Hans-Holger Bleß
Dr. rer. nat. Ines Witte

# Diagnosis of metabolic dysfunction-associated steatohepatitis (MASH)

## Review, Part 2

The economic consequences of MASLD and MASH are considerable, with direct annual costs in the billions for the healthcare system. This is another reason for the need to effectively address the burden of disease. Improved coordination and awareness-raising among doctors and an adaptation of the health policy framework are necessary to enable more effective early detection and treatment of MASH. This includes the implementation of screening measures in disease management programmes (DMP), the integration of transient elastography into the catalogue of services covered by statutory health insurance and the standardisation of diagnostic procedures.

>> The current S2k guideline presents a screening algorithm for the early detection of MASH, which can also be carried out by GPs in everyday clinical practice. A screening procedure is of great importance for the diagnosis of MASLD, as the symptoms of incipient and often moderate MASH are often very unspecific (e.g. reduced performance, fatigue, upper abdominal discomfort) and therefore do not directly indicate the presence of this specific disease.

Therefore, a screening procedure should be used in known risk populations that can identify potential patients with incipient or even higher-grade MASH at an early stage. Key risk groups for the development of MASLD identified by epidemiological studies are in particular patients with type 2 diabetes mellitus, obesity or metabolic syndrome (1), which according to the criteria of the International Diabetes Federation (IDF) includes type 2 diabetes mellitus or fasting blood glucose ≥100 mg/dL (≥ 5.6 mmol/L) and truncal obesity as key factors alongside elevated triglycerides, low HDL cholesterol and elevated blood pressure (2). The current S2k guideline therefore explicitly recommends comprehensive metabolic diagnostics in patients with hepatic steatosis, which includes these parameters.

In patients with these risk factors, one of the following tests should be carried out initially, depending on availability: Laboratory diagnostics with the liver values GPT (ALT) and GOT (AST), an ultrasound examination or a calculation of the Fatty Liver Index. The Fatty Liver Index (FLI) is made up of easily measurable values such as height, weight and waist circumference as well as the laboratory values triglycerides and gamma-GT and can detect fatty liver disease (steatosis hepatis) with a specificity of 86% and a positive likelihood ratio of 4.3 if the threshold value is ≥ 60 (3).

If GPT (ALT) values are repeatedly or continuously elevated, the patient should be referred directly to a gastroenterologist/hepatologist for differential diagnosis of hepatopathy; in the case of primarily abnormal ultrasound findings or a Fatty Liver Index above 60, the FIB-4 or NFS score should be calculated to clarify liver steatosis (see section Fibrosescores). The sequence of FLI and FIB-4 has been specifically investigated for screening in a risk group of type 2 diabetics (4). If the FIB-4 or NFS result is high risk, the patient should be referred to a gastroenterologist or hepatologist; if the risk is intermediate, a referral can be considered or regular follow-up using GPT (ALT), which is also recommended for low-risk patients (3).

The intervals between clinical follow-up checks in MASLD patients depend on the risk constellation and are specified by the European Liver Association (EASL) as follows: Patients with blanching steatosis without increased risk in the fibrosis markers can be checked at 2-year intervals; if liver enzymes are normal in the course and there is no steatosis on ultrasound, the interval can even be 3-5 years (5).

Specialists in gastroenterology and hepatology then perform clinical risk stratification, taking into account potential differential diagnoses and comorbidities, as well as another core element of non-invasive diagnostics in MASLD, elastography, in which a standardised, examiner-independent liver stiffness measurement is performed to reliably assess the risk of higher-grade fibrosis.

A significantly increased liver stiffness value of over 12 kPa using vibration-controlled transient elastography (VCTE) can already serve as the basis for multimodal therapy. The indication for a liver biopsy in the case of clinically unclear fibrosis status is explained in more detail in chapter 2.2 Invasive diagnostics (3).

