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Global Consensus Recommendations for Metabolic Dysfunction-Associated Steatotic Liver Disease and Steatohepatitis

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BACKGROUND & AIMS: Metabolic dysfunction-associated steatotic liver disease (MASLD) and steatohepatitis (MASH) are associated with adverse clinical outcomes, impaired health-related quality of life, and significant economic burden. The growing burden of MASLD and MASH has led to the publication of a large number of MASLD/MASH guidelines by national and international societies. However, important differences among the recommendations have created confusion, contributing to a low implementation rate and suboptimal management of MASLD and MASH. Creating a consensus recommendation has become more important since the approval of a selective agonist of thyroid hormone β receptor (resmetirom) for MASH treatment in the United States. We built a consensus among the most recently published recommendations for MASLD/MASH.

METHODS: A comprehensive search for MASLD and MASH guidelines, guidance documents, or similar publications from January 2018 to January 2025 using PubMed, Embase, Web of Science, and society websites was conducted. Each selected document was assessed across 8 specific domains with 145 variables. Variables with $<50\%$ concordance were used for the Delphi statement development. A supermajority threshold of 67% was set for statement acceptance. **RESULTS:** There were 61 documents published from 2018 through January 2025. Four rounds of Delphi were conducted: 46 statements were generated for Round 1, 32 statements for Round 2, 16 statements for Round 3, and 8 statements for Round 4, whereby 100% of statements achieved a greater than 90% agreement. All final consensus recommendations were summarized in

tables and algorithms. **CONCLUSIONS:** Our study provides an extensive set of recommendations generated based on a comprehensive review of the most recent MASLD/MASH guidelines and a consensus-building process.

Keywords: MASH; MASLD; Guideline; Global.

WHAT YOU NEED TO KNOW

BACKGROUND AND CONTEXT

A number of guidance documents have been developed to help clinicians care for patients with metabolic dysfunction-associated steatotic liver disease (MASLD) and steatohepatitis (MASH). Most recommendations are concordant; however, areas of discordance may cause confusion in the field.

NEW FINDINGS

A study of global MASLD/MASH guidelines, guidance documents, and similar publications (n = 61) determined 46 areas of discordance. Four rounds of the Delphi process established consensus recommendations for MASLD screening, risk stratification, and treatment.

LIMITATIONS

Although we focused on the most recent documents (2018–2025), some areas of management of MASLD are rapidly evolving, which may need to be modified in real time as new treatment and novel noninvasive tests are developed.

CLINICAL RESEARCH RELEVANCE

The resulting consensus recommendations may provide busy clinicians with a quick and easy-to-use resource when caring for patients with MASLD. These recommendations provide guidance that ranges from identification of patients at high risk for adverse outcomes as well as recommendations for optimal management of common comorbidities and liver disease with preferred drugs.

BASIC RESEARCH RELEVANCE

With a global consensus recommendation document available, future research on patient outcomes may be easier to standardize, which will allow for more personalized treatment of MASLD in different regions of the world.

It has been estimated that approximately one-third of adults worldwide have metabolic dysfunction-associated steatotic liver disease (MASLD, formally known as nonalcoholic fatty liver disease, NAFLD).[1,2] The progressive form of MASLD, known as metabolic dysfunction-associated steatohepatitis (MASH, previously termed nonalcoholic steatohepatitis, NASH), is characterized by steatosis, hepatocyte ballooning, and associated liver inflammation. As MASH progresses, the liver becomes fibrotic, leading to cirrhosis, possible hepatocellular carcinoma (HCC), and the need for liver transplantation.[3–5] Furthermore, MASH is associated with impaired health-related quality of life and a tremendous economic burden.[6] The global burden of MASH has been increasing in parallel with the increasing prevalence of obesity and additional metabolic disorders.[7] Until recently, management of MASLD/MASH has been limited to lifestyle intervention and medical treatment of comorbidities such as type 2 diabetes (T2D) and obesity.[8] On March 14, 2024, a selective agonist of thyroid hormone β receptor (THR-β agonist), resmetirom, became the first drug approved by the US Food and Drug Administration (FDA) for treatment of noncirrhotic MASH with fibrosis stage 2 or 3 (F2 or F3).[9] Studies of THR-β agonist (resmetirom) treatment have shown histologic improvement in MASH and liver fibrosis, as well as improvement of noninvasive biomarkers, with an acceptable safety profile.

As the growing burden of MASLD became increasingly recognized, a large number of clinical practice guidelines, guidance documents, and similar publications have been developed to assist clinicians in the management of people with MASLD. Although these documents are similar in many ways, there are important differences in their recommendations, which have created some confusion within the field. Areas of discordance among guidelines can be partly responsible for their low rate of implementation and the suboptimal awareness about this liver disease. Furthermore, these guidelines can be long and complex, making it challenging for busy clinicians to access the appropriate information quickly and efficiently. Nevertheless, it is also important to recognize that there are a variety of reasons for the divergence of recommendations by different guidelines, which may reflect the local availability of treatment options, noninvasive tests, reimbursement practices, and different target audiences (hepatologists vs multidisciplinary health care providers), to name a few. As one means of increasing their implementation in practice and overcoming some of these differences, the unification and simplification of the different recommendations may be beneficial to clinical practice. We have, therefore, performed a comprehensive search of all available NAFLD, MASLD, and metabolic dysfunction-associated fatty liver disease (MAFLD) guidelines, guidance documents, and similar publications, aiming to identify areas of agreement and discordance, and then, through a Delphi consensus-building process, build agreement in areas of divergence within these documents. Through this process, we aimed to streamline and simplify the recommendations, developing a summary

Abbreviations used in this paper: **ALD, alcohol-associated liver disease; ALT, alanine aminotransferase; AST, aspartate aminotransferase; BMI, body mass index; FDA, Food and Drug Administration; FIB-4, Fibrosis-4 test; GLP-1RAs, glucagon-like peptide-1 receptor agonists; GNC, Global NASH/MASH Council; HCC, hepatocellular carcinoma; LSM, liver stiffness measurement; MASH, metabolic dysfunction-associated steatohepatitis; MASLD, metabolic dysfunction-associated steatotic liver disease; NAFLD, nonalcoholic fatty liver disease; NIT, noninvasive test; T2D, type 2 diabetes; THR-β agonist, selective agonist of thyroid hormone β receptor; VCTE, vibration-controlled transient elastography.**

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document for ease of implementing these recommendations into clinical practice.

Methods

Study Design

Table 1 outlines and describes the steps of this study process. Briefly, we undertook 12 steps to develop a global guidelines consensus for recommendations on identifying high-risk MASLD, treating MASLD and its comorbidities, as well as addressing HCC surveillance, extrahepatic cancer surveillance, and future medications that are under investigation. Briefly, the first step of the 12 steps was to create a steering committee of experts in the field of MASLD. We invited experts from different regions of the world and from different clinical specialties, including gastroenterologists, hepatologists, nutrition experts, primary care physicians, and endocrinologists/diabetologists, as well as patient representatives.

The next 5 steps (Step 2–Step 6) involved the identification of the guidelines. Step 2 established our inclusion and exclusion criteria. The inclusion criteria required that the documents be country-specific guidelines, guidance papers, clinical practice guidelines, or expert consensus statements, published between 2018 and January 2025. If more than 1 document was available for any country, we included only the most recent and complete document. Papers were excluded if they were white papers, review papers, lacked recommendations, or were published before 2018. For clarity and readability, the term 'guideline' is used throughout this article to refer to all types of included documents.

After the establishment of the inclusion and exclusion, we began gathering the documents. We first obtained country-specific guidelines from a prior research study that provided 32 guidelines.[10] We then used Google Scholar, Google, professional society websites, and outreach to Global NASH/MASH Council (GNC) members to obtain any available guidelines for the remaining 166 countries. Through these efforts, we obtained 53 country-specific guidelines. We then made a list of the guidelines and shared with the members of the GNC for review, asking them to provide any additional guidelines that were not included in the first round of reviews. To ensure completeness, a professional librarian assisted the team in conducting searches in the Web of Science and Embase databases. PubMed was used to identify guidelines for any remaining country that was not found in other searches (Supplementary Tables 1, 2, and 3, Supplementary Figure 1). The expert committee members, the committee co-chairs and the project directors then worked together to identify the areas of focus. Then, the variables to include in each focus area were also identified and defined through the same process (see Table 1 and Supplementary Text Box 1). The final list of variables for each area of focus were placed into a standardized data collection form. Data were collected by assigning one project director to each focus area, who was responsible for extracting data from each identified guideline (Step 7).

Step 8 was data analysis for agreement and discordance in recommendations for each variable.

Items in each domain that did not have significant discordance (>50% agreement) were summarized and provided in the final document. These statements did not require additional assessment through the Delphi process. Steps 9 and 10 describe how the Delphi statements were developed (more details in the following section) and outline how the Delphi process was conducted to build consensus for areas of discordance discovered, as described in Step 8. Step 11 comprised the development of algorithms that were based on areas of consensus achieved before Delphi and those that were achieved through the Delphi process. Step 12 was considered the dissemination step in which the results of this study would be prepared for submission for publication.

