

Список літератури/ references

1. Hammer A. Ein Fall von thrombotischem Verschlusse einer der Kranzarterien des Herzens. Wien Med Wschr 1878;28:97–102.
2. Obraztsov VP, Straschesko ND. Zur Kenntnis der Thrombose der Koronararterien des Herzens. Z Klin Med 1910;71:116–132.
3. Herrick JB. Clinical features of sudden obstruction of the coronary arteries. JAMA 1912;59:2015–2022.
4. Friedberg CK, Horn H. Acute myocardial infarction not due to coronary artery occlusion. JAMA 1939;112:1675–1679.
5. World Health Organization. Working Group on the Establishment of Ischemic Heart Disease Registers. Report of the Fifth Working Group, Copenhagen. In: Report No. Eur 8201 (5). Geneva: World Health Organization; 1971.
6. Report of the Joint International Society and Federation of Cardiology/World Health Organization task force on standardization of clinical nomenclature. Nomenclature and criteria for diagnosis of ischemic heart disease. Circulation 1979;59:607–609.
7. Tunstall-Pedoe H, Kuulasmaa K, Amouyel P, Arveiler D, Rajakangas AM, Pajak A. Myocardial infarction and coronary deaths in the World Health Organization MONICA Project. Registration procedures, event rates, and case-fatality rates in 38 populations from 21 countries in four continents. Circulation 1994;90:583–612.
8. Luepker RV, Apple FS, Christenson RH, Crow RS, Fortmann SP, Goff D, Goldberg RJ, Hand MM, Jaffe AS, Julian DG, Levy D, Manolio T, Mendis S, Mensah G, Pajak A, Prineas RJ, Reddy KS, Roger VL, Rosamond WD, Shahar E, Sharrett AR, Sorlie P, Tunstall-Pedoe H. Case definitions for acute coronary heart disease in epidemiology and clinical research studies: A statement from the AHA Council on Epidemiology and Prevention; AHA Statistics Committee; World Heart Federation Council on Epidemiology and Prevention; the European Society of Cardiology Working Group on Epidemiology and Prevention; Centers for Disease Control and Prevention; and the National Heart, Lung, and Blood Institute. Circulation 2003;108:2543–2549.
9. The Joint European Society of Cardiology/American College of Cardiology Committee. Myocardial infarction redefined – a consensus document of the Joint European Society of Cardiology/American College of Cardiology Committee for the Redefinition of Myocardial Infarction. Eur Heart J 2000;21:1502–1513; J Am Coll Cardiol 2000;36:959–969.
10. Thygesen K, Alpert JS, White HD; Joint ESC/ACC/AHA/WHF Task Force for the Redefinition of Myocardial Infarction. Universal definition of myocardial infarction. Eur Heart J 2007;28:2525–2538; Circulation 2007;116:2634–2653; J Am Coll Cardiol 2007;50:2173–2195.
11. Mendis S, Thygesen K, Kuulasmaa K, Giampaoli S, M€aho nen M, Ngu Blackett K, Lisheng L; Writing group on behalf of the participating experts of the WHO con- sultation for revision of WHO definition of myocardial infarction. World Health Organization definition of myocardial infarction: 2008-09 revision. Int J Epidemiol 2011;40:139–146.
12. Thygesen K, Alpert JS, Jaffe AS, Simoons ML, Chaitman BR, White HD; Writing Group on the Joint ESC/ACC/AHA/WHF Task Force for the Universal Definition of Myocardial Infarction. Third universal definition of myocardial infarction. Eur Heart J 2012;33:2551–2567; Circulation 2012;126:2020–2035; J Am Coll Cardiol 2012;60:1581–1598.
13. Sarkisian L, Saaby L, Poulsen TS, Gerke O, Janggaard N, Hosbond S, Diederichsen ACP, Thygesen K, Mickley H. Clinical characteristics and outcomes of patients with myocardial infarction, myocardial injury, and nonelevated troponins. Am J Med 2016;129:446e.5–446e.21.
14. Sarkisian L, Saaby L, Poulsen TS, Gerke O, Hosbond S, Janggaard N, Diederichsen ACP, Thygesen K, Mickley H. Prognostic impact of myocardial injury related to various cardiac and noncardiac conditions. Am J Med 2016;129:506–514.
15. Ooi DS, Isotalo PA, Veinot JP. Correlation of antemortem serum creatine kinase, creatine kinase-MB, troponin I, and troponin T with cardiac pathology. Clin Chem 2000;46:338–344.

16. Jennings RB, Ganote CE. Structural changes in myocardium during acute ischemia. *Circ Res* 1974;35:156–172.
17. Virmani R, Forman MB, Kolodgie FD. Myocardial reperfusion injury. Histopathological effects of perfluorochemical. *Circulation* 1990;81:IV57–IV68.
18. Reimer KA, Jennings RB, Tatum AH. Pathobiology of acute myocardial ischemia: Metabolic, functional and ultrastructural studies. *Am J Cardiol* 1983;52:72A–81A.
19. Ibanez B, Heusch G, Ovize M, Van de Werf F. Evolving therapies for myocardial ischemia/reperfusion injury. *J Am Coll Cardiol* 2015;65:1454–1471.
20. Montecucco F, Carbone F, Schindler TH. Pathophysiology of ST-segment elevation myocardial infarction: Novel mechanisms and treatments. *Eur Heart J* 2016;37:1268–1283.
