understanding of metabolic pathophysiology, updated nomenclature and clinical guidelines as well as the approval of MASH-specific therapies [1, 4, 36–38, 95–100]. Prior the recent approval of MASH-specific pharmacotherapies, and considering that adipose tissue dysfunction contributes to the development of MASLD, weight management was the only effective intervention for MASLD/MASH, as it may improve adiposopathy and subsequently the development, progression and severity of MASLD/MASH [1, 92, 95, 97].

Overall, lifestyle modifications, obesity pharmacotherapy, and bariatric surgery are being recommended by clinical practice guidelines as an effective weight management intervention in MASLD/MASH [1]. Weight loss of ≥10% is associated with fibrosis regression in ~80% of patients; additionally, even modest weight reductions of 3–5% can reduce steatosis, while a 7% weight loss may lead to MASH regression [92, 93, 101]. Bariatric surgery led to improvements in metabolic and inflammatory profiles associated with MASLD pathophysiology; however, definite long-term evidence on fibrosis regression is lacking [102]. In this context, it is important to recognise that weight loss alone may not result in the reversion of advanced hepatic fibrosis and only partially improves the characteristics of

adiposopathy which may impact long-term weight maintenance and metabolic health [103–106]. Beyond weight loss, obesity pharmacotherapy is gaining increasing attention in MASLD/MASH, also for its multisystem benefits [1, 107]. The 2024 EASD-EASL-EASO guidelines recommend multidisciplinary care and the use of medications with multisystem benefits, including incretin-based therapies and sodium/glucose co-transporter-2 inhibitors (SGLT2is), to target multiple interconnected cardiometabolic conditions (T2D, dyslipidaemia, glycaemic control, blood pressure improvement, lipid profile improvement, amelioration in inflammation, cardiovascular, and kidney protection) [1]. As strategies that simultaneously target hepatic and cardiometabolic abnormalities are being adopted, we consider ongoing monitoring and timely therapy intensification to be critical for optimising the patient journey in MASLD and MASH.

5.1 Approved pharmacotherapies: MASH treatment and multi-system benefits

To date, two pharmacotherapies have been approved for adults with non-cirrhotic MASH and moderate to advanced fibrosis: resmetirom, a β-selective thyroid hormone receptor agonist, that has received conditional approval from both the European Medicines Agency (EMA) and the US Food and Drug Administration (FDA) and semaglutide 2.4 mg, a GLP-1RA currently conditionally approved by the FDA only [36–38].

Resmetirom In the MAESTRO-NASH trial, resmetirom demonstrated significant hepatic histological benefits and showed a favourable safety and tolerability profile [97, 108]. In addition, it has demonstrated improvements in biomarkers of dyslipidaemia, however, it has not shown significant effects on other cardiometabolic risk factors contributing to MASH progression, such as elevated BMI and hyperglycaemia [10, 36, 108–110]. Furthermore, it has not been associated with a reduction in cardiovascular outcomes, which remain the leading cause of mortality in MASLD [36, 110, 111]. Therefore, more research is required to establish the effects of resmetirom on cardiometabolic outcomes, but also to evaluate its long-term safety [97, 108].

Semaglutide In the interim analysis of the ESSENCE trial, semaglutide significantly improved MASH resolution and fibrosis compared with placebo, while additional improvements on NIT outcomes were observed [100, 112]. Notably, these effects were partially weight loss-independent, suggesting mechanisms beyond weight reduction that may have a role in addressing adiposopathy in MASLD [100, 112]. The safety profile was consistent with prior evidence, with no new liver-related safety signals reported to date [100]. However, some limitations of the current ESSENCE analysis have been noted to date, including the small proportion of black patients and lack of alcohol consumption data [100]. In terms of multi-system benefits, semaglutide reduced major adverse cardiovascular events (MACE) by 20% in adults with CVD and overweight/obesity and by 26% in people with CVD and T2D [113, 114]. It also lowered the incidence of a composite endpoint, including adverse kidney outcomes and kidney-related or cardiovascular mortality, by 24% in people with CKD and T2D [115]. In people with heart failure with preserved ejection fraction (HFpEF) and obesity, semaglutide reduced the risk of heart failure–related events or cardiovascular death by 69% [116]. Additionally, treatment with semaglutide reduced MACE by 35% in patients with heart failure with reduced ejection fraction (HFrFF); however, these patients had higher absolute event rates than those with HFpEF [117].