Development of Delphi Statements

Discordance was defined as when a variable of interest was not mentioned, no formal recommendation was made, or there were conflicting recommendations. In addition, significant discordance was defined when the recommended item was discordant among more than 50% of guidelines or when additional input seemed needed, given recent developments in the field. For each discordant item, a Delphi statement was developed and included in the next step.

Following the formation of the Delphi statements, a self-administered online survey was created using the survey platform, Qualtrics. Respondents were asked to provide their level of agreement with each statement on a 6-point Likert scale (Agree [A], Somewhat Agree [SA], Somewhat Disagree [SD], Disagree [D], Not Qualified to Answer [NQ], and Prefer Not to Answer [PN]). Each respondent was provided an opportunity to give qualitative feedback on each statement or to opt out of answering. A supermajority threshold for agreement was set at 67% (agree and somewhat agree). Based on the levels of agreement and qualitative feedback in the first Delphi survey, the discordant statements were revised, and subsequent rounds of the Delphi process were held accordingly until all statements achieved at least a 67% supermajority. However, the steering committee recommended that if the qualitative statements received were deemed important, the corresponding Delphi statement would be revised and included in each subsequent round of the Delphi process, even if a supermajority was achieved. This process continued until no statements with relevant information were obtained.

The first round of the Delphi survey included members of the GNC who agreed to participate (n = 142). The subsequent rounds of the Delphi process were undertaken with members of the steering committee (n = 32). After the final (fourth) round of the Delphi process was completed, all recommendations were summarized, and algorithms were developed as described previously.

Results

Identification of Guidelines

We identified a total of 85 guidelines related to MASLD. After applying our inclusion and exclusion criteria as described in the methods, 61 guidelines remained and were included in the study (Supplementary Figure 1, Supplementary Table 1).

Initial Review of Guidelines for Round 1 Delphi Statement Generation

Supplementary Table 4 provides the areas of concordance and discordance for the variables collected in each

Table 1. Delphi Process

Step	Goal	Action
1	Bring together global experts in MASLD	Developed a steering committee of global practitioners to include gastroenterologists, hepatologists, endocrinologists, primary care, and nutrition experts as well as patient representatives (n = 32).
2	Identify and obtain NASH/NAFLD/MASLD/MASH-related guidelines, guidance statements, and position papers in any language, from any part of the world	Guidelines from a prior research study were obtained[10] (n = 32 countries). For the remaining 166 countries, Google Science, Google, Professional Society Websites, and GNC members were queried to obtain available guidelines (n = 54 countries). For completion purposes, a professional librarian assisted in searching Web of Science and Embase databases. PubMed was used by each team member to search for guidelines from remaining countries (n = 0). Total guidelines included for review was 86.
3	Identify documents for inclusion	Inclusion criteria: country-specific guidelines, guidance papers, clinical practice guidelines, or expert consensus statements published from 2018 through 2025. Only the most recent guidelines were included. Exclusion criteria: white papers, narrative reviews, guidelines that did not provide recommendations or that were published before 2018. For more details on the included guidelines and the literature search, see Supplementary Figure 1 and Supplementary Tables 1, 2, and 3.
4	Identify documents in need of translation	Documents' relevant areas were translated with the assistance of a GNC team member fluent in the language or using Translation Services.
5	Identify the areas of focus and assigned each to a single project director, along with respective committee co-chairs	8 areas were identified and assigned: • Epidemiology and natural history (outcome committee) • Screening or case finding for high-risk MASLD (outcome committee) • Algorithm for risk stratification using NITs (NIT committee) • Management with lifestyle (lifestyle committee) • Treatment with existing medications (hepatology-non-hepatology committee) • Treatment with future medications (leadership committee) • HCC screening guidance and other preventive guidance (screening for varices, vaccination for hepatitis A and B viruses) (policy committee) • Pregnancy and children (pediatric committee)
6	Identify variables of interest to collect for each respective area	Project directors and committee co-chairs worked together to identify pertinent information. Supplementary Text Box 1 provides the full list of variables for each section.
7	Collect data for each area	Project directors collected data using committee co-chair approved variable collection list from which a standardized form was developed for data collection from the identified guidelines.
8	Identify areas of concordance and discordance	Analyzed each variable for concordance and discordance; discordance was determined if <**50%** agreed with the variable or did not make a recommendation statement incorporating the variable of interest (see Supplementary Table 4).
9	Delphi process	Supplementary Tables 5 and 6 present the characteristics of the GNC team members who participated in the Delphi survey (n = 142), the Delphi statements and the results of the Delphi statements for round 1.
10	Delphi process	The second, third, and fourth rounds of Delphi statements were then generated based on responses from the Expert Steering Committee (n = 32). Supplementary Table 7 shows the revision of the first round of the Delphi Process; Supplementary Table 8 provides the characteristics of the Expert Steering Committee and Supplementary Tables 9–12 provide the Delphi statement revisions and results for rounds 2 through 4.
11	Develop algorithms	To assist countries in the implementation of the guidelines for assessment, management, and treatment of individuals with MASLD, algorithms were then developed based on the areas of original concordance and the Delphi statements.
12	Distribution of guideline cohesion material	Publication

NOTE. All the reviewed guidelines were stored on the GNC server and are available for public download. This will be updated regularly to include any new guideline. The assessment committee was a subgroup of the steering committee.
NASH, nonalcoholic steatohepatitis.

assessment domain for each guideline. Briefly, all domains included had at least 1 area of discordance. On the other hand, major areas of discordance among guidelines were found in the domain of 'screening for MASLD'. There was discordance regarding methods and thresholds used to quantify alcohol consumption, types, and thresholds of noninvasive tests (NITs) used to identify high-risk patients with MASLD and frequencies and modalities used to screen for MASLD-related HCC. NITs used to determine risk level in patients with MASLD included the Fibrosis-4 (FIB-4) test, vibration-controlled transient elastography (VCTE) to assess liver stiffness measurement (LSM), as well as magnetic resonance elastography, and FAST and MAST analyses, which are only performed at specialized centers.

Furthermore, there were disagreements about pharmacological treatment of MASLD-related comorbidities (T2D and obesity), as well as when to start and how to monitor treatment with THR-β agonist (resmiterom) in clinical practices where this drug is available and licensed.

After the initial review, areas of discordance led to the development of 46 Delphi statements covering 6 of 8 domains (screening for MASLD, screening with NITs, lifestyle management, pharmacological treatment of MASH, pharmacological treatment of comorbidities, and HCC prevention and surveillance). These items underwent the first-round Delphi process, as described. Statements from the pediatric and epidemiology domains were not included in the Delphi process, owing to insufficient data (pediatric domain) and complete concordance (epidemiology domain).

Delphi Process Results

In the first round of the Delphi survey, carried out with the GNC members (N = 142) (Supplementary Table 5, Supplementary Figure 2), 76% of respondents worked primarily in clinical care and 17% were primarily involved in clinical research; they were from 50 countries and 7 global regions (Supplementary Table 5). All topic areas all reached a supermajority (>67%) of agreement. An average of 89% of the respondents agreed or somewhat agreed with the statements. However, among the 46 individual statements included in the first-round Delphi survey, 9% (4 of 46) achieved <67% agreement (below the supermajority); all these statements were within the 'Pharmacological Treatment of MASH' domain (Supplementary Table 6). Despite overall high agreement, there were several comments about some statements that prompted inclusion in the second-round Delphi survey.

After modification of the statements (Supplementary Table 7) from the areas of discordance, a second-round Delphi survey, containing 36 items (Supplementary Table 8), was sent only to the members of the steering committee (n = 32, Supplementary Table 9). The response rate from the second round was 100%, and the responses had an average 95% agreement (Supplementary Table 8). Despite the high level of agreement, some comments were noted for specific statements that required revision and review by the members of the steering committee (Supplementary Table 10).

Due to lack of agreement or important comments received from the second-round Delphi survey, 2 additional rounds of Delphi surveys were performed. Sixteen statements were included in Round 3. (Supplementary Table 11). Although most statements were agreed on by a supermajority, statements regarding the use of approved THR-β agonist (resmetirom) had lower levels of agreement and generated some important comments, triggering the fourth-round Delphi survey, which included 8 statements (Supplementary Table 12). All these statements were agreed on by a supermajority, with few comments (Supplementary Table 13).

