

## DAFTAR PUSTAKA

1. Heidenreich PA, Bozkurt B, Aguilar D, Allen LA, Byun JJ, Colvin MM, et al. 2022 AHA/ACC/HFSA guideline for the management of heart failure: a report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *Circulation.* 2022;145(5):895–1032.
2. McDonagh TA, Metra M, Adamo M, Gardner RS, Baumbach A, Bohm M, et al. 2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure. *Eur Heart J.* 2021;42(36):3599-726.
3. Groenewegen A, Rutten FH, Mosterd A, Hoes AW. Epidemiology of heart failure. *Eur Heart J.* 2020;22(8):1242-356.
4. Kementerian Kesehatan RI. Laporan Nasional Riset Kesehatan Dasar (RisKesDas) 2018. Badan Penelitian dan Pengembangan Kesehatan Kementerian Kesehatan Republik Indonesia 2019.
5. Klein, L. Heart Failure with Reduced Ejection Fraction. In: M. H. Crawford, ed. Current diagnosis & treatment: Cardiology 4th edition. 2014. p. 331-47.
6. Park JJ, Mebazaa A, Hwang IC, Park JB, Park JH, Cho GY, et al. Phenotyping heart failure according to the longitudinal ejection fraction change: myocardial strain, predictors, and outcomes. *J Am Heart Assoc.* 2020;9(12):1–17.
7. Park JJ, Park JB, Park JH, Cho GY. Global longitudinal strain to predict mortality in patients with acute heart failure. *J Am Coll Cardiol.* 2018;71(18):1947–57.
8. Stanton T, Leano R, Marwick T. Prediction of a cause mortality from global longitudinal speckle strain comparison with ejection fraction and wa motion scoring. *Circ Cardiovasc Imaging.* 2009. p. 356-64.
9. Farsalinos KE, Daraban AM, Ünlü S, Thomas JD, Badano LP, Voigt JU. Head-to-head comparison of global longitudinal strain measurements among

10. nine different vendors. *J Am Soc Echocardiogr.* 2015;28(10):1171-81.
11. Maia RJ, Branda CS, Leite J, Parente GB, Pinheiro F, Araujo BT, et al. Global longitudinal strain predicts poor functional capacity in patients with systolic heart failure. *Arq Bras Cardiol.* 2019;113(2):188–94.
12. Sengelov M, Jorgensen PG, Jensen JS, Bruun NE, Olsen FJ, Hansen TF, et al. Global longitudinal strain is a superior predictor of all-cause mortality in heart failure with reduced ejection fraction. *J Am Coll Cardiol.* 2015;8(12):1351–9.
13. DeVore A, McNulty S, Alenezi F, Ersboll M, Vader JM, Anstrom KJ, et al. Impaired left ventricular global longitudinal strain in patients with heart failure with preserved ejection fraction: insights from the RELAX trial. *Eur J Heart Fail.* 2017;19(7):893–900.
14. Mann, DL, Chakinala, MJ. Fauci, D. Kasper, S. Hauser, D. Longo, et al. Heart failure: Pathophysiology and diagnosis. *Harrison's principles of Internal Medicine.* New York: Mc Graw Hil; 2015.
15. Huang DH, Sun H, Shi JP. Diagnostic value of soluble suppression of tumorigenicity-2 for heart failure. *Chin Med J.* 2016;129(5):570-7.
16. Wang TJ, Wollert KC, Larson MG, et al. Prognostic utility of novel biomarkers of cardiovascular stress: the Framingham Heart Study. *Circulation* 2012;126(13):1596–604.
17. Moeryedi Y, Ross HJ. Advances in heart failure: a review of biomarkers, emerging pharmacological therapies, durable mechanical support and telemonitoring. *Clin Sci (Lond).* 2017;131(7):553–66.
18. Suthahar N, Meems L, Ho J, de Boer R. Sex-related differences in contemporary biomarkers for heart failure: a review. *Eur J Heart Fail.* 2020;22(5):775–88.
19. Januzzi JL, Pascual-Figal D, Daniels LB. ST2 testing for chronic heart failure therapy monitoring: The international st2 consensus panel. *J Am Coll Cardiol.*