21. Thygesen K, Mair J, Katus H, Plebani M, Venge P, Collinson P, Lindahl B, Giannitsis E, Hasin Y, Galvani M, Tubaro M, Alpert JS, Biasucci LM, Koenig W, Mueller CH, Huber K, Hamm C, Jaffe AS; The Study Group on Biomarkers in Cardiology of the ESC Working Group on Acute Cardiac Care. Recommendations for the use of cardiac troponin measurement in acute cardiac care. *Eur Heart J* 2010;31:2197–2204.
22. Thygesen K, Mair J, Giannitsis E, Mueller C, Lindahl B, Blankenberg S, Huber K, Plebani M, Biasucci LM, Tubaro M, Collinson P, Venge P, Hasin Y, Galvani M, Koenig W, Hamm C, Alpert JS, Katus H, Jaffe AS; Study Group on Biomarkers in Cardiology of the ESC Working Group on Acute Cardiac Care. How to use high-sensitivity cardiac troponins in acute cardiac care. *Eur Heart J* 2012;33:2252–2257.
23. Rittoo D, Jones A, Lecky B, Neithercut D. Elevation of cardiac troponin T, but not cardiac troponin I, in patients with neuromuscular diseases: Implications for the diagnosis of myocardial infarction. *J Am Coll Cardiol* 2014;63:2411–2420.
24. Jaffe AS, Vasile VC, Milone M, Saenger AK, Olson KN, Apple FS. Disease skeletal muscle: A noncardiac source of increased circulating concentrations of cardiac troponin T. *J Am Coll Cardiol* 2011;58:1819–1824.
25. Wens SCA, Schaaf GJ, Michels M, Kruijshaar ME, van Gestel TJM, In 't Groen S, Pijnenburg J, Dekkers DHW, Demmers JAA, Verdijk LB, Brusse E, van Schaik RHN, van der Ploeg AT, van Doorn PA, Pijnappel WWMP. Elevated plasma cardiac troponin T levels caused by skeletal muscle damage in Pompe disease. *Circ Cardiovasc Genet* 2016;9:6–13.
26. Mair J, Lindahl B, Müller C, Giannitsis E, Huber K, Mockel M, Plebani M, Thygesen K, Jaffe AS. What to do when you question cardiac troponin values. *Eur Heart J Acute Cardiovasc Care*; doi: 10.1177/2048872617708973. Published online ahead of print 1 May 2017.
27. Mair J, Lindahl B, Hammarsten O, Muller C, Giannitsis E, Huber K, Mockel M, Plebani M, Thygesen K, Jaffe AS; European Society of Cardiology (ESC) Study Group on Biomarkers in Cardiology of the Acute Cardiovascular Care Association (ACCA). How is cardiac troponin released from injured myocardium? *Eur Heart J Acute Cardiovasc Care*; doi: 10.1177/2048872617748553. Published ahead of print 1 December 2017.
28. Vestergaard KR, Jespersen CB, Arnadottir A, Soletormos G, Schou M, Steffensen R, Goetze JP, Kjoller E, Iversen KK. Prevalence and significance of troponin elevations in patients without acute coronary disease. *Int J Cardiol* 2016;222:819–825.
29. Schmid J, Liesinger L, Birner-Gruenberger R, Stojakovic T, Scharnagl H, Dieplinger B, Asslaber M, Radl R, Beer M, Polacin M, Mair J, Szolar D, Berghold A, Quasthoff S, Binder JS, Rainer PP. Elevated cardiac troponin T in skeletal myopathies. *J Am Cardiol Coll* 2018;71:1540–1549.
30. Apple FS, Jaffe AS, Collinson P, Mockel M, Ordonez-Llanos J, Lindahl B, Hollander J, Plebani M, Than M, Chan MH; on behalf of the International Federation of Clinical Chemistry (IFCC) Task Force on Clinical Applications of Cardiac Bio-Markers. IFCC educational materials on selected analytical and clinical applications of high sensitivity cardiac troponin assays. *Clin Biochem* 2015;48:201–203.
31. Goodman SG, Steg PG, Eagle KA, Fox KA, Lopez-Sendón J, Montalescot G, Budaj A, Kennelly BM, Gore JM, Allegrone J, Granger CB, Gurinkel EP; GRACE Investigators. The

- diagnostic and prognostic impact of the redefinition of acute myocardial infarcti on: Lessons from the Global Registry of Acute Coronary Events (GRACE). *Am Heart J* 2006;151:654–660.
32. Weil BR, Suzuki G, Young RF, Iyer V, Carty JM Jr. Troponin release and reversible left ventricular dysfunction following transient pressure overload: Stress-induced myocardial stunning. *J Am Cardiol Coll* 2018;71:2906–2916.
33. Turer AT, Addo TA, Martin JL, Sabatine MS, Lewis GD, Gerszten RE, Keeley EC, Cigarroa JE, Lange RA, Hillis LD, de Lemos JA. Myocardial ischemia induced by rapid atrial pacing causes troponin T release detectable by a highly sensitive assay: Insights from a coronary sinus sampling study. *J Am Coll Cardiol* 2011;57:2398–2405.
34. Siriwardena M, Campbell V, Richards AM, Pemberton CJ. Cardiac biomarker responses to dobutamine stress echocardiography in healthy volunteers and patients with coronary artery disease. *Clin Chem* 2012;58:1492–1494.