Summary of MASLD Document Review and Consensus

Epidemiology and progression of MASLD. Statements and items included in this section did not require inclusion in the Delphi process. Most of the guidelines (47 of 61, 78%) provided some epidemiology information, with more recent publications providing more updated data. In the early guidelines, the prevalence of MASLD in the adult global population was cited to be approximately 25%. Guidelines that cited meta-analysis data estimated the global prevalence of MASLD to be approximately 38%.[2] The global prevalence of MASH was mentioned in a quarter of the guidelines (n = 15), and estimated to be 3% to 5%, with the most recent guidelines estimating MASH prevalence to be 5.27%. (5%–7%).[1–5,7] Table 2 provides prevalence, incidence, and all-cause and cause-specific mortality values reported by the guidelines. Although these are average values for different countries or regions, differences exist within regions. For example, in the guideline from Indian National Association for Study of the Liver, the prevalence of MASLD was estimated to be 38% in adults and 35% in children, with significant differences between the urban and rural areas of India.[11]

Screening for MASLD, including alcohol consumption. Based on the initial review of guidelines, several areas related to the screening for MASLD required subsequent Delphi processes. After 4 steps, there was consensus to investigate and stratify for high-risk MASLD in patients with any 1 of the following:

1. Presence of T2D.
2. Obesity, defined as body mass index (BMI) ≥30 kg/m^2 or waist circumference ≥102 cm and 88 cm for men and women, respectively, with 1 or more additional cardiometabolic risk factors present (blood pressure ≥130/85 mm Hg or specific antihypertensive drug treatment, plasma triglycerides ≥150 mg/dL or lipid- lowering treatment, and/or plasma high-density lipoprotein-cholesterol <40 mg/dL for men and <50 mg/dL for women or lipid-lowering treatment). Please note the Asian BMI cutoffs for overweight and obesity of 24 kg/m^2 and 28 kg/m^2 and the waistline cutoffs for abdominal obesity of 90 cm and 85 cm for men and women, respectively.

Table 2. MASLD and MASH Prevalence, Incidence, and Mortality Values

Group	Value
Global NAFLD prevalence (2016–2019)	38%
Highest global NAFLD prevalence	Middle East and North Africa (42.6%)
Prevalence of lean MASLD in general population	5%-7%
Prevalence of lean NAFLD within the NAFLD population	20% in the western and eastern hemispheres ~ 40% (nonobese) in eastern hemisphere
F1–F2 prevalence in general population	7%–8%
F3–F4 prevalence in general population	1%–2%
Incidence of NAFLD	48.89–50.09 per 1000 person-years
All-cause mortality	12.61–7.1 per 1000 person-years
Cardiac-specific mortality	4.2–5.5 per 1000 person-years
Extrahepatic cancer mortality	2.8–4.2 per 1000 person-years
Liver-specific mortality	0.92–1.75 per 1000 person-years

NOTE. Data are based on NAFLD.
F1, F2, F3, F4, fibrosis stages 1, 2, 3, and 4.

3. Persistent increases in levels of aminotransferases (aspartate aminotransferase [AST] or alanine aminotransferase [ALT]) for ≥6 months, detected by a minimum of 2 tests, at least 4 weeks apart, after all other causes of liver disease are ruled out.

There was agreement that if any of these 3 clinical scenarios are present, MASLD is highly likely. Although in earlier guidelines, confirmation of steatosis using an imaging modality such as ultrasound had been suggested; more recent guidelines do not propose confirmation of hepatic steatosis with an imaging modality such as ultrasound.

In addition, there was some discrepancy in whether to assess alcohol consumption and to exclude alcohol-associated liver disease (ALD). Alcohol consumption can be assessed during a clinical interview using the alcohol use disorder identification test (AUDIT) tool and also by measuring a blood-based biomarker, the phosphatidylethanol (PEth) test. In the most recent definition of MASLD, the consensus established that alcohol consumption thresholds were ≤20 g/d and ≤30 g/d of alcohol for women and men, respectively.[12] Furthermore, in an individual with steatotic liver disease and at least 1 cardiometabolic risk factor with a daily alcohol consumption of >20 g but <50 g for women and >30 g but <60 g for men, the combination of metabolic-based and alcohol-based (Met-ALD) liver disease should be considered. Finally, for women and men with hepatic steatosis and alcohol ingestion >50 g/d and ≥60 g/d, respectively, ALD should be suspected—these individuals should be treated according to the ALD guidelines.[12]

Furthermore, as a part of the evaluation, assessments for common comorbidities such as T2D, dyslipidemia, cardiovascular disease, and kidney disease were recommended, whereas assessments for sarcopenia, hypothyroidism, hypogonadism, growth hormone deficiency, polycystic ovarian syndrome, and sleep apnea were recommended to be individualized (Table 3).

Risk stratification for MASLD using NITs. For individuals with MASLD, the next step is to determine risk of adverse outcomes (Figure 1). According to the most recent guidelines, high-risk MASLD (at risk for adverse outcome) should be investigated for individuals with MASLD who have T2D or are obese with ≥1 cardiometabolic risk factor, or individuals with chronic increases in levels of aminotransferases (ALT/AST), as described previously. High-risk MASLD is defined as MASLD with F ≥2, determined by histology or a validated NIT.[13] The Delphi process provided the following guidance statements on the use of NITs to identify individuals with potential high-risk MASLD.

For individuals with MASLD, T2D, or obesity with at least 1 cardiometabolic risk factor, or chronic increases in levels of aminotransferases (ALT/AST), the first step in the investigation for determination of high-risk MASLD is calculation of the fibrosis-4 (FIB-4) score. Individuals with FIB-4 scores <1.3 (<2.0 for those ≥65 years old) are considered low risk for advanced fibrosis or adverse outcomes and should continue management in the primary care setting, with consideration for retesting every 1 to 3 years, depending on the presence of risk factors such as T2D. Individuals with FIB-4 scores ≥1.3 (≥2.0 for those ≥65 years old) should undergo second-line NITs, such as VCTE to measure liver stiffness. The first-line test should be conducted in primary care or non-gastrointestinal/hepatology settings (endocrinology, cardiology). Although the second-line test can be conducted in the same settings, VCTE is performed primarily at gastroenterology or hepatology practices; only patients with LSM ≥8 kPa are considered at risk for advanced fibrosis (Figure 1).

It is important to note that the FIB-4 threshold for high-risk MASLD is lower in India (score of 1.0 instead of 1.3).[11] Although the lower threshold was adopted for risk stratification for India, the steering committee maintained a FIB-4 score of 1.3 as the cutoff score for advanced fibrosis (Figure 1).

In addition, an MAFLD guideline from Australia published in 2024 recommends ultrasound as the first test to document hepatic steatosis, followed by NITs (FIB-4, then VCTE-LSM or direct serum tests) and tests for cardiometabolic risk factors.[14] Use of ultrasound before risk stratification by NITs is not recommended by other recently published guidelines.[15,16]

Treatment of MASLD. The guideline review and consensus process provided some recommendations for the treatment of MASLD. Potential treatment strategies include lifestyle interventions, such as recommendations for a healthy diet, increased physical activity, and decreased sedentary time (Figure 2). Furthermore, treatment of metabolic comorbidities, such as T2D, should be optimized

Table 3. Recommendations for MASLD Screening and Medication-based Treatment

Evaluation for MASLD	
Step 1: Assess risk for MASLD if any 1 of the 3 of the following conditions are present:	1. Presence of T2D 2. Obesity, defined as a BMI ≥30 kg/m^2 (25 kg/m^2 for Asia) or waist circumference ≥102/88 cm for men and women (90 and 80 cm, respectively, for Asia[a]) with 1 or more of the following cardiometabolic risk factors present: • Fasting serum glucose ≥100 mg/dL or A1c of ≥ 5.7%) • Blood pressure ≥130/85 mm Hg or specific antihypertensive drug treatment • Plasma triglycerides ≥150 mg/dL or lipid-lowering treatment • Plasma HDL-cholesterol <40 mg/dL for men and <50 mg/dL for women or lipid-lowering treatment • Presence of T2D 3. Persistent elevation of AST and/or ALT for ≥6 months (in minimum of 2 tests, at least 4 weeks apart) indicates that all causes of SLD should be ruled out before investigating for MASLD[a]
Step 2: For individuals with any of the above situations, the following actions should be performed to exclude excessive alcohol use:	1. Assess alcohol consumption in a clinical interview and the AUDIT tool and/or PEth testing, if applicable 2. If not already done, assess for common comorbidities such as CVD, T2D, dyslipidemia, and kidney disease. Assessments for sarcopenia, hypothyroidism, hypogonadism, growth hormone deficiency, polycystic ovary syndrome, and sleep apnea should be individualized 3. Assess for CVD risk using an accepted CVD screening tool such as the ASCVD Risk Calculator
Step 3: Establishing diagnosis of MASLD	• If patients meet 1 of the above 3 criteria and daily alcohol consumption is no more than 20 g for women or 30 g for men, a diagnosis of MASLD should be made • If above criteria are met and patients have daily alcohol consumption >20 g and <50 g for women and >30 g <60 g for men, then the diagnosis of MetALD should be made • In the presence or absence of metabolic dysfunction, if alcohol consumption ≥50 g for women or ≥60 g for men, diagnosis of ALD should be made and treatment guidance for ALD should be followed
Consideration for selection of medications for treatment of comorbidities in those with MASH	
Pioglitazone	Pioglitazone can be considered as a treatment for T2D for individuals with or without MASH but not as a MASH-targeted therapy
GLP-1RAs	Until the FDA approves GLP-1RAs for MASH, these drugs should be considered the preferred treatments for T2D and/or obesity in individuals with MASH.
Sodium-glucose co- transporter-2 (SGLT-2) inhibitors	SGLT-2 inhibitors should be considered as treatments for T2D for individuals with or without MASH, but not as MASH-targeted therapies
Dipeptidyl peptidase-4 inhibitors	Dipeptidyl peptidase-4 inhibitors can be considered as treatments for T2D for individuals with or without MASH, but not as MASH-targeted therapies
Metformin, Insulin, and sulfonylureas	Metformin, insulin,[b] and sulfonylureas are used for treatment for T2D, but are not the preferred drugs for treatment of T2D in patients with MASLD or as MASH-targeted therapy[b]
Vitamin E	Due to a lack of sufficient evidence and balancing risks and benefits, vitamin E supplementation cannot be recommended as a MASH-targeted therapy, except in select individuals without T2D or cirrhosis
Ursodeoxycholic acid or Omega-3 fatty acids	Ursodeoxycholic acid or omega-3 fatty acids should not be considered as a treatment for people with MASH
MASH treatment with THR-β agonist (Resmetirom, approved in the United States)	
Recommendation 1	If available and licensed, resmetirom should be considered as treatment in individuals who meet NIT criteria: MASH with F2-F3 fibrosis in the absence of cirrhosis
Recommendation 2A	Treatment with resmetirom should be considered or offered for patients with VCTE liver stiffness measurements of ≥8 kPa <10 kPa, along with results from a second NIT also indicating F2, in the absence of cirrhosis (where local approval allows and is licensed)