Despite these encouraging developments, long-term as well as real-world efficacy data, including effects on cirrhosis progression and decompensation risk, are lacking [100, 108]. Finally, data on real-world health system savings and cost-effectiveness, particularly in low-resource settings, are needed to guide optimal use across diverse health systems.

5.2 Emerging pharmacotherapies: MASH treatment and multi-system benefits

Guidelines recommend incretin-based therapies for people with MASLD/MASH and T2D or obesity, and SGLT2is for people with MASLD/MASH, T2D, CKD, or heart failure (Fig. 1) [1]. Among incretin-based therapies, liraglutide and tirzepatide, have shown promising off-label evidence of improvement in MASH-related histology and NIT outcomes in earlier-phase trials, with safety profiles consistent with those observed in obesity and T2D studies [118, 119]. In the LEAN trial, liraglutide led to higher rates of steatohepatitis resolution versus placebo (39% vs. 9%) [118]. In the SYNERGY-NASH trial, tirzepatide treatment resulted in dose-dependent effects, with MASH resolution observed in 44–62% of participants and fibrosis regression in 51–55%, compared with 10% and 30% in the placebo group, respectively [119]. Tirzepatide treatment also led to a 38% reduction in cardiovascular mortality or worsening heart failure in people with HFpEF and obesity [120]. Topline results of the phase 3 SURPASS-CVOT trial showed that the effect of tirzepatide on MACE risk reduction is comparable to that of dulaglutide [121].

Within the drug class of (SGLT2is, the DEAN trial evaluated the off-label use of dapagliflozin in 154 adults with MASH from tertiary hospitals in China. Compared with

placebo, dapagliflozin was associated with higher rates of participants achieving MASH resolution (23% vs. 8%) and fibrosis regression of at least one stage (45% vs. 20%). The safety profile of dapagliflozin was similar to that observed in other clinical trials in T2D, with no SAEs in the dapagliflozin group [99]. While we consider these data promising, the region-specific nature of the study and the relatively small sample size highlights the need for further investigation. In addition, off-label empagliflozin has demonstrated similar improvements in non-invasive liver outcomes, including reductions in liver stiffness and fibrosis markers, with steatosis improvement occurring in 37% of participants with baseline steatosis, compared with 17% in the placebo group and no major AEs were reported [122]. Both dapagliflozin and empagliflozin have consistently reduced rates of hospitalisation and cardiovascular mortality in heart failure [123–125]. Additionally, beyond HFpEF, data in a population with HFrEF are available for both empagliflozin and dapagliflozin, with relative risk reductions of 25% and 26%, respectively, in heart failure-related events or cardiovascular death [123, 126]. Dapagliflozin also reduced the risk of worsening kidney disease or kidney-related and cardiovascular mortality by 39% in individuals with CKD with or without T2D [127]. In addition, empagliflozin lowered the risk of kidney disease progression or cardiovascular death by 28% in a similar population [128].

Moreover, the thiazolidinedione pioglitazone remains one of the most extensively off-label studied agents, with meta-analysis evidence supporting advanced fibrosis improvement and MASH resolution. However, safety considerations, including weight gain, fluid retention and fracture risk, may limit its role as a MASH-targeted therapy despite lower cost and potential applicability in LMIC settings [1, 129–132]. To our knowledge, there is no clear evidence on the cardiovascular benefits of pioglitazone [133–135]. A meta-analysis of randomised controlled trials in people with T2D reported a significant reduction of recurrent MACE among those with prior cardiovascular events [133]. However, pioglitazone did not reduce incident MACE, all-cause mortality, or hospitalisation for heart failure [133], and no dedicated cardiovascular outcomes trial has been conducted to date.

Finally, while several additional agents, such as cenicriviroc, elafibranor, and selonsertib, have failed to meet primary fibrosis endpoints in phase 3 trials, a number of emerging therapies are in clinical development for the treatment of MASH [136–142]. These include fibroblast growth factor 21 (FGF21) analogues (efruxifermin and pegozafermin), survodutide, a dual GLP-1/glucagon receptor agonist, and retatrutide, a triple glucose-dependent insulinotropic polypeptide (GIP)/GLP-1/glucagon receptor agonist, all of which have demonstrated improvements in hepatic steatosis and/or fibrosis in phase 2 trials [140–142]. In parallel, combination therapies, including FGF21 analogues with GLP-1RAs and GLP-1RAs with SGLT2i regimens, are also under investigation and early data suggest additive benefits on steatosis and fibrosis biomarkers [140, 143–146].

