

Research Advances in Multidisciplinary Management of Metabolic Dysfunction-Associated Steatotic Liver Disease from a Proactive Health Perspective

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Abstract: Metabolic Dysfunction-Associated Steatotic Liver Disease (MASLD), as the most prevalent chronic liver disease, poses challenges that a single department cannot adequately address. Proactive health is an original concept proposed by China to advance the transformation of its healthcare service system. This paper reviews the current state of multidisciplinary management research for MASLD, analyzes the difficulties and challenges in implementing such management, and introduces the concept of proactive health. It explores the division of responsibilities among individuals, hospitals, and communities within the proactive health framework, providing a basis for the practical implementation of multidisciplinary management for MASLD.

Keywords: Metabolic dysfunction-associated steatotic liver disease; Proactive health; Multidisciplinary management

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1. Introduction

Metabolic Dysfunction-Associated Steatotic Liver Disease (MASLD) is one of the leading causes of liver disease worldwide, having surpassed chronic hepatitis B as the primary chronic liver condition posing a threat to public health. The current global prevalence rate has reached as high as 32.4%, with the prevalence rate among adults in China reaching 29.6%^[1,2]. If MASLD is not properly controlled in its early stages, the disease spectrum can progress from simple fatty liver to Metabolic Dysfunction-Associated Steatohepatitis (MASH), liver fibrosis, and eventually cirrhosis or liver cancer. MAFLD often coexists with endocrine disorders, cardiovascular diseases, chronic kidney diseases, and other conditions. Traditional single-discipline approaches cannot meet the needs of comprehensive management, necessitating a multidisciplinary approach.

In 2015, the “13th Five-Year Plan” for science and technology first proposed the concept of “proactive health” centered on health^[3]. Its core principle is that individuals are the primary responsible parties for their health, integrating health into all policies, promoting widespread societal participation, strengthening cross-sectoral collaboration, and achieving chronic disease health management across the entire lifespan for the entire population. This paper aims to systematically review the current research status of multidisciplinary management of MASLD, explore how to guide the implementation of multidisciplinary management of MASLD from the perspective of proactive health, and provide a basis for the practice of multidisciplinary management of MASLD.

2. Composition of the multidisciplinary management team for MASLD

The 2024 Guidelines for the Prevention and Treatment of Metabolic Dysfunction-Associated Steatotic Liver Disease clearly state that the treatment of MASLD requires multidisciplinary collaboration and the establishment of a patient-centered multidisciplinary collaborative model^[4]. Lifestyle interventions necessitate the collaboration of clinical nutrition, exercise rehabilitation, clinical psychology, and big data centers to provide dietary prescriptions, exercise prescriptions, behavioral therapy, and digital follow-up, laying the foundation for disease management. Pharmacological or surgical treatments require the collaboration of endocrinology, cardiovascular medicine, hepatology, and general surgery to address metabolic disorders, cardiovascular comorbidities, liver damage, and end-stage surgical issues. Subsequently, scholars have proposed a multidisciplinary management pathway for MASLD. In the initial diagnosis phase, the gastroenterology and hepatology department leads diagnostic evaluation and staging, screens for cirrhosis and liver cancer, monitors treatment efficacy, and orchestrates multidisciplinary consultations to establish a comprehensive plan^[5]. Metabolic indicators, liver fibrosis progression, and lifestyle adherence are evaluated every 3–6 months, with dynamic adjustments to the plan. Following the initial diagnosis by the gastroenterology and hepatology department, multidisciplinary treatment is initiated, with collaborative development of treatment plans for liver protection and correction of metabolic disorders, and multidisciplinary reassessment of treatment efficacy every 3 months with timely adjustments.