35. White HD. Pathobiology of troponin elevations: Do elevations occur with myocardial ischemia as well as necrosis? *J Am Coll Cardiol* 2011;57:2406–2408.
36. Jaffe AS, Wu AH. Troponin release—reversible or irreversible injury? Should we care? *Clin Chem* 2012;58:148–150.
37. Eggers KM, Lindahl B. Application of cardiac troponin in cardiovascular diseases other than acute coronary syndrome. *Clin Chem* 2017;63:223–235.
38. Giannitsis E, Katus HA. Cardiac troponin level elevations not related to acute coronary syndromes. *Nat Rev Cardiol* 2013;10:623–634.
39. Agewall S, Giannitsis E, Jernberg T, Katus H. Troponin elevation in coronary vs. non-coronary disease. *Eur Heart J* 2011;32:404–411.
40. Kelley WE, Januzzi JL, Christenson RH. Increases of cardiac troponin in conditions other than acute coronary syndrome and heart failure. *Clin Chem* 2009;55:2098–2112.
41. Jeremias A, Gibson CM. Alternative causes for elevated cardiac troponin levels when acute coronary syndromes are excluded. *Ann Intern Med* 2005;142:786–791.
42. Weil BR, Young RF, Shen X, Suzuki G, Qu J, Malhotra S, Carty JM Jr. Brief myocardial ischemia produces cardiac troponin I release and focal myocyte apoptosis in the absence of pathological infarction in swine. *JACC Basic Transl Sci* 2017;2:105–114.
43. Braunwald E, Morrow DA. Unstable angina: Is it time for a requiem? *Circulation* 2013;127:2452–2457.
44. Bentzon JF, Otsuka F, Virmani R, Falk E. Mechanisms of plaque formation and rupture. *Circ Res* 2014;114:1852–1866.
45. Falk E, Nakano M, Bentzon JF, Finn AV, Virmani R. Update on acute coronary syndromes: The pathologists' view. *Eur Heart J* 2013;34:719–728.
46. Ibanez B, James S, Agewall S, Antunes MJ, Bucciarelli-Ducci C, Bueno H, Caforio ALP, Crea F, Goudevenos JA, Halvorsen S, Hindricks G, Kastrati A, Lenzen MJ, Prescott E, Roffi M, Valgimigli M, Varenhorst C, Vranckx P, Widimsky P. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. *Eur Heart J* 2018;39:119–177.
47. Roffi M, Patrono C, Collet JP, Mueller C, Valgimigli M, Andreotti F, Bax JJ, Borger MA, Brotons C, Chew DP, Gencer B, Hasenfuss G, Kjeldsen K, Lancellotti P, Landmesser U, da Mehilli J, Mukherjee D, Storey RF, Windecker S. 2015 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. *Eur Heart J* 2016;37:267–315.
48. Saaby L, Poulsen TS, Hosbond S, Larsen TB, Pyndt Diederichsen AC, Hallas J, Thygesen K, Mickley H. Classification of myocardial infarction: Frequency and features of type 2 myocardial infarction. *Am J Med* 2013;126:789–797.
49. Cediel G, Gonzalez-del-Hoyo M, Carrasquer A, Sanchez R, Boqué C, Bardají A. Outcomes with type 2 myocardial infarction compared with non-ischemic myocardial injury. *Heart* 2017;103:616–622.

50. Baron T, Hamraeus K, Sundstro^m J, Erlinge D, Jernberg T, Lindahl B; TOTAL-AMI study group. Type 2 myocardial infarction in clinical practice. *Heart* 2015;101:101–106.
51. Shah AS, McAllister DA, Mills R, Lee KK, Churchhouse AM, Fleming KM, Layden E, Anand A, Fersia O, Joshi NV, Walker S, Jaffe AS, Fox KA, Newby DE, Mills NL. Sensitive troponin assay and the classification of myocardial infarction. *Am J Med* 2015;128:493–501.
52. Gupta S, Vaidya SR, Arora S, Bahekar A, Devarapally SR. Type 2 versus type 1 myocardial infarction: A comparison of clinical characteristics and outcomes with a meta-analysis of observational studies. *Cardiovasc Diagn Ther* 2017;7:348–358.
53. Sandoval Y, Thygesen K. Myocardial infarction type 2 and myocardial injury. *Clin Chem* 2017;63:101–107.
54. Saaby L, Poulsen TS, Diederichsen ACP, Hosbond S, Larsen TB, Schmidt H, Gerke O, Hallas J, Thygesen K, Mickley H. Mortality rate in type 2 myocardial infarction: Observations from an unselected hospital cohort. *Am J Med* 2014;127:295–302.
55. Lambrecht S, Sarkisian L, Saaby L, Poulsen TS, Gerke O, Hosbond S, Diederichsen ACP, Thygesen K, Mickley H. Different causes of death in patients with myocardial infarction type 1, type 2 and myocardial injury. *Am J Med* 2018;131:548–554.
56. Chapman AR, Shah ASV, Lee KK, Anand A, Francis O, Adamson P, McAllister DA, Strachan F, Newby DE, Mills NL. Long term outcomes in patients with type 2 myocardial infarction and myocardial injury. *Circulation* 2018;137: 1236–1245.
57. Neumann JT, So^rrensen NA, Ru^rbsamen N, Ojeda F, Renne T, Qaderi V, Teltrop E, Kramer S, Quantius L, Zeller T, Caracas M, Blankenberg S, Westermann D. Discrimination of patients with type 2 myocardial infarction. *Eur Heart J* 2017; 38:3514–3520.