Table 3. Continued

Recommendation 2B	Treatment with resmetirom should be considered or offered for patients with VCTE liver stiffness measurement of ≥10 kPa <16 kPa, in the absence of cirrhosis (where local approval allows and is licensed)
Recommendation 3	Although treatment with resmetirom should be considered for patients with VCTE liver stiffness measurements of 16–20 kPa (consistent with F3), a second NIT must exclude cirrhosis and in the absence of clinical or laboratory signs of portal hypertension or cirrhosis (where local approval allows and dependent on the label)
Recommendation 4	Resmetirom should not be prescribed to patients with evidence of cirrhosis from a biopsy or if VCTE liver stiffness measurements are >20 kPa; or there are any clinical or laboratory signs of portal hypertension or cirrhosis
Recommendation 5	Assessments for excluding hepatotoxicity should be made 3, 6, and 12 months after initiation of treatment with resmetirom
Recommendation 6	A second-line NIT, such as VCTE, may be performed at 6 months after treatment initiation to gauge early response to resmetirom
Recommendation 7	If drug safety assessments made at 3, 6, and 12 months are within normal parameters, resmetirom treatment assessment for efficacy or futility should be conducted at 1 year after initiation of treatment, using NITs
Recommendation 8	Lack of ALT response after 1 year of treatment with resmetirom should not be used as the sole criterion for assessing therapeutic response
Recommendation 9	VCTE LSM can be used to assess response to resmetirom treatment if there is ≥30% improvement (positive response) or worsening (deterioration), which are considered clinically significant
Recommendation 10	Futility after 1 year of resmetirom treatment can be defined as the worsening of 2 NITs demonstrating concordance
Preventive recommendations for MASLD and MASH	
Screening for HCC in patients with MASLD with cirrhosis	In people with MASLD and cirrhosis, HCC screening should be performed via ultrasound, with or without AFP measurement, every 6 months minimum Other modalities, such as magnetic resonance imaging, should be considered on a case-by-case basis
Screening for HCC in patients with MASLD without cirrhosis	HCC surveillance, in people with MASLD without cirrhosis, should be individualized based on risk profile, including comorbidities such as T2D and obesity, family history, age, alcohol intake, smoking status, and fibrosis markers (FIB-4 score and liver stiffness measurement) This decision is based on clinician judgment and is assessed on a case-by-case basis
Suggested vaccinations	All people MASLD should be considered for vaccination against hepatitis A and hepatitis B viruses, when feasible and applicable
Decompensated cirrhosis	Monitor for decompensated cirrhosis per current cirrhosis guidelines (presence of ascites, esophageal varices, portal hypertension, and hepatic encephalopathy)
Extrahepatic cancers	Screening for extrahepatic cancers should be conducted in line with current guidelines and based on the individual risk profile

AFP, alpha fetoprotein; ASCVD, atherosclerotic cardiovascular disease; AUDIT, alcohol use disorder identification test; CVD, cardiovascular disease; F, fibrosis stage; HDL, high-density lipoprotein; Met-ALD, metabolic-based ALD; PEth, phosphatidylethanol test.

[a]In China, BMI cutoffs for overweight and obesity are 24 kg/m^2 and 28 kg/m^2, respectively, and the waist circumference cutoffs for abdominal obesity are ≥ 90 cm (male) and ≥ 85 cm (female).

[b]Insulin is the recommended treatment for MASLD-related cirrhosis and T2D.

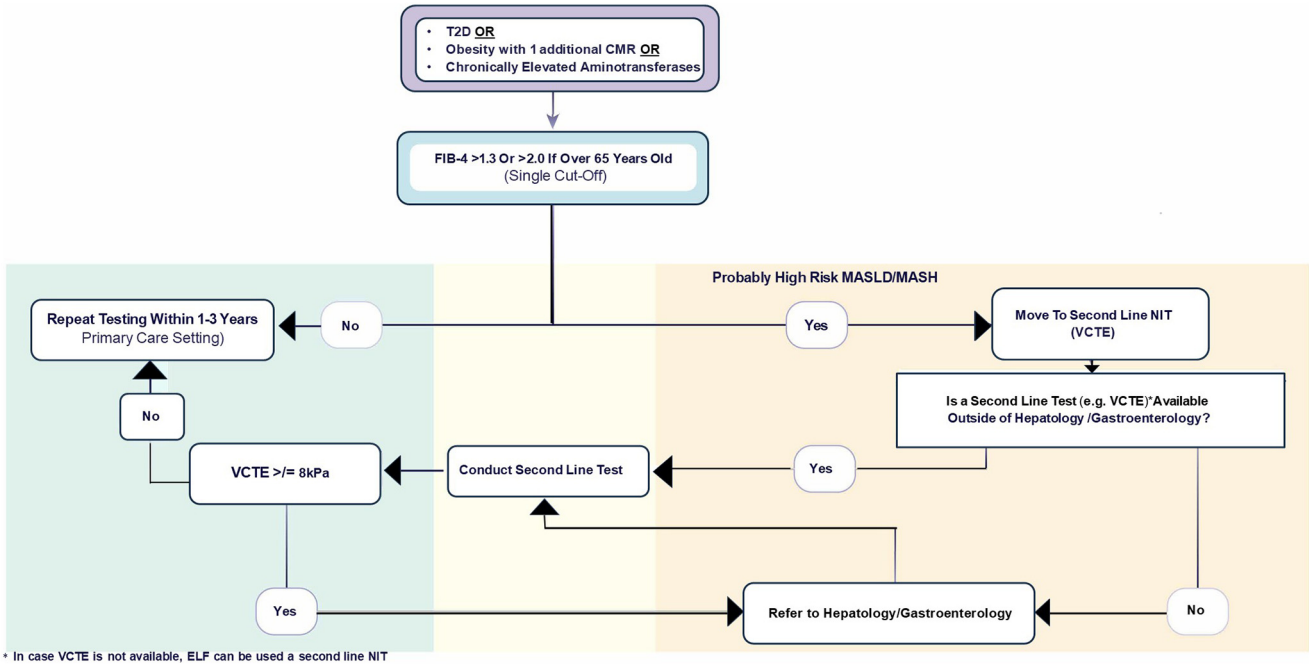

Figure 1. Initial screening for high-risk MASLD. CMR, cardiometabolic risk; ELF, enhanced liver fibrosis.

in patients with MASLD, regardless of MASH treatment. MASH-targeted drugs should be considered for patients who live where these are available and licensed (the United States and India).[11,17,18]

Lifestyle recommendations. Interestingly, most guidelines do not provide concise guidance on what is a "healthy lifestyle," except for the most recent guideline from the 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). On the other hand, almost all the guidelines mention consideration of a Mediterranean-style diet.[8] Therefore, as noted

