Cost-Effective and Efficient Screening Guidelines for Diagnosing Non-Alcoholic Fatty Liver Disease

Emma Montenegro, Savonne Sterk, Katelyn Ten Pas, Chelsea Thurm, Connor Van Peursem, Dr. Pamela Hulstein
Northwestern College, Department of Nursing

Clinical Question

In patients suspected to have non-alcoholic fatty liver disease, how do current practice screening guidelines compare for cost-efficiency and effectiveness?

Introduction

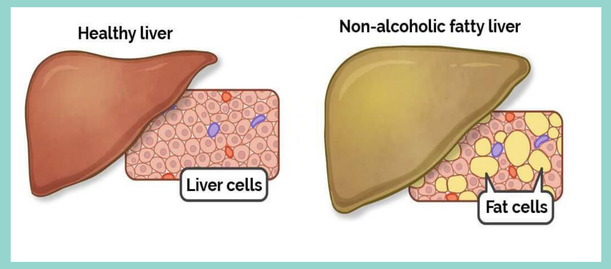
Purpose: Developed an evidence-based practice is to research current practice guidelines for screening non-alcoholic fatty liver disease (NAFLD) and cross reference these with cost-efficiency and effectiveness.

Introduction: NAFLD is an umbrella term used to describe a variety of conditions that affect the overall function the liver. A key characteristic is an excessive amount of fat stored in the liver, which leads to decreased liver function.

Promise Community Health Center wanted to establish screening guidelines to serve their increasing NAFLD population. They seek guidelines that are cost-effective and efficient to provide high-quality, affordable healthcare to their patients.

Methodology

- Review of the literature on NAFLD
- Research reports published between May 2007 and May 2023
- 10 reports met final inclusion criteria
- John Hopkins Appraisal tools (Dang, et al., 2022) used to determine quality and level of evidence
- Key search words:
  - Non-alcoholic fatty liver disease, Screening guidelines, Diagnostic tests, Cost effectiveness, Efficiency



Ann Antonucci (2023). Non-Alcoholic Fatty Liver Disease (NAFLD) Risks and Symptoms [Healthy liver with liver cells and Non-alcoholic fatty liver with fat cells]. Request A Test. https://requestatest.com/non-alcoholic-fatty-liver-nafld-symptoms-test

Proposed Intervention

Recommendation: Yearly screening of high-risk patients with FIB-4 screening to ELF testing pathway OR TyG Index screening

High Risk: patients with two or more components of metabolic syndrome (obesity, triglycerides, insulin resistance) and/or Type 2 diabetics

FIB-4 screening: a blood test calculated using a simple algorithm producing a ratio-based on age, ALT/AST and platelet count (Rinella et al., 2023) uses a mathematical formula with input lab values for liver enzymes ALT/AST and platelet count.

- High specificity, low sensitivity

ELF (Enhanced Liver Fibrosis) test: a blood test which analyzes three parts of the blood that contribute to liver fibrosis. Used a prognostic marker and a diagnostic tool (Khamseh et al., 2021)

- High sensitivity, so FIB-4 combined with ELF testing assists to negate false positives and negatives

TyG Index: a blood test that utilizes fasting triglyceride-glucose (TyG) related parameters and ratios in a linear regression model. Parameters include TyG-WC (wast circumference), TyG-BMI (body mass index), and TyG-WtHr (weight to height ration) (Xue et al., 2022)

- Up to 80% accuracy, cost-effective

Definitions

Non-alcoholic Fatty Liver Disease (NAFLD): a disease in which excess fat accumulates on the liver; to be differentiated from other fatty liver disorders in that other disorders involve excess alcohol use (National Institute of Diabetes and Digestive and Kidney Diseases, 2023).

Efficiency: produces the desired effect/result with minimum waste of time, money, effort, or skill.

Screening Guidelines: documents that contain recommendations about health interventions as they pertain to screening for a disease (Center for Disease Control, 2019).

Metabolic syndrome (MS): an umbrella term describing a case with several of the following abnormalities: abdominal obesity, elevated serum triglyceride level, decreased HDL level, elevated blood pressure, and elevated fasting glucose level (Hamaguchi et al., 2005).

Obesity: a condition characterized by excessive abdominal fat (Rinella et al., 2023).

Triglycerides (TG): serum lipids, or fat (Rinella et al., 2023).

Type 2 Diabetes (T2DM): disease characterized by decreased insulin sensitivity (Rinella et al., 2023).

AST/ALT: serum labs whose elevation suggests the presence of liver injury (Rinella et al., 2023).

PROMISE COMMUNITY HEALTH CENTER
an iowahealth center

Promise Community Health Center (2023). Promise Community Health Center Logo [Three Figures of People]. Promise Community Health Center an Iowa Health Center. https://promisechc.org

Results

Our Recommendation:

- Yearly Screening High Risk Patients
- Mathematical Models as screening tools

Two options best suited for Promise's population:

- FIB-4 test paired with the ELF test
- TyG Index linear regression model

Conclusion

Cost effective and efficient NAFLD screening tools are available for Promise Community Health Center to incorporate into care practices.

Implementation of these evidence-based guidelines will improve screening for NAFLD and prevent more advanced forms of liver damage within the population Promise serves.