## Care situation in the diagnosis of MASH

The care situation in the diagnosis of MASH in Germany and worldwide is currently still very limited due to multiple factors and could be significantly optimised in several aspects of patient care and organisation (6). The screening algorithm described in the guideline has not yet been established across large areas of Germany and can currently only be implemented to a limited extent in many clinical and outpatient areas of gastroenterological and general medical care due to various structural and financial conditions (3).

A key bottleneck is the definitive diagnosis, which requires a liver biopsy. However, this is rejected by many patients due to the high effort involved - an inpatient stay is often necessary to perform a biopsy - and the associated risk of complications. This results in a low diagnosis rate of histologically detectable MASH compared to the presumed prevalence within the overall group of patients with MASLD. Whether this histological evidence of MASH will also be a prerequisite for the indication of future new MASH drugs is currently not foreseeable.

Based on statutory health insurance data from 2018, 4.66% of insured patients were diagnosed with MASLD, while only 0.09% were diagnosed with MASH. This difference is not in the expected proportion to the total number of MASLD diagnoses (7). According to the study results, MASH is mentioned in 5-20% of MASLD, and in people with MASLD and comorbid diabetes mellitus, the probability of MASH is even around 40% (8-11). This means that the number of patients with an actual MASH diagnosis is very likely well below the level that can realistically be assumed, which is why many patients remain undiagnosed and therefore possibly also inadequately treated.

**Frequency of diagnosed fatty liver disease**

The prevalence of steatotic fatty liver disease associated with metabolic dysfunction is high, with more than 25% of the adult population worldwide suffering from MASLD (11). In 2016, Germany ranked third behind Greece and Italy in terms of estimated nationwide prevalence with 22.9% (9). The burden of MASH and MASLD on the healthcare system is expected to increase significantly in the coming years. A study by Estes et al. in 2018 predicted an increase of 63% in the number of diagnoses of MASH in the USA by 2030 and an increase of 21% for MASLD by 2030 (12).similar developments are predicted for Germany: The number of patients with MASLD is expected to rise from the current 18.4 million to around 21 million patients in 2030, while the number of patients with MASH fibrosis is expected to double from an estimated 600,000 in the same period (12).

The economic consequences of MASLD are significant. In a 2018 study, Younossi et. al. calculated the annual direct costs of MASLD in the four European countries France, Germany, England and Italy at a total of 35 billion euros. Assuming a constant incidence and standard interest rate assumptions, this amount would mean a 10-year burden of Euro 302 billion, and even a burden of Euro 334 billion if the incidence of obesity in the USA were to rise in line with the increase in recent years (10).

If the societal costs of lost QALYs due to MASLD are added to the direct costs, the annual costs amount to EUR 227.84 billion, whereby indirect costs such as lost labour and no specific treatment costs due to the lack of targeted forms of therapy for MASLD and MASH were taken into account in this calculation (10). Comparably detailed data on the economic burden of MASH in particular is not currently available, but one study calculated the annual direct care costs of MASH in Germany at Euro 1,900 per patient (7, 13).

The approval of specific treatment options for MASLD and MASH is to be expected in the medium and long term due to the significant disease burden and the need for targeted therapy. As a result of this change and the increasing prevalence, the economic burden of MASLD and MASH may also increase significantly and become a significant factor in the healthcare budgets of healthcare systems. In this context, the successful treatment of obesity and concomitant type 2 diabetes mellitus is also highly relevant for the development of MASH diagnosis figures.

In the current resolution of the Disease Management Programme Requirements Guideline for Obesity of the Joint Federal Committee (G-BA), 'obesity-specific measures, in particular for weight reduction, are regarded as the most important component of the treatment of non-alcoholic fatty liver disease' (14).

**Reimbursement options for diagnostic procedures**

The first step in the diagnostic algorithm recommended by the S2k guideline is to determine the risk using one of the two recommended fibrosis scores NFS or FIB-4. Both scores are comparatively easy to calculate from standard laboratory values such as GPT (ALT), GOT (AST), platelets, albumin, etc. (see chapter 2.1.1. Fibrosis scores).