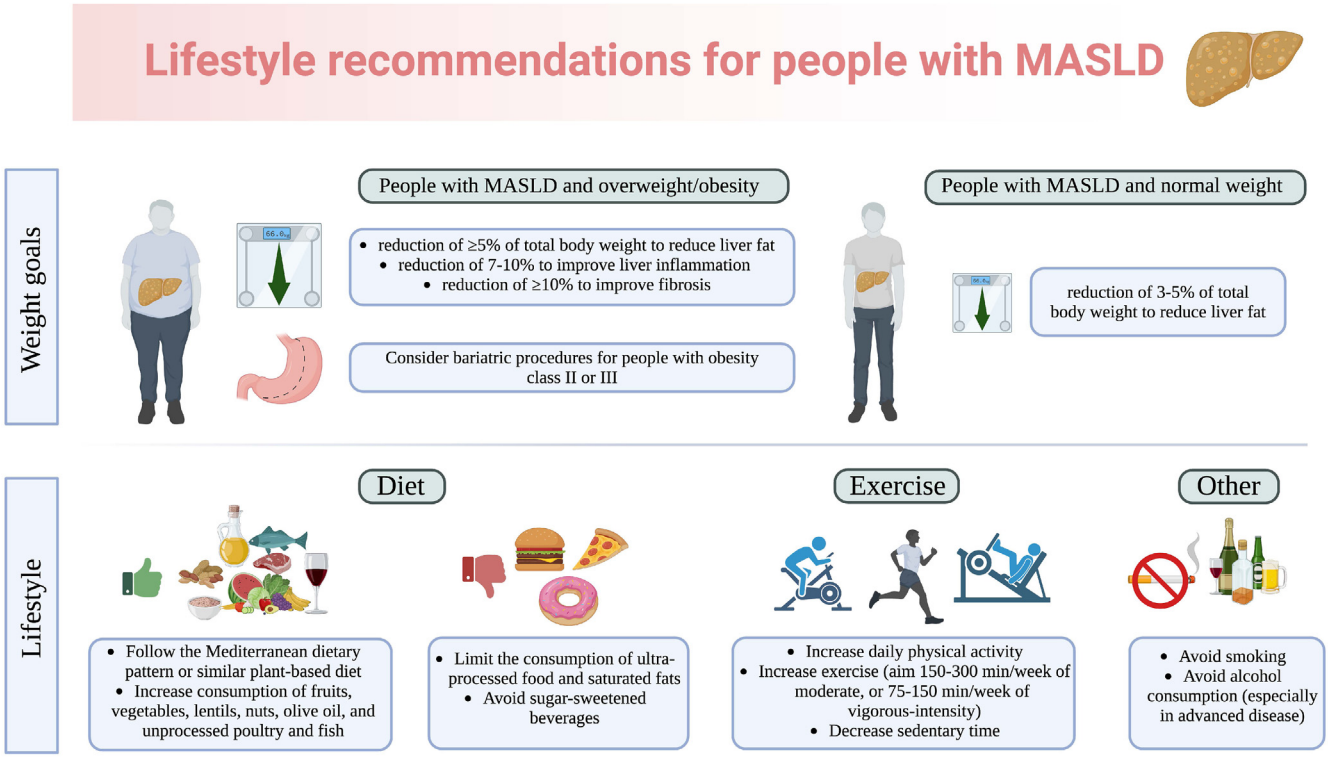

Figure 2. Lifestyle management.

through the Delphi process, the following guidance statements were generated (Figure 2). First, the treatment goal for healthy lifestyle intervention is a reduction of body weight by ≥5% (3%–5% in persons with a normal or lean BMI) to reduce liver fat, body weight reduction of 7% to 10% to decrease liver inflammation, and body weight loss ≥10% to reduce fibrosis.[8,19] To achieve these weight-loss goals, a healthy diet (such as the Mediterranean dietary pattern or a similar plant-based diet) should be recommended, with an emphasis on increased consumption of fruits, vegetables, legumes (eg, lentils, beans, chickpeas, green peas, soybeans), nuts, olive oil, and unprocessed poultry and fish. Ultra-processed foods, saturated fat, sugar-sweetened beverages, and foods with added fructose (found in industrialized processed foods) should be avoided or limited. In addition, decreasing sedentary time is recommended by increasing daily activity and performing 150 to 300 minutes of moderate activity or 75 to 150 minutes of vigorous activity each week. Individuals should also be encouraged to stop smoking and minimize alcohol consumption, especially for those with advanced liver disease. Consideration should also be given to the provision of access to structured lifestyle behavioral programs, psychological and social support when needed, and the measurement of health-related quality of life.

Treatment of metabolic comorbidities with existing medications. As noted, it is widely recommended that cardiometabolic risk factors be evaluated, according to their respective cardiometabolic guidelines,[15,16,20,21] regardless of availability of MASH-specific treatment. After the Delphi process, recommendations were proposed to assist caregivers in selection of therapies for the treatment of cardiometabolic risk factor in individuals with MASLD or MASH (Table 3, Supplementary Tables 6 and 8).

Bariatric and metabolic surgery. In the guideline review, there was high concordance among recommendations for bariatric surgery for weight-loss management among patients with MASH without cirrhosis. However, given the invasiveness of this procedure, a Delphi statement was generated and achieved an 85% agreement in the first round (Table 3, Supplementary Table 6). In this context, the consensus is that bariatric surgery should be considered as part of weight-loss management for people with non-cirrhotic MASH who meet the criteria for this type of surgery. However, bariatric surgery is not specifically recommended for the treatment of MASH; recommendations for patients to undergo bariatric surgery should follow current approved indications.

Drug treatment specific to MASH. Although some guidelines proposed vitamin E supplementation (800 IU per day) for treatment of MASH, the most recent guidelines did not recommend its use or suggested its use in limited cases among patients without T2D or cirrhosis.[15,16] Furthermore, based on review of guidelines, ursodeoxycholic acid or omega-3 fatty acids should not be considered as treatments for MASH (Table 3, Supplementary Tables 6 and 8). Previous guidelines have limited the use of pioglitazone for treatment of T2D among individuals with MASLD. Most glucagon-like peptide-1 receptor agonists (GLP-1RAs) have been recommended for treatment of T2D and obesity in individuals with MASLD, but not specifically as MASH-targeted therapies.[20,21] Nevertheless, there are data from phase 2 and 3 clinical trials reporting liver benefits from GLP-1RAs in patients with MASH. In a 3 phase trial of subjects with MASH and F2 or F3, almost 62.9% of those treated with semaglutide achieved resolution of steatohepatitis with no worsening of liver fibrosis, compared with 34.3% of subjects receiving placebo. Furthermore, a reduction in liver fibrosis without worsening of steatohepatitis was reported in 36.8% of the patients in the semaglutide group and in 22.4% of those in the placebo group ($P < .001$).[22] Once GLP-1RAs are approved and available for treatment of MASH, guidelines will be revised accordingly. Pioglitazone and other antidiabetic drugs have not been recommended specifically for treatment of MASH, but they are important for management of T2D in patients with MASH.[20,21] The guideline from India (Indian National Association for Study of the Liver) mentions saroglitazar as an approved treatment for MASH in India.[11]

Treatment of MASH with an approved THR-β agonist (resmetirom). In March of 2024, a novel THR-β agonist, resmetirom, was approved by the FDA for treatment of MASH in patients with F2–F3.[18,23] Although the FDA approval was based on histologic endpoints, treatment with this drug does not require MASH confirmation by liver biopsy. NITs are sufficient for diagnosis of MASH and monitoring the effects of resmetirom. As a part of the Delphi process, 14 statements related to resmetirom were selected to assist in the development of an algorithm.

Although all 14 statements achieved at least 70% agreement (the lowest agreement was 71%, for the Delphi statement "improvement in the liver biochemical profile is a principal indicator of treatment success"), numerous comments were received and deemed important for inclusion in the second through fourth rounds of the Delphi process. The second survey included 8 statements, which all achieved >80% agreement. However, 5 statements had 52% to 64% response rates for "Agree"; these 5 statements were reviewed with GNC experts, and an approval of at least 80% "Agree" was obtained.

After this step, 9 statements were generated to guide the administration and monitoring of resmetirom, covering treatment initiation, which NITs to use, and monitoring response to therapy.[18,22–24] These 9 statements were used in the third round of the Delphi process. Again, although all statements achieved >80% agreement, many comments were received during the Delphi process, which were used to generate 6 statements for the fourth round of the Delphi process. After the fourth round, all 6 statements achieved >80% agreement. Although some comments remain, there is insufficient scientific evidence and long-term clinical experience to refine the statements further. Additional research is needed to provide more clarity on resmetirom treatment and monitoring in patients with MASH (Supplementary Tables 6, 8, 11, and 13).

The review of the Delphi processes regarding treatment and monitoring of resmetirom is summarized in Table 3 and Figure 3. Briefly, diagnoses of MASH with F2 and F3 are