Sources

Beran, A., Ayesh, H., Mhanna, M., Wahood, W., Ghazaleh, S., Abuhelwa, Z., Sayeh, W., Aladamat, N., Musallam, R., Matar, R., Malhas, S.-E., & Assaly, R. (2022). Triglyceride-Glucose index for early prediction of nonalcoholic fatty liver disease: A meta-analysis of 121,975 individuals. *Journal of Clinical Medicine, 11*(9), 2666. https://doi.org/10.3390/jcm11092666

Dang, D., Dearholt S., Bissett, K., Ascenzi J., & Whalen, M. (2022). Johns Hopkins evidence-based practice for nurses and healthcare professionals: Model and guidelines (4th ed.). Sigma Theta Tau International

Hamaguchi, M., Kojima, T., Takeda, N., Nakagawa, T., Taniguchi, H., Fujii, K. Omatsu, T., Nakajima, T., Sarui, H., Shimazaki, M., Kato, T., Okuda, J., & Ida, K. (2005). The metabolic syndrome as a predictor of nonalcoholic fatty liver disease. *Annals of Internal Medicine, 143*(10), 722. https://doi.org/10.7326/0003-4819-143-10-200511150-00009

Jakobsen, M., Berentzen, T., Sorensen, T., & Overvad, K. (2007). Abdominal obesity and fatty liver. *Epidemiologic Reviews, 29*(1), 77-87. https://doi.org/10.1093/epirev/mxm002

Khamseh, M. E., Malek, M., Abbasi, R., Taheri, H., Lahouti, M., & Alaei-Shahmiri, F. (2021). Triglyceride glucose index and related parameters (Triglyceride glucose-body mass index and triglyceride glucose-waist circumference) identify nonalcoholic fatty liver and liver fibrosis in individuals with overweight/obesity. *Metabolic Syndrome and Related Disorders, 19*(3), 167-173. https://doi.org/10.1089/met.2020.0109

Kjaergaard, M., Lindvig, K. P., Thorhauge, K. H., Andersen, P., Hansen, J. K., Kastrup, N., Jensen, J. M., Hansen, C. D., Johansen, S., Israelsen, M., Torp, N., Trelle, M. B., Shan, S., Detlefsen, S., Antonsen, S., Andersen, J. E., Graupera, I., Ginés, P., Thiele, M., & Krag, A. (2023). Using the ELF test, FIB-4 and NAFLD fibrosis score to screen the population for liver disease. *Journal of Hepatology, 79*(2), 277-286. https://doi.org/10.1016/j.jhep.2023.04.002

Kotronen, A., Westerbacka, J., Bergholm, R., Pietiläinen, K. H., & Yki-Järvinen, H. (2007). Liver fat in the metabolic syndrome. *The Journal of Clinical Endocrinology & Metabolism, 92*(9), 3490-3497. https://doi.org/10.1210/jc.2007-0482

Kwok, R., Choi, K. C., Wong, G. L.-H., Zhang, Y., Chan, H. L.-Y., Luk, A. O.-Y., Shu, S. S.-T., Chan, A. W.-H., Yeung, M.-W., Chan, J. C.-N., Kong, A. P.-S., & Wong, V. W.-S. (2015). Screening diabetic patients for non-alcoholic fatty liver disease with controlled attenuation parameter and liver stiffness measurements: A prospective cohort study. *Gut, 65*(8), 1359-1368. https://doi.org/10.1136/gutjnl-2015-309265

Rinella, M. E., Neuschwander-Tetri, B. A., Siddiqui, M. S., Abdelmalek, M. F., Caldwell, S., Barb, D., Kleiner, D. E., & Loomba, R. (2023). AASLD practice guidance on the clinical assessment and management of nonalcoholic fatty liver disease. *Hepatology, 77*(5), 1797-1835. https://doi.org/10.1097/hep.0000000000000323

Tannahill, A. (2009). Health promotion: The Tannahill model revisited. *Public Health, 123(5),* 396-399. https://doi.org/10.1016/j.puhe.2008.05.021

Westfall, E. C. (2020, November 15). *Nonalcoholic fatty liver disease: Common questions and answers on diagnosis and management.* AAFP. https://www.aafp.org/pubs/afp/issues/2020/1115/p603.html#afp20201115p603-sort1

Wu, K.-T., Kuo, P.-L., Su, S.-B., Chen, Y.-Y., Yeh, M.-L., Huang, C.-I., Yang, J.-F., Lin, C.-I., Hsieh, M.-H., Hsieh, M.-Y., Huang, C.-F., Lin, W.-Y., Yu, M.-L., Dai, C.-Y., & Wang, H.-Y. (2016). Nonalcoholic fatty liver disease severity is associated with the ratios of total cholesterol and triglycerides to high-density lipoprotein cholesterol. *Journal of Clinical Lipidology, 10*(2), 420-425.e1. https://doi.org/10.1016/j.jacl.2015.12.026

Xue, Y., Xu, J., Li, M., & Gao, Y. (n.d.). Potential screening indicators for early diagnosis of NAFLD/MAFLD and liver fibrosis: Triglyceride glucose index–related parameters. https://www.frontiersin.org/articles/10.3389/fendo.2022.951689/full