3. Current application status of multidisciplinary management for MASLD

Patients with MASLD can benefit from multidisciplinary management, particularly those with advanced liver fibrosis. Studies have demonstrated that multidisciplinary management of MASLD has shown favorable outcomes and effects. In various regions of the UK, through risk stratification management, patients with advanced disease are referred to multidisciplinary metabolic liver disease clinics composed of hepatologists, endocrinologists, and specialist nurses. Lifestyle modifications and medical interventions have not only significantly improved liver and cardiometabolic outcomes but also effectively controlled economic costs for patients with comorbid type 2 diabetes mellitus (T2DM)^[6]. In Taiwan, China, under the leadership of physicians, dietitians, and nurses, a 6-month lifestyle management program for patients with MASH resulted in significant reductions in liver enzymes and metabolic indicators^[7]. Community-led multidisciplinary management, through nutritional counseling, behavioral guidance, and clinical monitoring, has improved metabolic and liver indicators while enhancing self-management adherence and quality of life for patients with MASLD^[8]. A study in the United States demonstrated that multidisciplinary management

involving seven disciplines, including hepatology, exercise physiology, bariatric surgery, sleep medicine, and psychology, effectively improved metabolic and liver outcomes through personalized treatment plans. It emphasized the critical role of disciplines previously overlooked in multidisciplinary models, such as exercise physiology, obesity medicine, and psychology, in achieving successful outcomes ^[9].

4. Problems and challenges faced by multidisciplinary management

4.1. Inadequate awareness among healthcare professionals

Insufficient awareness of MASLD among physicians can lead to difficulties in early identification and suboptimal management, representing the primary barrier to implementing multidisciplinary management ^[10]. This lack of awareness exhibits significant specialty-specific variations, with a prevalent phenomenon of physicians lacking knowledge about diseases outside their specialty. A comparative survey of physicians across different specialties revealed varying levels of mastery of the epidemiological characteristics, diagnostic criteria, and treatment principles of MASLD, with non-hepatology specialists demonstrating significantly lower awareness levels than hepatology specialists, particularly cardiovascular specialists and community physicians ^[10]. On one hand, inadequate awareness directly affects the early diagnosis of MASLD. As a metabolic disease with insidious onset and high heterogeneity, MASLD can be reversed through timely diagnosis and effective intervention before liver fibrosis occurs. However, the reality is that the early diagnosis rate of this disease is low, with most patients often progressing to middle or advanced stages before being diagnosed during hepatology specialist consultations. Studies have shown that within multidisciplinary management systems, primary care physicians have the lowest level of awareness of MASLD ^[10,11]. As a crucial frontline in the holistic management of MASLD, communities play a decisive role in identifying, referring, and conducting long-term follow-up of high-risk populations for diabetes, obesity, metabolic syndrome, and other conditions, determining the effectiveness of early disease intervention and control of disease progression. On the other hand, inadequate physician awareness also affects the prognosis of patients with middle or advanced disease. Cardiovascular disease represents the most severe complication of MASLD. However, recent research has found that, compared to other specialties, cardiovascular specialists are the least familiar with the symptoms and diagnostic criteria of MASLD and have the lowest confidence in diagnosing and managing it ^[11]. This may lead to underestimating the impact of liver metabolic abnormalities on cardiovascular prognosis, thereby lacking a sense of urgency in initiating or participating in multidisciplinary management.

4.2. Obstacles to multidisciplinary collaboration

The foremost requirement for multidisciplinary management is the establishment of unified diagnostic and treatment protocols and diagnostic criteria. The “Guidelines for Primary Care Diagnosis and Management of Metabolic Dysfunction-Associated Steatotic Liver Disease (2025)” clearly outline the clinical pathway for primary care institutions to conduct MASLD “screening-stratification-referral” ^[12]. The formation of a multidisciplinary team must first ensure the core role of hepatology in prognosis assessment and treatment guidance for MASLD, as well as clear delineation of responsibilities and rights among various departments to prevent fragmented efforts. China is characterized by uneven distribution of medical resources, with primary care institutions unable to conduct multidisciplinary treatment. Therefore, it is necessary to establish regional medical consortia to form medical cooperation circles. Unified diagnostic and treatment standards

and pathways should be established within regions to achieve “tiered diagnosis and treatment with upward and downward referrals”, thereby optimizing the allocation of medical resources. Mild cases are managed in communities through personalized lifestyle interventions, while moderate to severe cases are referred to tertiary hospitals for multidisciplinary treatment. International practices have also validated its effectiveness; for example, the UK promotes tiered diagnosis and treatment and multidisciplinary treatment in communities through initial screening using the FIB-4 index or MASLD fibrosis score (NFS) and standardized referral pathways ^[6,13]. The United States employs FIB-4 and liver stiffness measurement (LSM) for risk stratification of MASLD patients, enabling referral of high-risk patients for multidisciplinary treatment ^[14]. The LOCATE-MASLD model implemented by the University of Queensland in Australia utilizes specialist nurses to assess liver fibrosis using FibroScan in communities, significantly improving the diagnosis rate and referral efficiency of high-risk patients ^[15].