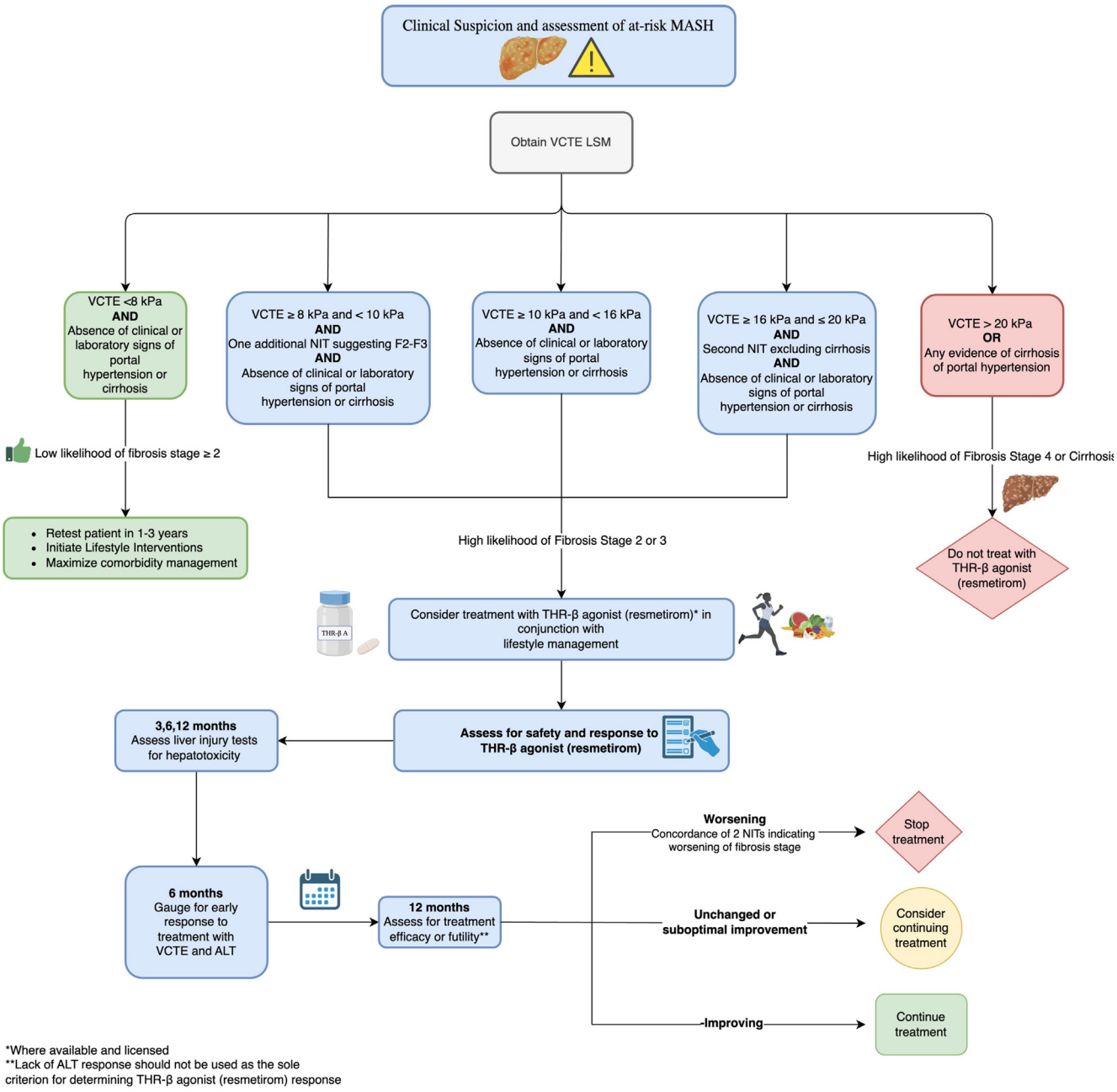

Figure 3. Algorithm for THR-β agonist resmetirom treatment.

made based on VCTE-LSM. In this context, patients with LSMs $\geq$8 kPa but <10 kPa require 1 additional NIT to establish F2 or F3. However, for LSM $\geq$10 kPa but <20 kPa after exclusion of cirrhosis or portal hypertension, resmetirom treatment should be considered. However, for an LSM of 16 to 20 kPa, extra care must be taken to exclude cirrhosis based on results from a second NIT, as well as on available clinical or laboratory data such as findings of thrombocytopenia.

Assessments of treatment safety and efficacy were reviewed based on publications and the Delphi process. There was full consensus that safety assessments (history, physical, and measurements of ALT and AST) should be performed in months 3, 6, and 12 after treatment begins. In addition, early responses to treatment may be investigated using VCTE after 6 months of treatment, but no treatment decision should be made based on VCTE results at this time. Therefore, the efficacy of MASH treatments should be evaluated 1 year after treatment initiation (Supplementary Tables 6, 8, 11, and 13).

From the Delphi process, futility of treatment has been defined as worsening MASH results from 2 NITs. Importantly, lack of ALT response should not be used as the sole criterion for stopping treatment. At 12 months after

treatment initiation, the decision to continue treatment should be made based not only on responses in NITs (≥30% improvement in LSM from baseline), but also on any coverage restrictions, safety concerns, side effects, patient preference, or worsening of liver disease. If MASH appears to be worsening, treatment should be discontinued. For patients who have partial improvement or are considered stable, treatment continuation can be considered and individualized. Obviously, this decision also depends on the approval and availability of other drugs for treatment of MASH. Although not specifically addressed by the Delphi process, the steering committee suggested that the long-term efficacy and safety of resmetirom be monitored in real-world clinical registries. If VCTE is not available, other NITs such as ELF can be considered (Figure 1).

MASH therapeutics in development. Among the guidelines reviewed, only 61% discussed drugs in development for MASH: 45% discussed agents that modulate peroxisome proliferator-activated receptors, 32% discussed agents that target the farnesoid X receptor (FXR), and 20% addressed C-C chemokine receptor 2 (CCR2) or CCR5 antagonists. Only 16% discussed probiotics, symbiotics, or lipogenesis inhibitors; 11% discussed THR-β agonists; and 2% discussed FGF-19 analogues. These findings suggest that although there is discussion of new drugs in development within the guidelines, they may not be up to date. However, more recent guidelines (2022–2024) had more up-to-date reporting. Such reporting will be important, as approval of other drugs, from different classes, is expected within the next few years.

HCC screening guidance and other preventive guidance (screening for varices and vaccination for hepatitis A and B viruses). Following the Delphi process, several recommendations for prevention were made (Supplementary Table 6, Table 3, and Figure 4). It is important to note that recommendations for HCC screening in patients with MASH-associated cirrhosis (F4) are similar to those for cirrhosis of other etiologies. Although patients

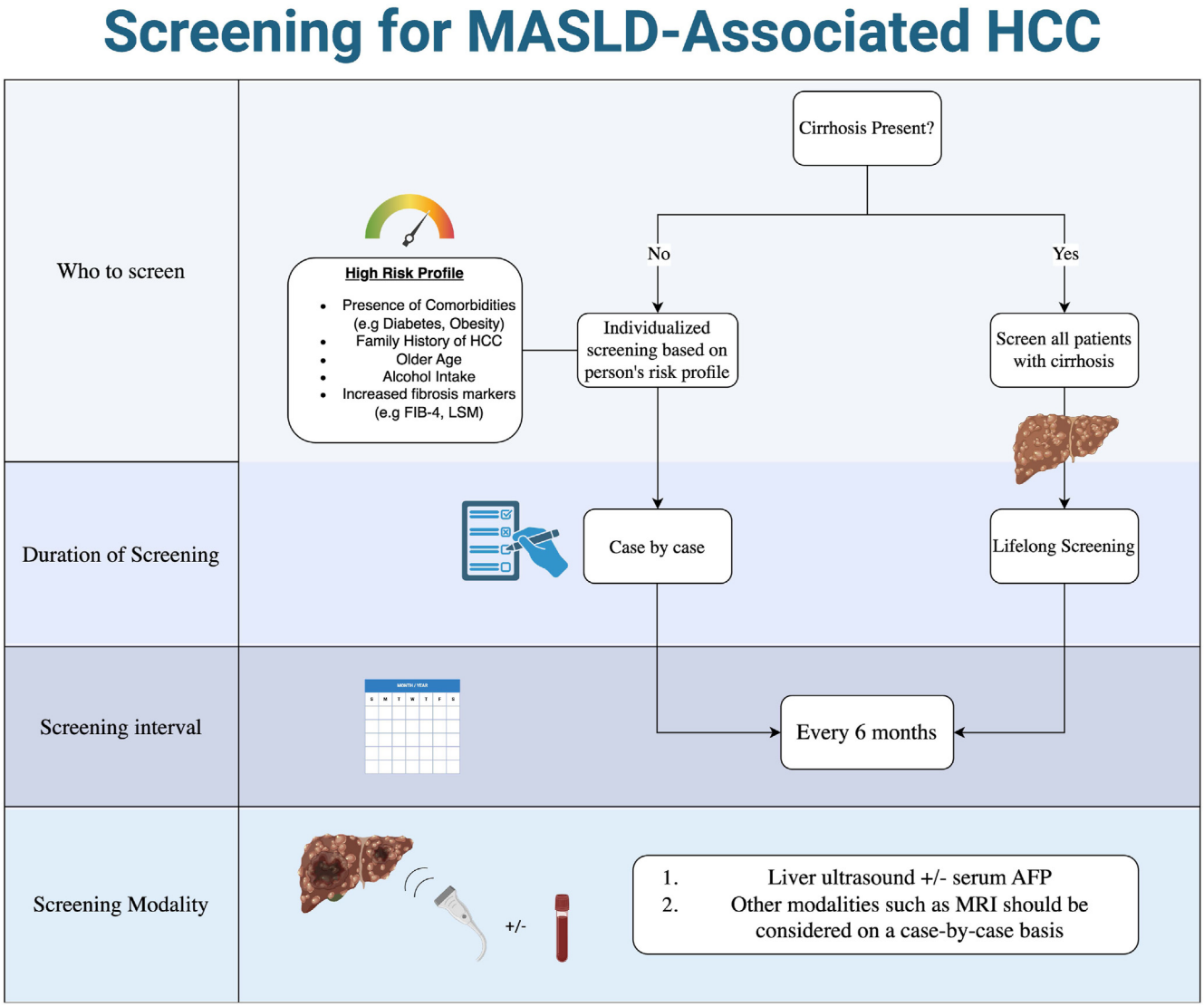

Figure 4. Hepatocellular carcinoma screening recommendations. MRI, magnetic resonance imaging.

with non-cirrhotic MASH can be at risk for HCC, their risk is below the screening threshold, so widespread screening cannot be recommended for this population. Nevertheless, patients with MASH and bridging fibrosis, family history of HCC, multiple cardiometabolic risk factors (especially T2D), or continuous alcohol use might have increased risk for HCC and should be assessed on a case-by-case basis. This decision should be left to patients' clinicians until additional evidence is generated for widespread or targeted screening for HCC in patients with MASH without cirrhosis.