- 2015;115(7):70B-5B.
20. Pan W, Yang D, Yu P, Yu H. Comparison of predictive value of NT-proBNP, sST2 and MMPs in heart failure patients with different ejection fractions. *BMC Cardiovasc Disord.* 2020;20(1):208.
  21. Fabiani I, Conte L, Pugliese NR, Calogero E, Barletta V, Di Stefano R, et al. The integrated value of sST2 and global longitudinal strain in the early stratification of patients with severe aortic valve stenosis: a translational imaging approach. *Int J Cardiovasc Imaging.* 2017;33(12):1915–20.
  22. Kurmani S, Squire I. Acute heart failure: Definition, classification and epidemiology. *Curr Heart Fail Rep.* 2017;14(5):385-92.
  23. Arrigo M, Jessup M, Mullens W, Reza N, Shah AM, Sliwa K, et al. Acute heart failure. *Nat Rev Dis Primer.* 2020;6(1):16.
  24. Paulus WJ, Tschöpe C. A novel paradigm for heart failure with preserved ejection fraction: comorbidities drive myocardial dysfunction and remodeling through coronary microvascular endothelial inflammation. *J Am Coll Cardiol.* 2013;62(4):263-71.
  25. King M, Kingery J, et al. Diagnosis and evaluation of heart failure. *Am Fam Physician J.* 2012;85(12):1161-68.
  26. Marwick TH. The role of echocardiography in heart failure. *Journal of Nuclear Medicine.* 2015;56(4):31S-8S.
  27. Ponikowski P, Voors AA, Anker SD, et al. 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure. *Eur J Heart Fail.* 2016;18(8):891-975.
  28. Voigt JU, Cvijic M. 2- and 3- dimensional myocardial strain in cardiac health and disease. *J Am Coll Cardiol.* 2019;12(9):1849–63.
  29. Tadic M, Cuspidi C, Bombelli M, Grassi G. Hypertensive heart disease beyond left ventricular hypertrophy: are we ready for echocardiographic strain evaluation in everyday clinical practice?. *J Hypertens.*

- 2017;36(4):1–10.
30. Vijayaraghavan G, Sivasankaran S. Global longitudinal strain: a practical step-by-step approach to longitudinal strain imaging. *J Indian Acad Echocardiogr Cardiovasc Imaging*. 2020;4(1):22–8.
  31. Lang RM, Badano LP, Avi VM, Afilalo J, Armstrong A, Ernande L, et al. Recommendations for cardiac chamber quantification by echocardiography in adults: an update from the american society of echocardiography and the european association of cardiovascular imaging. *J Am Soc Echocardiogr*. 2015;28(1):1–39.
  32. Marie R, Philippe M. B-type natriuretic peptide and obesity in heart failure: a mysterious but important association in clinical practice. *Cardiovasc Med*. 2020;23:1–5.
  33. Avi MV, Lang MR, Badano LP, Belohlavek M, Cardim NM, Derumeaux G, et al. Current and evolving echocardiographic techniques for the quantitative evaluation of cardiac mechanics: ASE/EAE consensus statement on methodology and indications endorsed by the japanese society of echocardiographic. *J Am Soc Echocardiogr*. 2011;24(3):277–313.
  34. Voigt J, Pedrizetti G, Lysyansky P, Marwick TH, Houle H, Baumann R, et al. Definitions for a common standard for 2d speckle tracking echocardiography. *Eur Heart J*. 2015;16(1):1–11.
  35. Stanton T, Leano R, Marwick T. Prediction of A-Cause Mortality From Global Longitudinal Speckle Strain Comparison With Ejection Fraction and Wall Motion Scoring. *Circ Cardiovasc Imaging*. 2009;2(5):356-64.
  36. Rangel I, Goncalves A, de Sousaa C, Almeidaa P, Rodrigues J, et al. Global longitudinal strain as a potential prognostic marker in patients with chronic heart failure and systolic dysfunction. *Rev Port Cardiol*. 2014;33(7-8):403-9.
  37. Santos BA, Foppa M, Bertoluci C, Branchi TV, Fuchs SC, Fuchs FD. Stage I hypertension is associated with impaired systolic function by strain imaging