4.3. Inadequate long-term management of patients

As a typical metabolic lifestyle disease, the first-line treatment and core intervention for MASLD have always been lifestyle modifications. Multiple guidelines list lifestyle interventions as the cornerstone and recommended evidence for MASLD management ^[4,16]. However, the current status of long-term management for MASLD patients is not optimistic. Studies have shown that only 30% of MASLD patients achieve a weight loss of more than 5% through lifestyle modifications within 13 months, and the dropout rate for long-term lifestyle interventions is as high as 50%. A qualitative evidence summary found that barriers to implementing lifestyle management in MASLD patients include low health literacy, inadequate disease awareness, poor self-efficacy, and lack of professional guidance ^[17,18]. According to a survey, the health literacy level of Chinese residents in 2024 was 31.87%, with disparities remaining between urban and rural areas and across regions. Residents generally lack correct awareness of the disease knowledge and prognosis of MASLD and do not attach sufficient importance to it ^[19]. It is necessary to strengthen the construction of primary community hospitals, including talent reserves, examination equipment, and health education, to fully leverage the role of communities in knowledge dissemination and primary screening. Digital therapeutics technology provides crucial support for addressing issues such as untimely follow-up and lack of personalized interventions in traditional MASLD management models by reshaping the management scenario. It plays a positive role at both the patient and healthcare system levels. At the patient level, digital therapeutics utilize mobile health applications, wearable devices, and other tools to integrate health management into patients' daily lives. For example, patients can quantitatively record dietary intake and physical activity levels through software and simultaneously monitor physiological and behavioral parameters using wearable biosensors ^[20,21]. This continuous self-monitoring, combined with immediate feedback and personalized guidance provided by the platform, can effectively enhance the long-term adherence and sustainability of lifestyle modifications in patients ^[22]. Existing research has confirmed that encouraging patients to use such technologies for self-monitoring significantly promotes the maintenance of physical activity and healthy habits ^[22]. At the healthcare system level, the construction of digital therapeutics platforms serves as a data hub connecting healthcare institutions at all levels and patients, enabling information sharing and providing objective evidence for implementing “tiered diagnosis and treatment with upward and downward referrals”, further optimizing the allocation of medical resources. Meanwhile, the physician-side functions of the platform support remote real-time monitoring and guidance of patients'

dietary, exercise, and other data, achieving continuous supportive interventions extending from the hospital to the community ^[23].

5. Multidisciplinary management strategies for MASLD from the perspective of proactive health

The goal of proactive health is to achieve health for the entire population throughout the entire lifespan and the entire process ^[24]. On the premise of clarifying that individuals are the primary responsible parties for their health, it fully mobilizes the enthusiasm of individuals and society to jointly achieve the forward shift of disease prevention and control through multidisciplinary collaboration ^[25]. From the perspective of proactive health, multidisciplinary management of MASLD is far-sighted; its significance is not limited to the clinical diagnosis and treatment level but extends health management to the entire society and population. By stimulating individuals' subjective initiative, it ultimately achieves the goal of proactive health for the entire population. The key lies in accurately identifying the interests and demands of all parties, clarifying their roles and functional positioning, and promoting the formation of a collaborative governance synergy among all parties ^[26].

5.1. Mobilizing individual enthusiasm to become practitioners of proactive health

Individuals and families are the specific executors of proactive health, serving as both demanders and suppliers ^[26]. The main challenge in current MASLD management is low health literacy and insufficient disease awareness among patients, which in turn leads to poor treatment adherence and low self-management efficacy. Although proactive health emphasizes that individuals are the primary responsible parties for their health, the primary responsible parties often possess responsibilities but lack the rights to exercise them ^[26]. Stimulating individual initiative and establishing a "proactive health" awareness are key to achieving a transition from "passive response" to "active management". First, enhance patients' disease awareness and health literacy. Through diversified channels such as community health lectures and digital health education platforms, conduct targeted health knowledge dissemination, focusing on explaining the reversibility of MASLD and the importance of lifestyle interventions. Second, empower patients to participate in the entire process of disease management. By granting them health autonomy in decision-making, improving self-management skills and confidence, and enabling patients to transition from "passive adherence to medical advice" to "active responsibility for health", their willingness for active management can be effectively enhanced ^[27]. Finally, multidisciplinary management provides professional guidance to improve self-management abilities, gradually cultivate healthy behavioral habits, and become practitioners of proactive health.