The collection of GPT (ALT) and GOT (AST) can be billed to the statutory health insurance scheme (GKV) using EBM codes 32069 and 3270, each 0.25 euros. Supplemented by the recording of thrombocytes (EBM 32120 á 0.50 Euro) or the determination of albumin (EBM 32435 á 3.40 Euro), both tests could in principle be covered by the SHI.

However, the liver stiffness measurement using transient elastography or shear wave elastography recommended by the guidelines in the event of an increased risk is not a service thatcan be provided at the expense of the SHI. These procedures are currently offered as self-payer services for around 60-100 euros.

An OPS code 'Complex differential diagnostic sonography using Tissue Doppler Imaging (TDI) and deformation analyses of tissue' (OPS 3-034) exists for the inpatient sector. Although an OPS code is a decisive element for the documentation of medical services as a basis for remuneration within the DRG system, it is not directly linked to a remuneration amount.

A liver biopsy, on the other hand, can be provided at the expense of the SHI. In principle, this can be performed on an outpatient or inpatient basis. There is an OPS code for inpatient services (1 -442.0 - Percutaneous biopsy of the hepatobiliary system and pancreas with guidance by imaging techniques: Liver). Alternatively, the service can also be provided as part of outpatient surgery in accordance with Section 115b SGB V.

A liver puncture is remunerated on an outpatient basis via EBM 02341 at Euro 16.35. Additional billing codes for post-operative monitoring and further costs for pathological findings (EBM 13910 at EUR 9.91) may be added.

In conclusion, the diagnosis of MASLD and MASH is definitely included in the SHI benefits catalogue. However, the possibility of being able to detect larger risk groups with non-invasive elastography is not included in the benefits catalogue.

## Effects of new diagnostic approaches on the care situation

Patients with MASLD have a high utilisation of medical services (15). An important factor in Germany, but also in other high-income countries such as the USA, France, UK and Canada, is the continued major role of liver biopsy for the definitive diagnosis of MASH, which many patients experience as very critical and often reject due to the potentially life-threatening complications (15, 16).

In a 2017 survey of 121 doctors specialising in relevant fields in the countries mentioned, concerns regarding diagnostic methods were cited by the doctors surveyed as the most important suspected reason for the low rate of diagnostically confirmed MASH cases (16). 57% of all physicians surveyed and 53% of all physicians surveyed in Germany cited this reason in the study.

The next most common reasons given were the current symptoms or current health status of the patients, a lack of expertise and awareness of MASH among general practitioners, and a lack of availability of diagnostic methods, both in Germany and in the overall sample (16).

A new diagnostic approach that does not require invasive diagnostics and can be applied across the board could potentially significantly increase the number of MASH diagnoses and thus also significantly improve the therapeutic care of patients with MASH. From a socio-economic perspective, a higher rate of diagnosed MASH cases would increase direct disease-associated care costs, but could also significantly reduce overall care costs by preventing very costly

consequences of advanced stages of the disease such as liver transplantation.

In the USA, fatty liver inflammation is currently the second most common reason for liver transplantation after alcohol-associated liver disease (7). A liver transplant costs on average around 105,000 euros in the year of transplantation and 20,000 euros in the following year (7, 17). However, patients with a liver transplant often require very close medical support and immunosuppressive therapy in all subsequent years.

10-20% of MASH patients develop high-grade fibrosis, and around 5% develop liver cirrhosis, meaning that severe courses of the disease with often frequent hospital visits and intensive medical and nursing care are not uncommon and cause significant costs (7). In the presence of liver cirrhosis, the risk of hepatocellular carcinoma is approximately 2% per year, so that avoidable oncological therapies, which account for a large proportion of treatment costs in Germany, may also become necessary during the course of the disease (18).

## Analysing the current gaps and challenges in care

In addition to the challenges in MASH care due to invasive diagnosis, there are other factors that systematically complicate the medical treatment of MASH patients. Awareness of the disease among the population and treating physicians is of particular importance here. A survey of 224 physicians specialising in relevant fields in Germany, Italy, England and the USA showed that many specialists perceive a lack of expertise and disease awareness among general practitioners in the four countries, including with regard to the necessary screening indicators (19).