58. Saw J, Mancini GB, Humphries KH. Contemporary review on spontaneous coronary artery dissection. *J Am Coll Cardiol* 2016;68:297–312.
59. Januzzi JL, Sandoval Y. The many faces of type 2 myocardial infarction. *J Am Cardiol Coll* 2017;70:1569–1572.
60. Jangaard N, Sarkisian L, Saaby L, Mikkelsen S, Lassen AM, Marcusen N, Thomsen JL, Diederichsen A, Thygesen K, Mickley H. Incidence, frequency and clinical characteristics of type 3 myocardial infarction in clinical practice. *Am J Med* 2017;130:862.e9–862.e14.
61. Selvanayagam JB, Petersen SE, Francis JM, Robson MD, Kardos A, Neubauer S, Taggart DP. Effects of off-pump versus on-pump coronary surgery on reversible and irreversible myocardial injury: A randomized trial using cardiovascular magnetic resonance imaging and biochemical markers. *Circulation* 2004;109:345–350.
62. Selvanayagam JB, Porto I, Channon K, Petersen SE, Francis JM, Neubauer S, Banning AP. Troponin elevation after percutaneous coronary intervention directly represents the extent of irreversible myocardial injury: Insights from cardiovascular magnetic resonance imaging. *Circulation* 2005;111:1027–1032.
63. Rahimi K, Banning AP, Cheng AS, Pegg TJ, Karamitsos TD, Channon KM, Darby S, Taggart DP, Neubauer S, Selvanayagam JB. Prognostic value of coronary revascularisation-related myocardial injury: A cardiac magnetic resonance imaging study. *Heart* 2009;95:1937–1943.
64. Tricoci P. Consensus or controversy?: Evolution of criteria for myocardial infarction after percutaneous coronary intervention. *Clin Chem* 2017;63:82–90.
65. Ndrepepa G, Colleran R, Braun S, Cassese S, Hieber J, Fusaro M, Kufner S, Ott I, Byrne RA, Husser O, Hengstenberg C, Laugwitz KL, Schunkert H, Kastrati A. High-sensitivity troponin T and mortality after elective percutaneous coronary intervention. *J Am Coll Cardiol* 2016;68:2259–2268.
66. Zeitouni M, Silvain J, Guedeney P, Kerneis M, Yan Y, Overtchouk P, Barthelemy O, Hauguel-Moreau M, Choussat R, Helft G, Le Feuvre C, Collet JP, Montalescot G; ACTION Study Group. Periprocedural myocardial infarction and injury in elective coronary stenting. *Eur Heart J* 2018;39:1100–1109.

67. Thygesen K, Jaffe AS. The prognostic impact of periprocedural myocardial infarction and injury. *Eur Heart J* 2018;39:1110–1112.
68. Garcia-Garcia HM, McFadden EP, Farb A, Mehran R, Stone GW, Spertus J, Onuma Y, Morel MA, van Es GA, Zuckerman B, Fearon WF, Taggart D, Kappetein AP, Krucoff MW, Vranckx P, Windecker S, Cutlip D, Serruys PW. Standardized endpoint definitions for coronary intervention trials: The Academic Research Consortium-2 Consensus Document. *Eur Heart J* 2018;39:2192–2207; *Circulation* 2018;137:2635–2650.
69. Pegg TJ, Maunsell Z, Karamitsos TD, Taylor RP, James T, Francis JM, Taggart DP, White H, Neubauer S, Selvanayagam JB. Utility of cardiac biomarkers for the diagnosis of type V myocardial infarction after coronary artery bypass grafting: Insights from serial cardiac MRI. *Heart* 2011;97:810–816.
70. Jørgensen PH, Nybo M, Jensen MK, Mortensen PE, Poulsen TS, Diederichsen ACP, Mickley H. Optimal cut-off value for cardiac troponin I in ruling out type 5 myocardial infarction. *Interact Cardiovasc Thorac Surg* 2014;18:544–550.
71. Wang TK, Stewart RA, Ramanathan T, Kang N, Gamble G, White HD. Diagnosis of MI after CABG with high-sensitivity troponin T and new ECG or echocardiogram changes: Relationship with mortality and validation of the universal definition of MI. *Eur Heart J Acute Cardiovasc Care* 2013;2:323–333.
72. Thielmann M, Sharma V, Al-Attar N, Bulluck H, Bisleri G, Bunge JJH, Czerny M, Ferdinand P, Frey UH, Heusch G, Holfeld J, Kleinbongard P, Kunst G, Lang I, Lentini S, Madonna R, Meybohm P, Muneretto C, Obadia JF, Perrino C, Prunier F, Sluijter JPG, Van Laake LW, Sousa-Uva M, Hausenloy DJ. ESC Joint Working Groups on Cardiovascular Surgery and the Cellular Biology of the Heart Position Paper: Peri-operative myocardial injury and infarction in patients undergoing coronary artery bypass graft surgery. *Eur Heart J* 2017;38:2392–2411.
73. Moussa ID, Klein LW, Shah B, Mehran R, Mack MJ, Brilakis ES, Reilly JP, Zoghbi G, Holper E, Stone GW. Consideration of a new definition of clinically relevant myocardial infarction after coronary revascularization: An expert consensus document from the Society for Cardiovascular Angiography and Interventions (SCAI). *J Am Coll Cardiol* 2013;62:1563–1570.