5.2. Leveraging the leading role of hospitals and integrating multidisciplinary resources

Hospitals play a demonstrative and leading role in proactive health, being responsible for coordinating prevention, treatment, rehabilitation, and health promotion within regional medical networks to provide patients with integrated and continuous medical services ^[28]. Currently, insufficient collaboration among different disciplines and fragmented efforts lead to the fragmentation of proactive health resources within hospitals, making it difficult to form synergy. Second, strengthen external resource linkage, establish medical consortia and compact urban medical groups, deepen collaboration with primary care institutions, and

achieve holistic disease management for patients “before, during, and after diagnosis”. For example, the Dapeng New District in Shenzhen guided the sinking of high-quality medical resources through a compact medical consortium, leveraged multidisciplinary cooperation, and improved multiple key indicators for chronic disease prevention and control year by year ^[29]. The proportion of primary care diagnoses increased from 31.69% to 57.29%, and residents’ health literacy levels improved from 39.1% to 50.82% ^[29]. The Third People’s Hospital of Shenzhen constructed an integration ring for medical prevention and treatment for MASLD, relying on medical consortia and specialist alliances to jointly build a “community-hospital” prevention and treatment system, forming an efficient two-way referral model, achieving medical resource integration and horizontal service connectivity, and providing patients with integrated, lifelong proactive health services for “prevention, screening, diagnosis, treatment, and rehabilitation” ^[30]. Finally, strengthen technological support to enhance the efficiency of proactive health management. Promote the transformation and application of scientific and technological achievements, such as constructing integrated proactive health artificial intelligence application scenarios for families, communities, and hospitals, developing proactive health technical standards and norms through technological integration and innovation, and facilitating the popularization and sharing of high-quality medical and health resources through information technology. Luo Yinghua et al. proposed constructing a “3 + 1 + 2” health management cloud platform to provide patients with integrated management services before, during, and after disease diagnosis, “3” refers to three databases (outpatient, inpatient, and physical examination databases), “1” refers to one big data center, and “2” refers to two platforms (multidisciplinary health management platform and proactive health management platform) ^[31].

5.3. Leveraging the pivotal role of communities as a guarantee for continuous management

Communities serve as the primary frontline for health promotion and guiding residents to implement proactive health management ^[32]. They are also crucial hubs connecting hospitals and individuals, playing a vital role in ensuring the sustainability and effectiveness of non-pharmacological interventions for MASLD. Communities form close collaborations with hospitals through medical consortia, establish electronic health records for residents, conduct preliminary screenings for high-risk populations of MASLD, and achieve holistic lifelong management for patients through two-way referral mechanisms. In terms of health education, adopt a combination of online and offline diversified approaches, such as distributing promotional brochures, holding health lectures, and pushing science popularization videos and public account articles, to gradually enhance residents’ awareness of MASLD ^[33]. Leverage the advantages of peer support by having nursing staff organize self-management groups and promote interaction among peers through regular activities, enhancing patients’ self-efficacy and assisting them in changing unhealthy behaviors and lifestyles and improving self-management abilities. Rely on family doctor contract services, with nursing staff providing regular follow-up, health assessments, and personalized guidance for residents. Simultaneously optimize the community environment and improve resource allocation to create a supportive health atmosphere. Finally, healthcare professionals need to strengthen the cultivation of proactive health awareness to promote the improvement of residents’ health literacy ^[34].

6. Conclusion

MASLD is not a single liver lesion but a specific manifestation of systemic metabolic disorders in the liver,

often accompanied by multisystem complications such as endocrine disorders, cardiovascular diseases, and chronic kidney diseases. Therefore, it must be managed through multidisciplinary collaboration. This study clarifies the difficulties and challenges currently faced by multidisciplinary management of MASLD and explores the division of responsibilities among individuals, hospitals, and communities in multidisciplinary management based on the concept of proactive health. However, how to effectively stimulate the initiative of all parties in collaboration remains a core issue that urgently needs to be addressed.

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