5.3 Follow-up

5.3.1 Treatment evaluation

The effect of treatment for MASLD/MASH and comorbidities, as well as the benefits of lifestyle modifications, should be monitored periodically to evaluate fibrosis progression, steatohepatitis resolution, and mitigate the risk of adverse outcomes [1]. The EASL-EASD-EASO guidelines suggest reassessing FIB-4 after 1–3 years or at ≤1 year, if the initial FIB-4 measurement was <1.3 or 1.3–2.67, respectively, although the time interval for reassessment is dependent on the control of metabolic factors [1]. The recently published Delphi consensus on MASLD/MASH recommended monitoring resmetirom treatment with safety assessments at 3, 6, and 12 months, evaluating early response using NITs (such as VCTE) at 6 months, and assessing efficacy or futility at one year using multiple NITs [147]. The 2025 American Diabetes Association (ADA) guidelines for the management of MASLD in patients with diabetes recommend the use of VCTE to evaluate treatment responses, defining any decrease of ≥30% in liver stiffness as a positive response [148].

5.3.2 Disease progression

Early diagnosis and initiation of treatment for MASLD and the driving comorbidities are imperative for mitigating disease progression [1]. However, periodic monitoring of liver stiffness allows for timely identification of compensated advanced chronic liver disease (cACLD) in cases that do progress [149]. Furthermore, identification of cACLD raises awareness of potential liver-related complications [149]. The Baveno working group defines cACLD as the NIT-based stage of advanced liver disease that precedes the onset of clinical symptoms of decompensation, whereas the diagnosis of cirrhosis remains based on invasive procedures [149]. The Baveno working group recommends that individuals with LSM values 7–10 kPa and ongoing liver injury should be monitored for cACLD. LSM values <10 kPa suggest a low likelihood of cACLD; values between 10 and 15 kPa are considered suggestive, and LSM >15 kPa is highly suggestive of cACLD [149]. The Baveno working group recommends that patients with compensated cirrhosis who are not eligible for nonselective beta blockers to prevent decompensation should undergo endoscopic variceal

screening if LSM by transient elastography (TE) is ≥20 kPa or platelet count is ≤150 × 10^9/L [149]. For patients who defer endoscopy, annual monitoring with TE and platelet count is advised, with endoscopy indicated if LSM reaches 20 kPa or more or platelet count falls at or below 150 × 10^9/L [149].

In our clinical perspective, the current guidelines lack clear guidance on which populations should be screened for cACLD. This represents a critical point, as individuals with cACLD or cirrhosis are at high risk of developing clinically significant portal hypertension (CSPH), a condition associated with increased liver-related mortality [149]. The 2024 EASL-EASD-EASO guidelines state that CSPH may be ruled out in individuals with LSM≤15 kPa and platelet count≥150 × 10^9/L [1]. In addition, spleen stiffness measurement by TE may be used in cACLD due to viral hepatitis to rule out and rule in CSPH. However, further validation of the optimal cut-off using a 100 Hz specific TE probe, as well as pSWE and 2D-SWE is required [149]. The 2025 ADA guidelines for the management of MASLD in diabetes recommend annual evaluation of platelet counts for individuals with cirrhosis to screen for the development of portal hypertension [148]. In both guidelines, surveillance for hepatocellular carcinoma (HCC), via liver ultrasound and α-fetoprotein, is recommended in the presence of cirrhosis and should be performed every 6 months (Fig. 1) [1, 147, 148]. Nevertheless, consistent guidance on HCC surveillance and CSPH screening specifically in individuals with cACLD is currently lacking in existing guidelines.

5.3.3 Digital health solutions in the follow-up of people with MASLD and MASH

Digital health solutions have the potential to enhance the quality of care in rural areas and areas without easy access to specialist centres [150]. The effect of eHealth interventions on MASLD, such as internet-based platforms, telemedicine, mobile applications, and smartwatches, was investigated in a recent systematic review and meta-analysis [151]. These interventions showed improvement in the levels of hepatic enzymes and resulted in higher reductions in body weight versus standard of care [151]. Despite their potential, eHealth solutions are yet to be incorporated into current clinical practice guidelines for MASLD/MASH.