74. Apple FS, Murakami MM. Cardiac troponin and creatine kinase MB monitoring during in-hospital myocardial reinfarction. *Clin Chem* 2005;51:460–463.
75. Sinning JM, Hammerstingl C, Schueler R, Neugebauer A, Keul S, Ghanem A, Mellert F, Schiller W, Muller C, Vasa-Nicotera M, Zur B, Welz A, Grube E, Nickenig G, Werner N. The prognostic value of acute and chronic troponin elevation after transcatheter aortic valve implantation. *EuroIntervention* 2016;11:1522–1529.
76. Wang TKM, Stewart RAH, Ramanathan T, Choi D, Gamble G, Ruygrok PN, White HD. Diagnosis of myocardial infarction and prognostic utility of high-sensitivity troponin T after isolated aortic valve replacement. *Clin Trials Regul Sci Cardiol* 2016;16:1–5.
77. Devereaux PJ, Xavier D, Pogue J, Guyatt G, Sigamani A, Garutti I, Leslie K, Rao-Melacini P, Chrolavicius S, Yang H, Macdonald C, Avezum A, Lanthier L, Hu W, Yusuf S; POISE (PeriOperative ISchemic Evaluation) Investigators. Characteristics and short-term prognosis of perioperative myocardial infarction in patients undergoing noncardiac surgery: A cohort study. *Ann Intern Med* 2011;154:523–528.
78. The Vascular Events in Noncardiac Surgery Patients Cohort Evaluation (VISION) Study Investigators. Association between postoperative troponin levels and 30-day mortality among patients undergoing noncardiac surgery. *JAMA* 2012;307:2295–2304.
79. Nagele P, Brown F, Gage BF, Gibson DW, Miller JP, Jaffe AS, Apple FS, Scott MG. High-sensitivity cardiac troponin T in prediction and diagnosis of myocardial infarction and long-term mortality after noncardiac surgery. *Am Heart J* 2013;166:325–332.
80. Weber M, Luchner A, Manfred S, Mueller C, Liebetrau C, Schlitt A, Apostolovic S, Jankovic R, Bankovic D, Jovic M, Mitrovic V, Nef H, Mollmann H, Hamm CW. Incremental

- value of high-sensitive troponin T in addition to the revised cardiac index for perioperative risk stratification in non-cardiac surgery. *Eur Heart J* 2013;34:853–862.
81. Kavsak PA, Walsh M, Srinathan S, Thorlacius L, Buse GL, Botto F, Pettit S, McQueen MJ, Hill SA, Thomas S, Mrkobrada M, Alonso-Coello P, Berwanger O, Biccard BM, Cembrowski G, Chan MT, Chow CK, de Miguel A, Garcia M, Graham MM, Jacka MJ, Kueh JH, Li SC, Lit LC, Martinez-Brull C, Naidoo P, Nagele P, Pearse RM, Rodseth RN, Sessler DI, Sigamani A, Szczeklik W, Tiboni M, Villar JC, Wang CY, Xavier D, Devereaux PJ. High sensitivity troponin T concentrations in patients undergoing noncardiac surgery: A prospective cohort study. *Clin Biochem* 2011;44:1021–1024.
82. Devereaux PJ, Biccard BM, Sigamani A, Xavier D, Chan MTV, Srinathan SK, Walsh M, Abraham V, Pearse R, Wang CY, Sessler DI, Kurz A, Szczeklik W, Berwanger O, Villar JC, Malaga G, Garg AX, Chow CK, Ackland G, Patel A, Borges FK, Belley-Cote EP, Duceppe E, Spence J, Tandon V, Williams C, Sapsford RJ, Polanczyk CA, Tiboni M, Alonso-Coello P, Faruqui A, Heels-Ansdell D, Lamy A, Whitlock R, LeManach Y, Roshanov PS, McGillion M, Kavsak P, McQueen MJ, Thabane L, Rodseth RN, Buse GAL, Bhandari M, Garutti I, Jacka MJ, Schuermann HJ, Cortes OL, Coriat P, Dvirnik N, Botto F, Pettit S, Jaffe AS, Guyatt GH. Association of postoperative high-sensitivity troponin levels with myocardial injury and 30-day mortality among patients undergoing noncardiac surgery. *JAMA* 2017;317:1642–1651.
83. Puelacher C, Lurati Buse G, Seeberger D, Sazgary L, Marbot S, Lampart A, Espinola J, Kindler C, Hammerer A, Seeberger E, Strebel I, Wildi K, Twerenbold R, du Fay de Lavallaz J, Steiner L, Gurke L, Breidhardt T, Rentsch K, Buser A, Gualandro DM, Osswald S, Mueller C. Perioperative myocardial injury after non-cardiac surgery: Incidence, mortality, and characterization. *Circulation* 2018;137:1221–1232.
84. Duvall WL, Sealove B, Pungotri C, Katz D, Moreno P, Kim M. Angiographic investigation of the pathophysiology of perioperative myocardial infarction. *Catheter Cardiovasc Interv* 2012;80:768–776.
85. Landesberg G, Beattie WS, Mosseri M, Jaffe AS, Alpert JS. Perioperative myocardial infarction. *Circulation* 2009;119:2936–2944.