MASLD in pregnancy and pediatric populations. Although this review has focused on guidelines related to non-pregnant adults (≥18 years), the status of guidelines for special populations was also considered. Our review of the guidelines revealed that 13 of the 61 guidelines (21%) mentioned pregnancy, but within these guidelines, only 2 (1%) made any recommendations. Neither of the guidelines for pregnancy mentioned prevalence information nor presented any criteria for screening or diagnosis. One of the guidelines mentioned MASLD incidence, 1 mentioned mortality rate, 1 mentioned patient-reported outcomes, 1 mentioned screening for and treatment of risk factors including cardiovascular disease and prediabetes/diabetes, and 1 mentioned special treatment considerations for working with pregnant patients who had undergone bariatric surgery. One mentioned lifestyle and diet changes as treatment interventions.

In addition to pregnancy and MASLD, our review process included MASLD in the pediatric population. Forty of the 61 (65%) guidelines mentioned pediatric populations, but only 22 of these 40 (55%) provided any recommendations. Although 68% (n = 15) of the guidelines mentioned MASLD prevalence, only 5% (n = 1) mentioned MASLD incidence or mortality data. Eighteen percent (n = 4) presented MASH prevalence and 18% (n = 4) presented patient-reported outcomes data for children. Only 55% (n = 12) provided any risk factors to consider in screening for MASLD. In addition, discussions of increased levels of ALT and cutoff values for use in evaluation varied considerably among the pediatric portions of the guidelines. Eighteen percent (n = 4) recommended against the use of ultrasound for diagnosis, and only 23% (n = 5) listed any diagnostic criteria for children. However, 55% (n = 12) suggested liver biopsy for children with increased risk for advanced liver disease or advanced fibrosis, and 41% proposed screening and treating other risk factors, such as T2D and obesity. Seventy-three percent of guidelines (n = 16) suggested diet and exercise as treatment interventions, 59% (n = 13) discussed bariatric surgery considerations, and 19% (n = 4) considered mental health needs. This information may be helpful to pediatric organizations in the development of updated guidelines.

Discussion

The purpose of this study was to create global consensus in recommendations for management of MASLD among guidelines developed from 2018 through January 2025. Although most recommendations from these recent documents are concordant, there are some important areas of discordance. These areas are related to steps that must be followed for screening for MASLD, risk stratification of MASLD using NITs, treatment of comorbidities, and recently approved treatment for MASH. Using a comprehensive review and an extensive Delphi process, we were able to establish consensus recommendations in almost all areas of disagreement, including the use of NITs, their thresholds, and their sequence of use in patients with MASH.

Keeping in mind the variability of use and access to NITs around the world, we summarized NIT-based algorithms, starting with the FIB-4, which can be used in most regions of the world. Despite the limitations of the FIB-4 test (such as effects of age, presence of T2D, and different cutoffs for use in India), the high specificity with which it rules out advanced fibrosis has made the FIB-4 the most acceptable first-line NIT in most guidelines.[23] Although the VCTE-LSM is the most frequently used second-line NIT for the determination of stage, this test is not always available. Other validated modalities (Shear Wave Elastography, Enhanced Liver Fibrosis tests, etc) may be considered for specific countries where they are available.

In this context, as new medications and technologies are available, first-line and second-line NIT selections may require reevaluation. However, at this time, the algorithm for diagnosis of high-risk MASLD generated from this study uses 2 NITs, completed in a 2-step process (FIB-4 followed by VCTE-LSM or FIB-4 followed by ELF) to identify patients with MASLD who are considered at risk for adverse outcomes (≥F2).

Our consensus recommendations aim to provide pictorial guidance in terms of lifestyle management and drugs that are preferred for treatment of comorbidities (T2D and obesity) in patients with MASLD. This pictorial approach may be especially helpful in busy clinical practices for determining therapeutic strategies for comorbidities in patients who may not already be prescribed the preferred medications.

Historically, limited data have provided support to use vitamin E (800 IU per day) for treatment of MASH. The most recent American Association for the Study of Liver Diseases guidance suggests that vitamin E supplementation can be considered for select individuals diagnosed with MASH but without T2D or cirrhosis.[16] On the other hand, the most recent EASL-EASD-EASO guideline states that, given the lack of robust effects of vitamin E on histologic features of steatohepatitis and liver fibrosis proven in phase 3 trials and its potential long-term risks, vitamin E cannot be recommended as a MASH-targeted therapy.[15] In the second round of our Delphi, 87% of participants agreed or strongly agreed not to recommend vitamin E for this indication (Supplementary Table 8). In this context, vitamin E cannot be recommended universally for this indication due to lack of robust evidence rather than any specific contraindication. Although a phase 3 clinical trial of vitamin E is not expected, the Vitamin E Dosing Study (VEDS) may provide additional evidence of any effects (ClinicalTrials.gov no. NCT04801849). Any potential benefits (MASH improvement) of vitamin E therapy (800 IU per day) must outweigh its potential long-term risks (hemorrhagic stroke).

We have provided recommendations on the use and monitoring of the currently approved THR-β agonist (resmetirom) in persons with MASH. Because this medication has only recently been approved in the United States, guidance for its use will need to be updated as more long-term data become available, especially as approval expands to other countries. However, several key findings came from this Delphi process regarding treatment with resmetirom. First, it was recommended that in the absence of cirrhosis, patients with a FIB-4 score of $\geq$1.3 should undergo second-line testing with VCTE-LSM. A review of recent documents[17,18] suggests 2 different cutoff LSMs to consider in initiating treatment, which were considered in the Delphi process. The consensus suggested that, for patients with LSM $\geq$8 kPa but $<$10 kPa (in the absence of cirrhosis), a second NIT should be performed to determine whether F2-F3 is present. However, in this case, results from the 2 NITs must be concordant for presence of F2-F3. However, for patients with VCTE-LSM $\geq$10 kPa but $<$20 kPa (in the absence of cirrhosis), treatment with resmetirom is recommended. It is important to note that patients with MASLD and LSMs of 16–20 kPa can also be considered for treatment, but must be carefully assessed based on clinical data, laboratory test findings (absence of thrombocytopenia), and results from a second NIT that exclude cirrhosis.

The Delphi process also led to some recommendations on monitoring resmetirom therapy to detect hepatotoxicity, identify an early response to treatment, and guide treatment efficacy or futility 1 year after treatment initiation. Although these recommendations are reasonable, more research is required to determine which NITs are best for monitoring response to resmetirom, especially because a lack of ALT response after 1 year of treatment is not a definitive indicator of treatment failure.[17]

Although our results are grounded in sound methodology, it is important to point out that these recommendations are not meant to replace existing, recent guidelines. The goal of this process was to address areas of discordance in recommendations among the guidelines and provide easy-to-use guidance for the care of patients with MASLD. Nonetheless, this consensus-building project for MASH was an important endeavor given the rapid worldwide increase in the prevalence of MASLD, the development of new NITs, and the approval of MASH-targeted treatment. Further research is needed to determine the impact of algorithms, such as the one we have recommended, as well as ways to increase awareness of MASLD and recommended treatment strategies, including resmetirom. Greater awareness and improved management of MASLD could decrease health care costs, reduce the need for liver transplantation, and improve health-related quality of life.[18,24–26]

This study has several potential limitations. First, only a minority of the guidelines evaluated used standardized methods in their guideline-development process or selection of their recommendations. This is not really a weakness of our study but a weakness of guideline development in the field of MASLD/MASH. Nevertheless, during the development of the Delphi statements, the steering committee ensured alignment with the recommendations provided in high-quality guidelines. Second, there may have been bias in the selection of the Delphi panel participants; however, in our selection process, we aimed for diversity in gender, nationality, and expertise among panel members, aiming to ensure input from a range of geographic regions with different resources, health systems, and coverage for MASLD and related morbidities. This diversity in the guidelines reviewed and the Delphi panel member's input increased the external validity of our findings and recommendations, although structural differences between countries may still affect their implementation. Information bias was minimized by a predefined, structured protocol of paper selection, data extraction, and Delphi procedures. Another limitation of our study is that these findings apply only to non-pregnant adults (18 years and older). There is a great need for similar guidance for special populations, such as pregnant women and children.

In summary, through an in-depth review of recent MASLD guidelines or similar documents from around the world, and the Delphi process with global MASH experts, we have developed consensus recommendations for busy clinicians. These recommendations cover diagnosis through treatment of MASLD. Further research is required to determine the effectiveness of this algorithm in raising awareness of MASLD and its treatment.[25,26]

Supplementary Material

Note: To access the supplementary material accompanying this article, visit the online version of *Gastroenterology* at www.gastrojournal.org, and at https://doi.org/10.1053/j.gastro.2025.02.044.