5.4 Areas for consideration to optimise the management of MASLD and MASH: An author's position

Overall, although significant progress has been made in establishing a framework for the follow-up of individuals with MASLD, existing guidance on monitoring disease progression as well as responses to pharmacological and lifestyle interventions remains suboptimal. Some considerations could include:

1) **Assessment of dietary and lifestyle interventions** for all people with MASLD to prevent progression to fibrosis and those with current fibrosis. These assessments may be performed by clinical nutritionists and endocrinologists/hepatologists, if feasible, considering the healthcare system infrastructure. Nutritional assessments should be performed every 3 months. Assessments performed by other specialties of the multidisciplinary team may be required to reinforce lifestyle interventions in people with limited self-efficacy. Assessments by a hepatologist should be performed every 6 months for patients with cACLD and every 1–3 years in patients with low FIB-4. According to individual clinical needs, other professionals may be involved in the multidisciplinary clinic (see Sect. 8).
2) **Evaluation of responses to MASH-directed interventions** at ≤1 year via VCTE or suitable alternative NIT based on regional availability.
3) **Screening for cACLD in people with LSM values between 7 and 10 kPa**, in line with the Baveno working group recommendations, to ensure appropriate management. This includes lifestyle modifications, intensified treatment of metabolic comorbidities, regular screening for HCC and cirrhosis-related complications, and timely evaluation for liver transplantation.
4) **Monitoring platelet counts in individuals with cACLD or F3 fibrosis** for timely diagnosis of CSPH and prevention of severe complications.
5) **Introduce eHealth interventions** to monitor the efficacy of lifestyle modifications on body weight and other cardiometabolic and hepatic risk factors.
6) **Facilitate the conduct of platform trials**, if regionally feasible, to accelerate drug development and expand the portfolio of MASH-specific treatments. Platform trials are innovative and adaptive clinical trial designs that enable the evaluation of multiple interventions simultaneously against a shared control group under a single master protocol, with the possibility of adding new interventions during the course of the trial [152].
7) **Collect real-world data**, if feasible, to gather insights on clinical practice patterns and patient outcomes.
8) **Collaborate with policymakers** to ensure access to appropriate screening methods and approved treatments for MASH and related comorbidities, prioritising reimbursement for people at high risk of adverse outcomes and mortality. In addition, public–private partnerships could be supported to subsidise access to approved medications in resource-limited settings.

6 Educational strategies

Beyond practical clinical challenges, knowledge gaps remain a significant barrier to optimal MASLD/MASH management [24, 25, 88]. The AwareNASH survey showed that 64% of physicians underestimated MASLD prevalence, with 68% reporting lack of awareness as a major barrier to screening [24]. A qualitative study involving primary care physicians, specialists, payers, and patient advocates identified key barriers to the appropriate use of NITs, including limited awareness and uncertainty about the clinical value of NITs [88]. Another study emphasised the lack of accessible educational materials as a major challenge to effective MASLD management [25].

The impact of educational programmes for HCPs on guideline implementation and care optimisation has been studied in the broader field of cardiometabolic diseases [153–155]. In T2D and obesity, a study using faculty-led short-duration videos targeting endocrinologists demonstrated improvements in knowledge, competence, and performance of HCPs [155]. The same study also showed increased uptake of guideline-recommended incretin-based and combination therapies [155]. In the GOAL study, physicians treating patients with vascular disease received online reminders of guideline recommendations, resulting in approximately 50% more patients achieving lipid targets through intensified treatment [153]. However, 33% of patients refused treatment intensification, highlighting the need to also increase awareness among patients [153].

6.1 Areas for consideration to optimise educational strategies: An author's position

These findings suggest that implementation of educational programmes could yield positive outcomes in the field of MASLD/MASH when targeting both HCPs and patients [25, 154]. Areas for consideration on future educational programmes include:

1) **Targeted educational activities for all medical specialties** involved in the management of MASLD/MASH, especially those that frequently encounter high-risk patients.
2) **Use of consistent and unified language across specialties in educational materials**, unless specialty-specific access to diagnostics or therapeutics, needs to be acknowledged.
3) **A combination of educational deliverables may be implemented**, including face-to-face meetings, online courses, applications, and printed materials.
4) **Educational strategies to factor in cultural preferences and regional healthcare pathways**, ensuring that HCP and patient education resonates with regional real-life clinical practice and patients' perspectives.
5) **Educational programmes for high-risk patients may be prioritised**, such as for people with T2D, dyslipidaemia and/or obesity, to raise awareness of MASLD/MASH and promote healthy lifestyles.
6) **Patient engagement should expand beyond MASLD/MASH patient associations.** Considering the interlink of MASLD with diabetes, obesity, and CVD, collaborations with the respective patient associations may be beneficial.
7) **Guidance on MASLD management to be provided in a patient-friendly language.** These materials should clearly outline how individuals can recognise and manage MASLD, with guidance on lifestyle modifications, such as dietary advice. Dietary advice should be culturally adapted and aligned with national/regional dietary guidelines for the general population.
8) **Social media should be utilised to maximise patient engagement** and reach a wider patient population, in particular, those living in rural or underserved areas. Social media may also be used for educational purposes to clarify false information shared on social platforms.
9) **Measuring the impact of educational interventions**. Key performance indicators may include: the number of patients with MASLD/MASH identified, the rates of timely specialists' referrals and treatment initiation.

7 The multidisciplinary MASLD/MASH clinic

Although multidisciplinary care is guideline-recommended, no consensus model exists and specialists are rarely co-located in the same clinic [1, 156]. A recent study implemented a fully co-located program involving diverse specialties that provided coordinated lifestyle counseling, metabolic risk management and access to obesity pharmacotherapy. Among 26 patients with F2/F3 fibrosis followed for 6 months, improvements were observed in ALT levels and overall cardiometabolic risk profiles [156].

This approach may be further supported by proof-of-concept data from studies evaluating the outcomes of patient care within obesity, diabetes, and cardiometabolic clinics [157–159]. Cardiometabolic clinics are specialised healthcare models designed to manage holistically the interconnected risks of cardiovascular, kidney, and metabolic diseases [157–159]. While the clinic structure may vary based on the patient population and focus on either primary or secondary prevention, these clinics demonstrate significantly improved outcomes compared with conventional care [157–159]. Patients treated in these cardiometabolic clinics are more likely to receive guideline-recommended