- compared with prehypertension. *J Clin Hyperntens.* 2019;21(11):1705–10.
38. Pascual-Figal DA, Januzzi JL. The biology of ST2: The international ST2 consensus panel. *Am J Cardiol.* 2015;115(7):3B-7B.
  39. Van Kimmenade RR, Januzzi JL Jr. Emerging biomarkers in heart failure. *Clin Chem.* 2012;58(1):127-38.
  40. Mueller T, Leitner I, Egger M, Halmayer M, Dieplinger B. Association of the biomarkers soluble ST2, galectin-3 and growth-differentiation factor-15 with heart failure and other non-cardiac diseases. *Clin Chim Acta.* 2015;445:155-60.
  41. Januzzi JL Jr., Peacock WF, Maisel AS, Chae CU, Jesse RL, Baggish AL, et al. Measurement of the interleukin family member ST2 in patients with acute dyspnea: Results from the PRIDE (Pro-brain natriuretic peptide investigation of dyspnea in the emergency department) study. *J Am Coll Cardiol.* 2007;50(7):607-13.
  42. Sanada S, Hakuno D, Higgins LJ, Schreiter ER, McKenzie AN, Lee RT. IL-33 and ST2 comprise a critical biomechanically induced and cardioprotective signaling system. *J Clin Invest.* 2007;117(6):1538-49.
  43. Moussion C, Ortega N, Girard JP. The IL-1-like cytokine IL-33 is constitutively expressed in the nucleus of endothelial cells and epithelial cells in vivo: a novel ‘alarmin’?. *PLoS One.* 2008;3(10):3331.
  44. Weinberg EO, Shimpo M, De Keulenaer GW, MacGillivray C, Tominaga S, Solomon SD, et al. Expression and regulation of ST2, an interleukin-1 receptor family member, in cardiomyocytes and myocardial infarction. *Circulation.* 2002;106(23):2961-6.
  45. Yancy CW, Jessup M, Bozkurt B, Butler J, Casey DE, Drazner MH, et al. 2013 ACCF/AHA guideline for the management of heart failure: A report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *J Am Coll Cardiol.* 2013;62(16):147–239.

46. Wu AH, Wians F, Jaffe A. Biological variation of galectin-3 and soluble ST2 for chronic heart failure: implication on interpretation of test results. *Am Heart J.* 2013;165(6):995-9.
47. Rienstra M, Yin X, Larson MG, Fontes JD, Magnani JW, McManus DD, et al. Relation between soluble ST2, growth differentiation factor-15, and high-sensitivity troponin I and incident atrial fibrillation. *Am Heart J.* 2014;167(1):109-15.
48. Lu J, Snider JV, Grenache DG. Establishment of reference intervals for soluble ST2 from a United States population. *Clin Chim Acta.* 2010;411(21-22):1825-6.
49. Wang Y, Zhang Y, An T, Zhang R, Zhao X, Liu N, et al. ErbB4 gene polymorphism is associated with the risk and prognosis of congestive heart failure in a northern han chinese population. *J Card Fail.* 2016;22(9):700-9.
50. Konukoğlu D. Can soluble ST2 be a new marker in heart failure?. *Int J Med Biochem.* 2018;1(1):44-51.
51. Mueller T, Leitner I, Egger M, Halmayer M, Dieplinger B. Association of the biomarkers soluble ST2, galectin-3 and growth-differentiation factor-15 with heart failure and other non-cardiac diseases. *Clin Chim Acta.* 2015;445:155-60.
52. Sánchez-Más J, Lax A, Fernandez-Del, Palacio MJ, Caballero L, Santarelli G, et al. Modulation of IL-33/ST2 system in post infarction heart failure: Correlation with cardiac remodelling markers. *Eur J Clin Invest.* 2014;44(7):643-51.
53. Immanuel S, Mandey NM, Makmun LH. ST2 levels before and after treatment of NYHA III and IV heart failure. *Acta Med Indones.* 2015;47(4):304–10.
54. Aleksova A, Paldino A, Beltrami A, Padoan L, Iacoviello M, Sinagra G, et al. Cardiac biomarkers in the emergency department: The role of soluble ST2