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Guarantor of Article

Zobair M. Younossi is the guarantor of this work and had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. All authors read and approved the final version of the manuscript.

Conflicts of interest

These authors disclose the following: Zobair M. Younossi is a consultant or has received research funding from Intercept, Cymabay, Boehringer Ingelheim, Ipsen, Gilead Sciences, Inventiva, BMS, GSK, NovoNordisk, Siemens, Madridgal, Merck, Akero, and Abbott. Shira Zelber-Sagi received one-time travel funding for a scientific talk from AbbVie and one-time consultant fee from Siemens. Jeffrey V. Lazarus received grants to ISGlobal from AbbVie, Boehringer Ingelheim, Echosens, Gilead Sciences, Madrigal Pharmaceuticals, Moderna Pharmaceuticals, MSD, Novo Nordisk, Pfizer, and Roche Diagnostics; consulting fees from Echosens, NovoVax, GSK, Novo Nordisk, and Pfizer; and payment or honoraria for lectures from AbbVie, Echosens, Gilead Sciences, Janssen, Moderna, MSD, Novo Nordisk, and Pfizer, outside of the submitted work. Vincent Wong served as a consultant or advisory board member for AstraZeneca, AbbVie, Boehringer Ingelheim, Echosens, Gilead Sciences, Intercept, Inventiva, Merck, Novo Nordisk, Pfizer, Sagimet Biosciences, TARGET PharmaSolutions, and Visirna and has been a speaker for Abbott, AbbVie, Echosens, Gilead Sciences, Novo Nordisk, and Unilab. He has received a research grant from Gilead Sciences and is a co-founder of Illuminatio Medical Technology. Yusuf Yilmaz has served as a consultant for Cymabay, Zydus, and Novo Nordisk. Laurent Castera reports consulting fees from Boston Pharmaceutical, Echosens, Gilead, GSK, Madrigal, MSD, Novo Nordisk, Pfizer, Sagimet, and Siemens Healthineers; he has received speaker fees from Echosens, Gilead, Inventiva, Madrigal, and Novo Nordisk. Emmanuel Tsochatzis participated in advisory boards for Boehringer, Siemens Healthineers, MSD, and NovoNordisk and reports speaker fees for Boehringer, Echosens, Novo Nordisk, and AbbVie. C. 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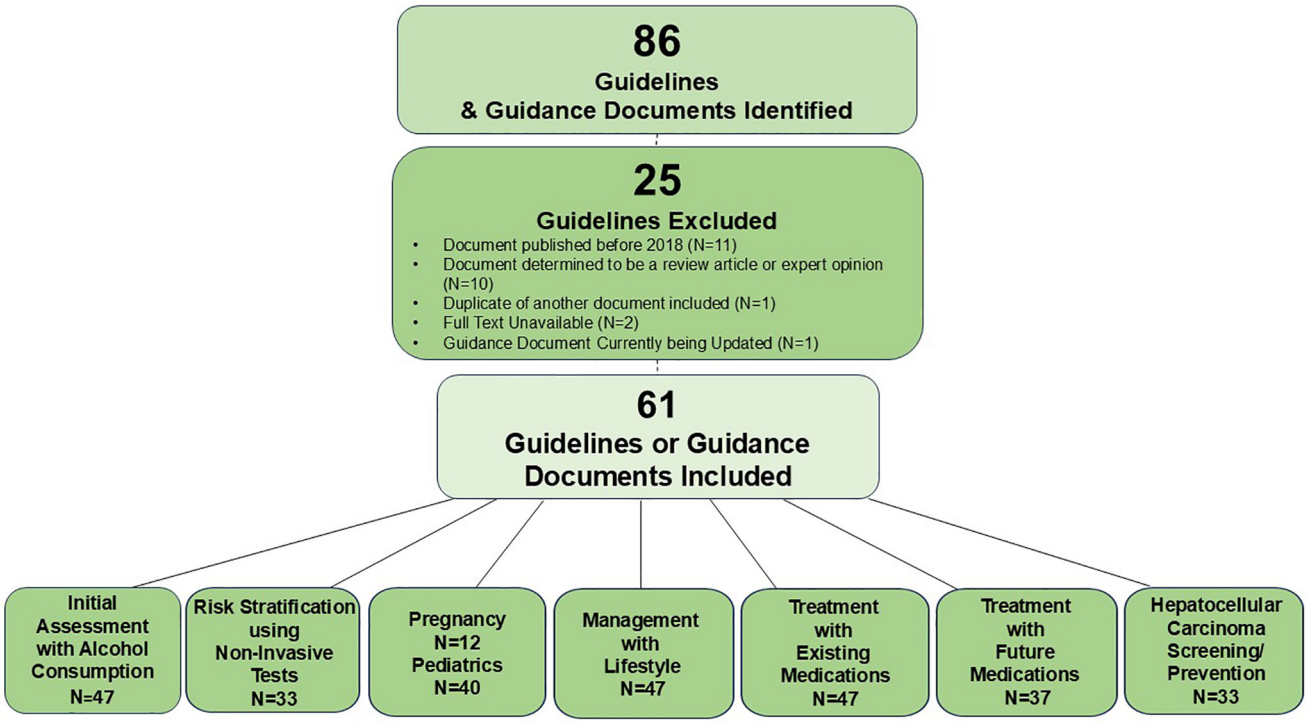
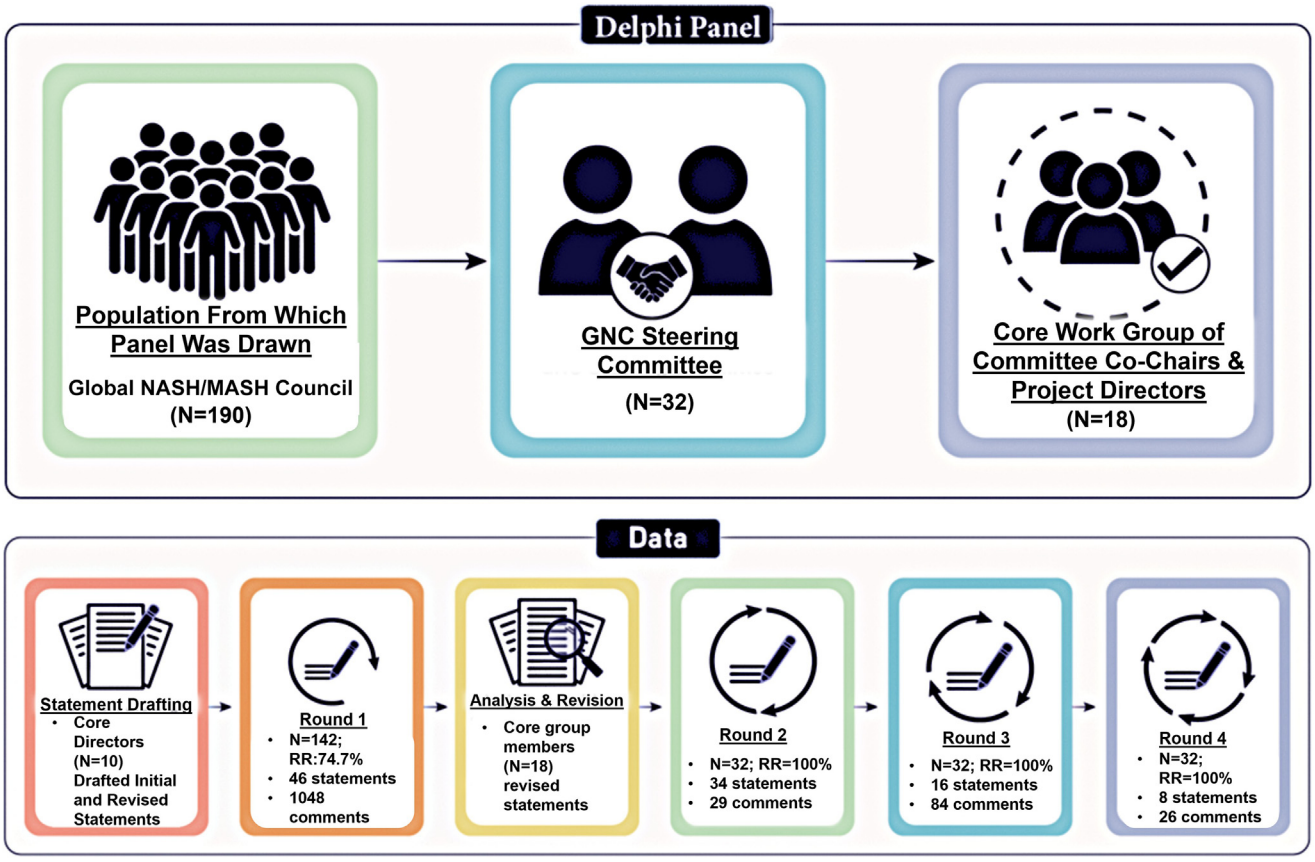
Data Availability

All data from this study are contained within the manuscript text, the tables, and the supplementary tables.



Supplementary Figure 1. Literature search.



Supplementary Figure 2. Delphi panel and data. GNC, Global NASH/MASH Council.