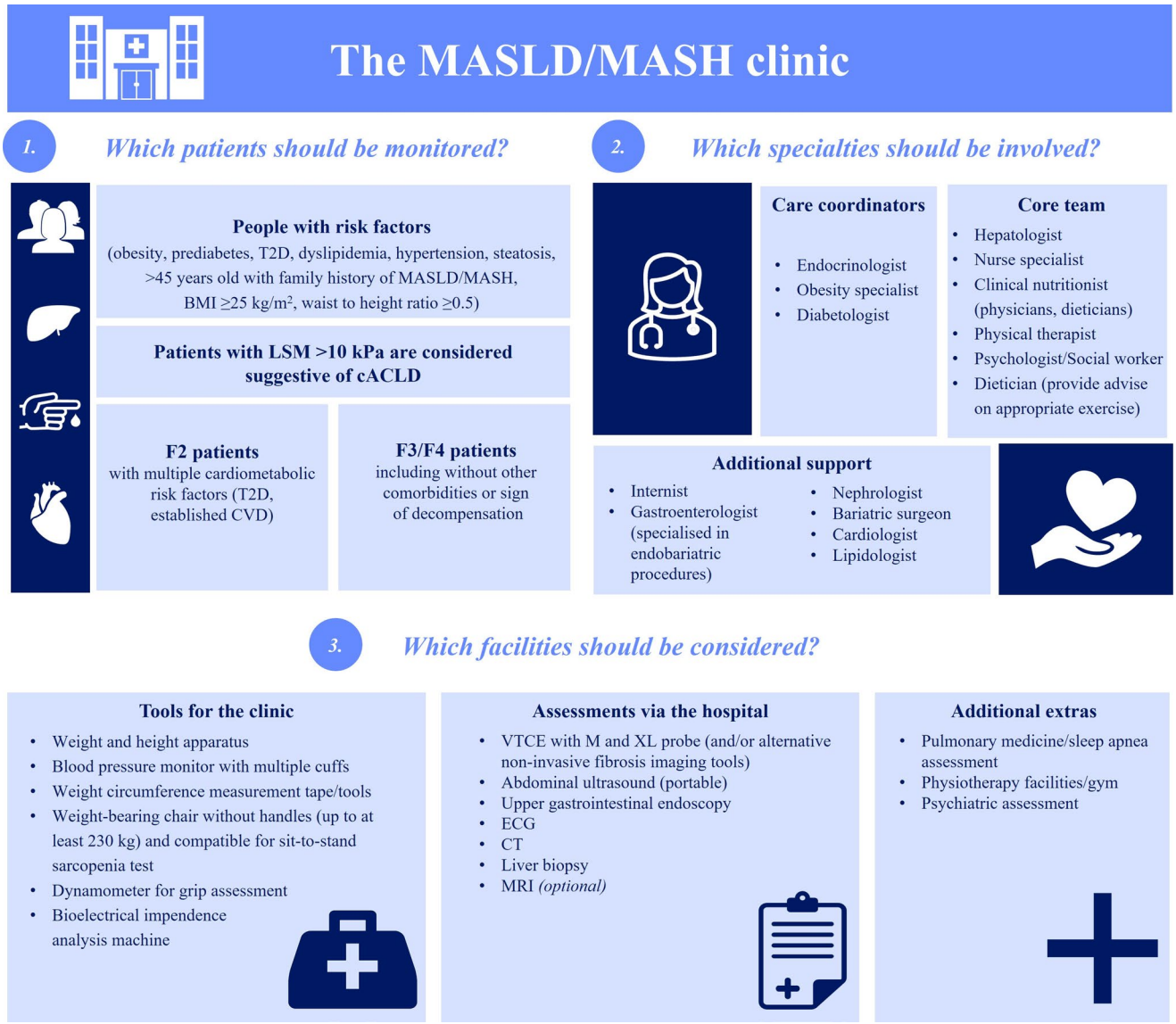

Fig. 2 The multidisciplinary MASLD/MASH clinic.

therapies, including ACE inhibitors, high-intensity statins, SGLT-2is and GLP-1RAs [157, 158].

7.1 The blueprint of a MASLD/MASH clinic: An author's position

While screening and diagnosis should ideally be performed in primary care settings, we suggest that optimisation of treatment and follow-up for people with MASLD/MASH may be achieved through the establishment of multidisciplinary clinics. MASLD/MASH clinics could be either stand-alone models of care or part of obesity or cardiometabolic clinics (Fig. 2). Initially, these clinics may be implemented as pilot programs, to determine their impact on patient outcomes and cost-effectiveness. In SEEMEA countries, where establishing a MASLD/MASH clinic is not feasible, priority may be given to establishing clear treatment protocols and referral pathways between hepatology or gastroenterology clinics and cardiometabolic clinics.

BMI, body mass index; cACLD, compensated advanced chronic liver disease; CT, computed tomography; CVD, cardiovascular disease; ECG, electrocardiogram; F, fibrosis stage; F2, moderate fibrosis; F3, severe fibrosis; F4, cirrhosis; LSM, liver stiffness measurement; MASH, metabolic dysfunction–associated steatohepatitis; MASLD, metabolic dysfunction–associated steatotic liver disease; MRI, magnetic resonance imaging; T2D, type 2 diabetes; VCTE, vibration-controlled transient elastography.

To provide effective multidisciplinary care, MASLD/MASH clinics may engage HCPs from diverse specialties. At a minimum, this may include obesity medicine, endocrinology or diabetology, hepatology, nursing, clinical nutrition, physiotherapy, psychology or social therapy. In optimal settings, we suggest additional involvement from cardiology, nephrology, clinical pharmacology, and occupational therapy. Within these clinics, patients with MASLD and advanced fibrosis should primarily be offered access to FIB-4 testing, timely referrals for more extensive hospital assessments, prioritising VCTE and liver ultrasound, as well as access to GLP-1RAs.

8 Conclusions

Key gaps remain in the management of MASLD/MASH, requiring both practical and educational strategies that extend beyond hepatology. This review manuscript addresses the barriers in applying recommendations in routine clinical care in the SEEMEA region, especially in cases with limited universal access to healthcare resources. Strengthening the implementation of clinical guidance at regional levels is essential. Priorities should include refining screening triggers and exploring alternative techniques that enable timely and accurate diagnosis. Improved accessibility to validated treatments, implementation of educational programmes, and multidisciplinary care could yield positive outcomes in MASLD/MASH. In addition, advances in pharmacotherapy need to be closely monitored, while a structured "blueprint" for specialised MASLD clinics, incorporating both essential and optional facilities, can provide a framework for optimised patient care.

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Declarations

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