89% of respondents also agreed with the statement that general practitioners should be more involved in screening patients with MASH. 77% of respondents said that there was often a significant delay before patients with suspected MASH reached specialised specialists. With regard to the current screening algorithms, a lack of consensus was lamented at the time of the survey and some screening protocols were considered clinically impractical (19). Generating increased awareness of MASH among physicians, better coordination of the screening process and better integration of general practitioners into this process are therefore of great importance for improving the care situation as well as increasing the standardisation and more pragmatic design of screening algorithms (6).

In the study by Cook et. al. 2020 mentioned in the previous section, the doctors surveyed were also asked about the methods they used, whereby several methods could be selected. 94% cited blood tests as a method, 93% an ultrasound examination and 79% transient elastography (16). A confirmatory liver biopsy was the method of choice for 81% of physicians.

Transient elastography was cited significantly more frequently by doctors in England and Canada (90%) than by doctors in Germany (60%). MRI and CT were used relatively frequently at 48% and 46% respectively, although the German guideline does not primarily recommend these procedures as diagnostic methods for MASH, only as additional parameters if an MRI or CT is performed anyway for other reasons (3). Therefore, increased standardisation and systematisation in the general practitioner and specialist context are also of great importance for the care of MASH with regard to the selected diagnostic methods.

## Recommendations for action to improve the care situation

The increasing prevalence of MASLD and MASH and the associated metabolic diseases such as obesity and type 2 diabetes emphasises the importance of targeted screening and diagnosis of liver disease in these patient populations.

Several fields of action open up as starting points for implementing the recommendations of the evidence-based S2k guideline, in particular with regard to the inclusion of screening measures in the relevant DMPs, the implementation of early detection measures in the health check-up guideline and the inclusion of transient elastography in the SHI catalogue of standard services.

**Mapping screening recommendations in DMPs**

A DMP exists for the risk population of patients with type 2 diabetes, but it does not currently include recommendations for screening for MASLD. While the DMP type 2 diabetes makes no reference to liver disease (14), the guideline recently drawn up by the G-BA for the DMP obesity contains the reference that obesity-specific measures are the most important component of the treatment of MASLD, but without mentioning guideline-compliant screening (14).

Within the system of the DMP guideline, it is also a standard practice to specify regular screening for concomitant and secondary diseases and to subsequently measure their implementation as a quality assurance measure in accordance with Section 137f SGB V. For example, the prevention of arterial hypertension and diabetes mellitus is declared as a goal for obesity, while the prevention of renal and cardiovascular diseases as well as retinopathies and blindness are mentioned for existing diabetes mellitus. It therefore seems questionable that fatty liver disease is not included in these high-risk groups.

The importance of MASLD and MASH and the recommendations on screening were already pointed out in the commenting procedure on the obesity guideline synopsis prepared by the Institute for Quality and Efficiency in Health Care (IQWiG). However, IQWiG refused to consider the S2k guideline as requested, as it 'is not specific to obese patients with NAFLD' (20).

Implementing the screening recommendations in both DMPs would be extremely simple. The collection of GOT (AST) and GPT (ALT)1 (EBM 32069, 3270 Eurio 0.25 each) in addition to the CBC (EBM 32120 á Euro 0.50) enables early and promising intervention and prevention of progression to irreversible liver damage with little effort.

To increase practicability, laboratories should also regularly report the calculated FIB-4 score when requesting this combination of laboratory parameters. The G-BA justifies that the transient elastography procedure is not a standard SHI service. The G-BA confirms in principle that elastography is suitable for 'monitoring the progress and reducing the frequency of liver biopsies' and has included elastography in the scope of services for certain liver diseases as part of the guidelines on outpatient specialised care (ASV) in accordance

with Section 116b SGB V (22).