- (sST2) in acute heart failure and acute coronary syndrome—there is meat on the bone. *J Clin Med.* 2019 Feb;8(2):270.
55. Villacorta H, Maisel AS. Soluble ST2 Testing: A Promising Biomarker in the Management of Heart Failure. *Arq Bras Cardiol.* 2015;106(2).
  56. Anand IS, Rector TS, Kuskowski M, Snider J, Cohn JN. Prognostic value of soluble ST2 in the Valsartan Heart Failure trial. *Circ Heart Fail.* 2014;7(3):418-26.
  57. Xu H, Turnquist HR, Hoffman R, Billiar TR. Role of the IL-33-ST2 axis in sepsis. *Mil Med Res.* 2017 Dec;4(1):3.
  58. Parenica J, Malaska J, Jarkovsky J, Lipkova J, Dastych M, Helanova K, et al. Soluble ST2 levels in patients with cardiogenic and septic shock are not predictors of mortality. *Exp Clin Cardiol.* 2012;17(4):205–9.
  59. Zhu Y, Fang C, Zhang Q, Lu Y, Zhang R, Wang A, et al. Soluble ST2 and risk of cognitive impairment after acute ischemic stroke: a prospective observational study. *BMC Geriatr.* 2021 Dec;21(1):330.
  60. Wolcott Z, Batra A, Bevers MB, Sastre C, Khoury J, Sperling M, et al. Soluble ST2 predicts outcome and hemorrhagic transformation after acute stroke. *Ann Clin Transl Neurol.* 2017;4(8):553–63.
  61. Birbrair A, editor. Tumor Microenvironment: The Role of Interleukins – Part A. Cham: Springer International Publishing [Internet]. 2020;1240. Available from: <http://link.springer.com/10.1007/978-3-030-38315-2>
  62. Yang Z, Liang Y, Xi W, Li C, Zhong R. Association of increased serumIL-33 levels with clinical and laboratory characteristics of systemic lupus erythematosus in Chinese population. *Clin Exp Med.* 2011;11(2):75-80.
  63. Mok MY, Huang FP, Ip WK, Lo Y, Wong FY, Chan EY, Lam KF, Xu D. Serum levels of IL-33 and soluble ST2 and their association with disease activity in systemic lupus erythematosus. *Rheumatology (Oxford).* 2010;49(3):520-7.

64. Griesenauer B, Paczesny S. The ST2/IL-33 Axis in Immune Cells during Inflammatory Diseases. *Front Immunol.* 2017 Apr 24;8:475.
65. Sun Z, Chang B, Huang A, Hao S, Gao M, Sun Y, et al. Plasma levels of soluble ST2, but not IL-33, correlate with the severity of alcoholic liver disease. *J Cell Mol Med.* 2019;23:887-97.
66. Sakata Y, Shimokawa H. *Epidemiology of Heart Failure in Asia*. *Circ J*, 2013 pp. 2209 – 2217.
67. Lecoeur E, Domengé O, Fayol A, Jannot AS, Hulot JS. Epidemiology of heart failure in young adults: a French nationwide cohort study. *European Heart Journal*. 2022 Dec 1;44(5):383–92.
68. Chen C, Sung KT, Shih SC, Liu CC, Kuo JY, Hou CJY, et al. Age, Gender and Load-Related Influences on Left Ventricular Geometric Remodeling, Systolic Mid-Wall Function, and NT-ProBNP in Asymptomatic Asian Population. Talkachova A, editor. *PLOS ONE*. 2016 Jun 9;11(6):e0156467.
69. Azizi MS, Nasution SA, Setiati S, Shatri H. Global Longitudinal Strain (GLS) in Elderly and Its Associated Factors. *Acta Medica Indonesiana* 2020 Jan 1 [cited 2024 Feb 20];52(1):47–54.
70. Soufi Taleb Bendiab N, Meziane-Tani A, Ouabdesselam S, Methia N, Latreche S, Henaoui L, et al. Factors associated with global longitudinal strain decline in hypertensive patients with normal left ventricular ejection fraction. *European Journal of Preventive Cardiology*. 2017 Sep 1;24(14):1463–72.
71. Tromp J, Teng T, Tay WT, Hung CL, Narasimhan C, Shimizu W, et al. Heart failure with preserved ejection fraction in Asia. *European Journal of Heart Failure*. 2018;5:1–14.
72. Tromp J, Shen L, Jhund PS, Anand IS, Pitt D, Carson PE, et al. Age-related characteristics and outcomes of patients with heart failure with preserved ejection fraction. *JACC*. 2019;74(5):601–13.