86. Hanson I, Kahn J, Dixon S, Goldstein J. Angiographic and clinical characteristics of type 1 versus type 2 perioperative myocardial infarction. *Catheter Cardiovasc Interv* 2013;82:622–628.
87. Gualandro DM, Campos CA, Calderaro D, Yu PC, Marques AC, Pastana AF, Lemos PA, Caramelli B. Coronary plaque rupture in patients with myocardial infarction after noncardiac surgery: Frequent and dangerous. *Atherosclerosis* 2012;222:191–195.
88. Kociol RD, Pang PS, Gheorghiade M, Fonarow GC, O'Connor CM, Felker GM. Troponin elevation in heart failure prevalence, mechanisms, and clinical implications. *J Am Coll Cardiol* 2010;56:1071–1078.
89. Januzzi JL Jr, Filippatos G, Nieminen M, Gheorghiade M. Troponin elevation in patients with heart failure: on behalf of the third Universal Definition of Myocardial Infarction Global Task Force: Heart Failure Section. *Eur Heart J* 2012;33:2265–2271.
90. Lyon AR, Bossone E, Schneider B, Sechtem U, Citro R, Underwood SR, Sheppard MN, Figtree GA, Parodi G, Akashi YJ, Ruschitzka F, Filippatos G, Mebazaa A, Omerovic E. Current state of knowledge on Takotsubo syndrome: A Position Statement from the Taskforce on Takotsubo Syndrome of the Heart Failure Association of the European Society of Cardiology. *Eur J Heart Fail* 2016;18:8–27.
91. Templin C, Ghadri JR, Diekmann J, Napp LC, Bataiosu DR, Jaguszewski M, Cammann VL, Sarcon A, Geyer V, Neumann CA, Seifert B, Hellermann J, Schwyzer M, Eisenhardt K, Jenewein J, Franke J, Katus HA, Burgdorf C, Schunkert H, Moeller C, Thiele H, Bauersachs J, Tschope C, Schultheiss HP, Laney CA, Rajan L, Michels G, Pfister R, Ukena C, Böhm M, Erbel R, Cuneo A, Kuck KH, Jacobshagen C, Hasenfuss G, Karakas M, Koenig W, Rottbauer W, Said SM, Braun-Dullaeus RC, Cuculi F, Banning A, Fischer TA, Vasankari T, Airaksinen KE, Fijalkowski M, Rynkiewicz A, Pawlak M, Opolski G, Dworakowski R, MacCarthy P,

- Kaiser C, Osswald S, Galiuto L, Crea F, Dichtl W, Franz WM, Empen K, Felix SB, Delmas C, Lairez O, Erne P, Bax JJ, Ford I, Ruschitzka F, Prasad A, Lu'scher TF. Clinical features and outcomes of takotsubo (stress) cardiomyopathy. *N Engl J Med* 2015;373:929–938.
92. Medeiros K, O'Connor MJ, Baicu CF, Fitzgibbons TP, Shaw P, Tighe DA, Zile MR, Aurigemma GP. Systolic and diastolic mechanics in stress cardiomyopathy. *Circulation* 2014;129:1659–1667.
93. Sharkey SW, Lesser JR, Zenovich AG, Maron MS, Lindberg J, Longe TF, Maron BJ. Acute and reversible cardiomyopathy provoked by stress in women from the United States. *Circulation* 2005;111:472–479.
94. Redfors B, Ra'munddal T, Shao Y, Omerovic E. Takotsubo triggered by acute myocardial infarction: A common but overlooked syndrome? *J Geriatr Cardiol* 2014;11:171–173.
95. Agewall S, Beltrame JF, Reynolds HR, Niessner A, Rosano G, Caforio AL, De Caterina R, Zimarino M, Roffi M, Kjeldsen K, Atar D, Kaski JC, Sechtem U, Tornvall P; Working Group on Cardiovascular Pharmacotherapy. ESC Working Group position paper on myocardial infarction with non-obstructive coronary arteries. *Eur Heart J* 2017;38:143–153.
96. Lindahl B, Baron T, Erlinge D, Hadziosmanovic N, Nordenskjöld AM, Gard A, Jernberg T. Medical therapy for secondary prevention and long-term outcome in patients with myocardial infarction with nonobstructive coronary artery disease. *Circulation* 2017;135:1481–1489.
97. Pasupathy S, Air T, Dreyer RP, Tavella R, Beltrame JF. Systematic review of patients presenting with suspected myocardial infarction and nonobstructive coronary arteries. *Circulation* 2015;131:861–870.
98. Smilowitz NR, Mahajan AM, Roe MT, Hellkamp AS, Chiswell K, Gulati M, Reynolds HR. Mortality of myocardial infarction by sex, age, and obstructive coronary artery disease status in the ACTION Registry-GWTG (Acute Coronary Treatment and Intervention Outcomes Network Registry-Get With the Guidelines). *Circ Cardiovasc Qual Outcomes* 2017;10:e003443.
99. Jacobs LH, van de Kerkhof J, Mingels AM, Kleijnen VW, van der Sande FM, Wodzig WK, Kooman JP, van Dieijken-Visser MP. Haemodialysis patients longitudinally assessed by highly sensitive cardiac troponin T and commercial cardiac troponin T and cardiac troponin I assays. *Ann Clin Biochem* 2009;46:283–290.