For new laboratory services to be included in the standardised valuation scale (EBM), which regulates the billing of outpatient medical services within the framework of statutory health insurance in Germany, a decision by the valuation committee (BA) is required. However, an application to initiate such a procedure can be submitted not only via the BA's sponsoring organisations, but also via professional medical associations, medical societies and associations of manufacturers of diagnostic services and medical devices (23).

In conclusion, it can be said that a liver biopsy, despite its high informative value, is not suitable for broad-based diagnostics or screening due to its complexity, invasiveness and associated risks. After risk stratification with the recommended NFS and FIB-4 scores, regular further diagnostics are only possible with a non-invasive diagnostic procedure. The inclusion of transient elastography in the statutory health insurance catalogue of services would therefore make it possible to detect liver changes at an early stage and counteract them.

**Anchoring early detection in the healthcheck-up guideline**

In addition to the indication-specific DMPs, regular screening for the presence of MASLD should also be included in the G-BA's health check-up guideline. According to § 2, the stated aim of the guideline is the 'early detection of diseases of importance to population medicine' combined with the requirement that 'suspected cases found are diagnosed in detail, detected diseases are treated in good time

## Literature


1. Francque SM, Marchesini G, Kautz A, Walmsley M, Dorner R, Lazarus JV et al. Non-alcoholic fatty liver disease: A patient guideline. JHEP Rep 2021; 3(5):100322. doi: 10.1016/j.jhepr.2021.100322.
2. Alberti KGMM, Zimmet P, Shaw J. Metabolic syndrome--a new world-wide definition. A Consensus Statement from the International Diabetes Federation. Diabet Med 2006; 23(5):469–80. doi: 10.1111/j.1464-5491.2006.01858.x.
3. Roeb E, Canbay A, Bantel H, Bojunga J, Laffolie J de, Demir M et al. Aktualisierte S2k-Leitlinie nicht-alkoholische Fettlebererkrankung der Deutschen Gesellschaft für Gastroenterologie, Verdauungs- und Stoffwechselkrankheiten (DGVS) – April 2022 – AWMF-Registernummer: 021–025. Z Gastroenterol 2022; 60(9):1346–421. doi: 10.1055/a-1880-2283.
4. Ciardullo S, Muraca E, Perra S, Bianconi E, Zerbini F, Oltolini A et al. Screening for non-alcoholic fatty liver disease in type 2 diabetes using non-invasive scores and association with diabetic complications. BMJ Open Diabetes Res Care 2020; 8(1). doi: 10.1136/bmjdrc-2019-000904.
5. EASL-EASD-EASO Clinical Practice Guidelines for the management of non-alcoholic fatty liver disease. J Hepatol 2016; 64(6):1388–402. doi: 10.1016/j.jhep.2015.11.004.
6. Teufel A, Geier A, Sarrazin C, Schattenberg JM, Kautz A, Dorner R et al. Intersektorales Management von Patienten mit unklarer Leberwerterhöhung und nichtalkoholischer Fettlebererkrankung (NAFLD). Z Gastroenterol 2023; 61(8):1028–36. doi: 10.1055/a-1957-5671.
7. Stahmeyer JT, Hemmerling M, Burger B, Eberhard S, Krauth C, Zeidler J et al. Die Häufigkeit von diagnostizierten Fettlebererkrankungen (NAFLD) in der deutschen Bevölkerung – Eine Analyse auf der Basis von GKV-Routinedaten. Z Gastroenterol 2021; 59(8):851–8. doi: 10.1055/a-1402-1263.
8. Stefan N, Häring H-U, Cusi K. Non-alcoholic fatty liver disease: causes, diagnosis, cardiometabolic consequences, and treatment strategies. Lancet Diabetes Endocrinol 2019; 7(4):313–24. doi: 10.1016/S2213-8587(18)30154-2.