73. Kenchaiah S, Pocock SJ, Wang D, Finn PV, Zornoff LAM, Skali H, et al. Body mass index and prognosis in patients with chronic heart failure: insights from the Candesartan in Heart failure: Assessment of Reduction in Mortality and morbidity (CHARM) program. *Circulation*. 2007 Aug 7;116(6):627–36.
74. Voulgari C, Tentolouris N, Dilaveris P, Tousoulis D, Katsilambros N, Stefanadis C: Increased heart failure risk in normal-weight people with metabolic syndrome compared with metabolically healthy obese individuals. *J Am Coll Cardiol* 2011, 58(13):1343–1350.
75. Krishnasamy R, Isbel NM, Hawley CM, Pascoe EM, Burrage M, Leano R, et al. Left Ventricular Global Longitudinal Strain (GLS) Is a Superior Predictor of All-Cause and Cardiovascular Mortality When Compared to Ejection Fraction in Advanced Chronic Kidney Disease. Rebaldi G, editor. *PLOS ONE*. 2015 May 15;10(5):e0127044.
76. King A, Thambyrajah J, Leng E, Stewart MJ. Global longitudinal strain: a useful everyday measurement? *Echo Research and Practice*. 2016 Sep;3(3):85–93.
77. Hasibuan FS, M Aminuddin, B Utomo, Pratama IS. Importance of Basal Soluble ST2 and Global Longitudinal Strain 2D-Speckle Tracking Echocardiography to Detect Left Ventricle Remodeling in Post-Myocardial Infarction Patients. *IOP Conference Series: Earth and Environmental Science*. 2020 Feb 1;441(1):012172–2.
78. Mondillo S, Cameli M, Caputo ML, Lisi M, Palmerini E, Padeletti M, et al. Early Detection of Left Atrial Strain Abnormalities by Speckle-Tracking in Hypertensive and Diabetic Patients with Normal Left Atrial Size. *Journal of the American Society of Echocardiography*. 2011 Aug;24(8):898–908.
79. Romano S, Mansour IN, Kansal M, Gheith H, Dowdy Z, Dickens CA, et al. Left Ventricular global longitudinal strain predicts heart failure readmission in acute decompensated heart failure. *Cardiovascular Ultrasound*. 2017 Mar

- 15;15(1).
80. Herlina Yulidia, Muhammad Aminuddin, Pikir BS. Corelation of global longitudinal strain (GLS) – left ventricle and soluble supression oftumorgenicity 2 (sST2) in acute heart failure with systolic dysfunction. Indonesian Journal of Cardiology. 2019 Sep 11;39(4).
  81. Edoardo Sciatti, Merlo A, C. Scangiuzzi, Limonta R, Gori M, D'Elia E, et al. Prognostic Value of sST2 in Heart Failure. Journal of Clinical Medicine. 2023 Jun 11 [cited 2024 Jan 14];12(12):3970–0.
  82. Gaggin HK, Januzzi JL. Biomarkers and diagnostics in heart failure. Biochimica et biophysica acta. 2013;1832(12):2442–50.
  83. Beetler DJ, Bruno KA, Di Florio DN, Douglass EJ, Shrestha S, Tschöpe C, et al. Sex and age differences in sST2 in cardiovascular disease. Frontiers in Cardiovascular Medicine. 2023 Jan 18;9.
  84. Takigiku K, Takeuchi M, Izumi C, Yuda S, Sakata K, Ohte N, et al. Normal Range of Left Ventricular 2-Dimensional Strain. Circulation Journal. 2012;76(11):2623–32.
  85. Yingchoncharoen T, Agarwal S, Popović ZB, Marwick TH. Normal Ranges of Left Ventricular Strain: A Meta-Analysis. Journal of the American Society of Echocardiography. 2013 Feb;26(2):185–91.