100. Unger ED, Dubin RF, Deo R, Daruwalla V, Friedman JL, Medina C, Beussink L, Freed BH, Shah SJ. Association of chronic kidney disease with abnormal cardiac mechanics and adverse outcomes in patients with heart failure and preserved ejection fraction. *Eur J Heart Fail* 2016;18:103–112.
101. Twerenbold R, Wildi K, Jaeger C, Gimenez MR, Reiter M, Reichlin T, Walukiewicz A, Gugala M, Krivoshei L, Marti N, Moreno Weidmann Z, Hillinger P, Puelacher C, Rentsch K, Honegger U, Schumacher C, Zurbriggen F, Freese M, Stelzig C, Campodarve I, Bassetti S, Osswald S, Mueller C. Optimal cutoff levels of more sensitive cardiac troponin assays for the early diagnosis of myocardial infarction in patients with renal dysfunction. *Circulation* 2015;131:2041–2050.
102. deFilippi C, Seliger SL, Kelley W, Duh SH, Hise M, Christenson RH, Wolf M, Gaggin H, Januzzi J. Interpreting cardiac troponin results from high-sensitivity assays in chronic kidney disease without acute coronary syndrome. *Clin Chem* 2012;58:1342–1351.
103. Michos ED, Wilson LM, Yeh HC, Berger Z, Suarez-Cuervo C, Stacy SR, Bass EB. Prognostic value of cardiac troponin in patients with chronic kidney disease without suspected acute coronary syndrome: A systematic review and meta-analysis. *Ann Intern Med* 2014;161:491–501.
104. Parikh RH, Seliger SL, deFilippi CR. Use and interpretation of high sensitivity cardiac troponins in patients with chronic kidney disease with and without acute myocardial infarction. *Clin Biochem* 2015;48:247–253.

105. Friden V, Starnberg K, Muslimovic A, Ricksten SE, Bjurman C, Forsgard N, Wickman A, Hammarsten O. Clearance of cardiac troponin T with and without kidney function. *Clin Biochem* 2017;50:468–474.
106. Stacy SR, Suarez-Cuervo C, Berger Z, Wilson LM, Yeh HC, Bass EB, Michos ED. Role of troponin in patients with chronic kidney disease and suspected acute coronary syndrome: A systematic review. *Ann Intern Med* 2014;161:502–512.
107. Guest TM, Ramanathan AV, Tuteur PG, Schechtman KB, Ladenson JH, Jaffe AS. Myocardial injury in critically ill medical patients: A surprisingly frequent complication. *JAMA* 1995;273:1945–1949.
108. Babuin L, Vasile VC, Rio Perez JA, Alegria JR, Chai HS, Afessa B, Jaffe AS. Elevated cardiac troponin is an independent risk factor for short- and long-term mortality in medical intensive care unit patients. *Crit Care Med* 2008;36:759–765.
109. Landesberg G, Vesselov Y, Einav S, Goodman S, Sprung CL, Weissman C. Myocardial ischemia, cardiac troponin, and long-term survival of high-cardiac risk critically ill intensive care unit patients. *Crit Care Med* 2005;33:1281–1287.
110. Thygesen K, Alpert JS, Jaffe AS, White HD. Diagnostic application of the universal definition of myocardial infarction in the intensive care unit. *Curr Opin Crit Care* 2008;14:543–548.
111. Vatner SF, Baig H, Manders WT, Maroko PR. The effects of coronary artery reperfusion on myocardial infarct size calculated from creatine kinase. *J Clin Invest* 1978;61:1048–1056.
112. Starnberg K, Jeppsson A, Lindahl B, Hammarsten O. Revision of the troponin T release mechanism from damaged human myocardium. *Clin Chem* 2014;60:1098–1104.
113. Jaffe AS, Moeckel M, Giannitsis E, Huber K, Mair J, Mueller C, Plebani M, Thygesen K, Lindahl B. In search for the Holy Grail: Suggestions for studies to define delta changes to diagnose or exclude acute myocardial infarction: A position paper from the study group on biomarkers of the Acute Cardiovascular Care Association. *Eur Heart J Acute Cardiovasc Care* 2014;3:313–316.
114. Reichlin T, Irfan A, Twerenbold R, Reiter M, Hochholzer W, Burkhalter H, Bassetti S, Steuer S, Winkler K, Peter F, Meissner J, Haaf P, Potocki M, Drexler B, Osswald S, Mueller C. Utility of absolute and relative changes in cardiac troponin concentrations in the early diagnosis of acute myocardial infarction. *Circulation* 2011;124:136–145.
115. Mueller M, Biener M, Vafaie M, Doerr S, Keller T, Blankenberg S, Katus HA, Giannitsis E. Absolute and relative kinetic changes of high-sensitivity cardiac troponin T in acute coronary syndrome and in patients with increased troponin in the absence of acute coronary syndrome. *Clin Chem* 2012;58:209–218.
116. Keller T, Zeller T, Ojeda F, Tzikas S, Lillpopp L, Sinning C, Wild P, Genth-Zotz S, Warnholtz A, Giannitsis E, Mockel M, Bickel C, Peetz D, Lackner K, Baldus S, Munzel T, Blankenberg S. Serial changes in highly sensitive troponin I assay and early diagnosis of myocardial infarction. *JAMA* 2011;306:2684–2693.