9. Stefan N, Roden M. Diabetes und Fettleber. Diabetologie 2023; 19(4):459–63. doi: 10.1007/s11428-023-01038-z.
10. Younossi ZM, Blissett D, Blissett R, Henry L, Stepanova M, Younossi Y et al. The economic and clinical burden of nonalcoholic fatty liver disease in the United States and Europe. Hepatology 2016; 64(5):1577–86. doi: 10.1002/hep.28785.
11. Younossi ZM, Koenig AB, Abdelatif D, Fazel Y, Henry L, Wymer M. Global epidemiology of nonalcoholic fatty liver disease-Meta-analytic assessment of prevalence, incidence, and outcomes. Hepatology 2016; 64(1):73–84. doi: 10.1002/hep.28431.
12. Modeling NAFLD disease burden in China, France, Germany, Italy, Japan, Spain, United Kingdom, and United States for the period 2016–2030, Estes, Chris et al.; Journal of Hepatology, Volume 69, Issue 4, 896 - 904.
13. O'Hara J, Finnegan A, Dhillon H, Ruiz-Casas L, Pedra G, Franks B et al. Cost of non-alcoholic steatohepatitis in Europe and the USA: The GAIN study. JHEP Rep 2020; 2(5):100142. doi: 10.1016/j.jhepr.2020.100142.
14. Gemeinsamer Bundesausschuss (G-BA). Beschluss des Gemeinsamen Bundesausschusses über die 34. Änderung der DMP-Anforderungen-Richtlinie (DMP-A-RL): Änderung der Anlage 2, Ergänzung der Anlage 23 (DMP Adipositas) und der Anlage 24 (Adipositas Dokumentation); 2023 [Stand: 18.01.2024]. Verfügbar unter: https://www.g-ba.de/downloads/39-261-6299/2023-11-16_DMP-A-RL_Anlage-2-23-24-Adipositas.pdf.
15. Geier A, Rinella ME, Balp M-M, McKenna SJ, Brass CA, Przybysz R et al. Real-World Burden of Nonalcoholic Steatohepatitis. Clin Gastroenterol Hepatol 2021; 19(5):1020-1029.e7. doi: 10.1016/j.cgh.2020.06.064.
16. Cook N, Geier A, Schmid A, Hirschfield G, Kautz A, Schattenberg JM et al. Assessing physician preferences on future therapeutic options and diagnostic practices in non-alcoholic steatohepatitis. JHEP Rep 2020; 2(2):100081. doi: 10.1016/j.jhepr.2020.100081.
17. Harries L, Schrem H, Stahmeyer JT, Krauth C, Amelung VE. High resource utilization in liver transplantation – how strongly differ costs between the care sectors and what are the main cost drivers?: a retrospective study. Transpl Int 2017; 30(6):621–37. doi: 10.1111/tri.12950.
18. Weiß J, Rau M, Geier A. Non-alcoholic fatty liver disease: epidemiology, clinical course, investigation, and treatment. Dtsch Arztebl Int 2014; 111(26):447–52. doi: 10.3238/arztebl.2014.0447.
19. Lazure P, Tomlinson JW, Kowdley KV, Magni P, Santos RD, Jacobs G et al. Clinical practice gaps and challenges in non-alcoholic steatohepatitis care: An international physician needs assessment. Liver Int 2022; 42(8):1772–82. doi: 10.1111/liv.15324.
20. Institut für Qualität und Wirtschaftlichkeit im Gesundheitswesen (IQWiG). Leitliniensynopse Adipositas – Erwachsene; 2022 [Stand: 18.01.2024]. Verfügbar unter: https://www.iqwig.de/projekte/v21-05.html.
21. Gemeinsamer Bundesausschuss (G-BA). Richtlinie des Gemeinsamen Bundesausschusses über die Gesundheitsuntersuchungen zur Früherkennung von Krankheiten (Gesundheitsuntersuchungs-Richtlinie); 2021 [Stand: 18.01.2024]. Verfügbar unter: https://www.g-ba.de/downloads/62-492-2383/GU-RL_2020-11-20_iK-2021-02-12.pdf.
22. Gemeinsamer Bundesausschuss (G-BA). Richtlinie des Gemeinsamen Bundesausschusses über die ambulante spezialfachärztliche Versorgung nach § 116b SGB V; 2023 [Stand: 18.01.2024]. Verfügbar unter: https://www.g-ba.de/downloads/62-492-3307/ASV-RL_2023-11-08_iK_2024-01-01.pdf.
23. Bewertungsausschuss Ärzte. Verfahrensordnung (VerfO) des Bewertungsausschusses nach § 87 Absatz 1 Satz 1 SGB V.; 2021 [Stand: 18.01.2024]. Verfügbar unter: https://institut-ba.de/ba/Verfahrensordnung_des_Bewertungsausschusses_Aerzte.pdf.

and changes in health-damaging behaviour are brought about at an early stage' (21). The early detection of fatty liver disease would be ideally suited to fulfil this self-imposed goal.

**Include elastography in the SHI benefits catalogue**

A further obstacle to the early detection of MASLD is that the transient elastography procedure is not a standard service provided by the statutory health insurance. The G-BA confirms in principle that elastography is suitable for use for "monitoring the course and reducing the frequency of liver biopsies" and has included elastography in the scope of services for certain liver diseases within the framework of the guidelines on outpatient specialist medical care (ASV) according to Section 116b SGB V (22).

For new laboratory services to be included in the uniform assessment standard (EBM), which in Germany regulates the billing of outpatient medical services within the framework of the statutory health insurance, a decision by the Assessment Committee (BA) is necessary. However, an application to initiate such a procedure can be submitted not only through the BA's sponsoring organizations, but also through medical professional associations, medical specialist societies and associations of manufacturers of diagnostic services and medical products (23).

In conclusion, it can be said that despite its high informative value, a liver biopsy is not suitable for broad-based diagnostics or screening due to the effort, invasiveness and associated risks. After risk stratification with the recommended NFS and FIB-4 scores, regular further diagnostics are only possible with a non-invasive diagnostic procedure. By including transient elastography in the standard service catalog of the statutory health insurance, it would be possible to detect liver changes at an early stage and counteract them. <<

***1:*** The recommendation to measure GPT (ALT) is already part of the DMP-A-RL Obesity.

## Author's statement

Dr Ines Witte is Senior Medical Advisor at Novo Nordisk Pharma GmbH and contributed to the preparation of this article. Hans-Holger Bleß is a partner at _fbeta GmbH. The review was produced with the financial support of Novo Nordisk Pharma GmbH, DE24OB00019, DE24SN00023

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**Hans-Holger Bleß** **ORCID: 0000-0001-7643-9966**



studierte Pharmazie an der Freien Universität Berlin. Nach Tätigkeiten in öffentlichen Apotheken arbeitete er für die AOK Brandenburg und leitete dort zuletzt den Fachbereich „Grundlagen und Verträge Arzneimittel“. Er war am IGES Institut tätig und leitete dort den Bereich Versorgungsforschung und den Bereich HTA & Value Strategy. Danach war er Geschäftsführer des Instituts für angewandte Versorgungsforschung (inav). Er ist Partner bei _fbeta und leitet den Geschäftsbereich Healthcare Research & Market Access sowie den Geschäftsbereich Digital Health. Kontakt: Holger.Bless@fbeta.de

**Dr. rer. nat. Ines Witte** **ORCID: 0009-0009-0884-1289**



hat in Hamburg Biologie studiert und promoviert. Anschließend wechselte sie nach Mainz in das Institut für Pharmakologie der Universitätsmedizin Mainz, zuletzt als Leiterin einer Forschungsgruppe im Bereich „Cell and Redox Signaling“. Sie arbeitet als Senior Medical Advisor bei Novo Nordisk Pharma GmbH. Ihr Schwerpunkt liegt im Bereich Lebererkrankungen, mit besonderem Fokus auf der metabolisch Dysfunktion-assoziierten Steatohepatitis (MASH). Kontakt: inwi@novonordisk.com