117. Jaffe AS, Apple FS, Morrow DA, Lindahl B, Katus HA. Being rational about (im)precision: A statement from the Biochemistry Subcommittee of the Joint European Society of Cardiology/American College of Cardiology Foundation/ American Heart Association/World Heart Federation Task force for the definition of myocardial infarction. *Clin Chem* 2010;56:941–943.
118. Sandoval Y, Apple FS. The global need to define normality: The 99th percentile value of cardiac troponin. *Clin Chem* 2013;60:455–462.
119. Apple FS, Sandoval Y, Jaffe AS, Ordonez-Llanos J; IFCC Task Force on Clinical Applications of Cardiac Bio-Markers. Cardiac troponin assays: Guide to understanding analytical characteristics and their impact on clinical care. *Clin Chem* 2017;63:73–81.
120. Giannitsis E, Kurz K, Hallermayer K, Jarausch J, Jaffe AS, Katus HA. Analytical validation of a high-sensitivity cardiac troponin T assay. *Clin Chem* 2010;56:254–261.

121. Frankenstein L, Wu AHB, Hallermayer K, Wians FH, Giannitsis E, Katus HA. Biological variation and reference change value of high-sensitivity troponin T in healthy individuals during short and intermediate follow-up periods. *Clin Chem* 2011;57:1068–1071.
122. Apple FS, Ler R, Murakami MM. Determination of 19 cardiac troponin I and T assay 99th percentile values from a common presumably healthy population. *Clin Chem* 2012;58:1574–1581.
123. Wu AHB, Christenson RH, Greene DN, Jaffe AS, Kavsak PA, Ordonez-Llanos J, Apple FS. Clinical laboratory practice recommendations for the use of cardiac troponin in acute coronary syndrome: Expert opinion from the Academy of the American Association for Clinical Chemistry and the Task Force on Clinical Applications of Cardiac Bio-Markers of the International Federation of Clinical Chemistry and Laboratory Medicine. *Clin Chem* 2018;64:645–655.
124. Collinson PO, Heung YM, Gaze D, Boa F, Senior R, Christenson R, Apple FS. Influence of population selection on the 99th percentile reference value for car- diac troponin assays. *Clin Chem* 2012;58:219–225.
125. McKie PM, Heublein DM, Scott CG, Gantzer ML, Mehta RA, Rodeheffer RJ, Redfield MM, Burnett JC Jr, Jaffe AS. Defining high-sensitivity cardiac troponin concentrations in the community. *Clin Chem* 2013;59:1099–1107.
126. Olivieri F, Galeazzi R, Giavarina D, Testa R, Abbatecola AM, Ceka A, Tamburini P, Busco F, Lazzarini R, Monti D, Franceschi C, Procopio AD, Antonicelli R. Aged-related increase of high sensitive troponin T and its implication in acute myocardial infarction diagnosis of elderly patients. *Mech Ageing Dev* 2012;133:300–305.
127. Reiter M, Twerenbold R, Reichlin T, Haaf P, Peter F, Meissner J, Hochholzer W, Stelzig C, Freese M, Heinisch C, Breidthardt T, Freidank H, Winkler K, Campodarve I, Gea J, Mueller C. Early diagnosis of acute myocardial infarction in the elderly using more sensitive cardiac troponin assays. *Eur Heart J* 2011;32:1379–1389.
128. Shah AS, Griffiths M, Lee KK, McAllister DA, Hunter AL, Ferry AV, Cruikshank A, Reid A, Stoddart M, Strachan F, Walker S, Collinson PO, Apple FS, Gray AJ, Fox KA, Newby DE, Mills NL. High sensitivity cardiac troponin and the under- diagnosis of myocardial infarction in women: Prospective cohort study. *BMJ* 2015;350:g7873.
129. Eggers KM, Johnston N, James S, Lindahl B, Venge P. Cardiac troponin I levels in patients with non-ST-elevation acute coronary syndrome—the importance of gender. *Am Heart J* 2014;168:317.e1–324.e1.
130. Balmelli C, Meune C, Twerenbold R, Reichlin T, Rieder S, Drexler B, Rubini MG, Mosimann T, Reiter M, Haaf P, Mueller M, Ernst S, Ballarino P, Alafify AA, Zellweger C, Wildi K, Moehring B, Vilaplana C, Bernhard D, Merk S, Ebmeyer S, Freidank H, Osswald S, Mueller C. Comparison of the performances of cardiac troponins, including sensitive assays, and copeptin in the diagnostic of acute myocardial infarction and long-term prognosis between women and men. *Am Heart J* 2013;166:30–37.
131. Bjurman C, Larsson M, Johanson P, Petzold M, Lindahl B, Fu ML, Hammarsten O. Small changes in troponin T levels are common in patients with non-ST segment elevation myocardial infarction and are linked to higher mortality. *J Am Coll Cardiol* 2013;62:1231–1238.
132. D’Souza M, Sarkisian L, Saaby L, Poulsen TS, Gerke O, Larsen TB, Diederichsen ACP, Jangaard N, Diederichsen SZ, Hosbond S, Hove J, Thygesen K, Mickley H. Diagnosis of unstable angina pectoris has declined markedly with the advent of more sensitive troponin assays. *Am J Med* 2015;128:852–860.
133. Reichlin T, Twerenbold R, Reiter M, Steuer S, Bassetti S, Balmelli C, Winkler K, Kurz S, Stelzig C, Freese M, Drexler B, Haaf P, Zellweger C, Osswald S, Mueller C. Introduction of high-sensitivity troponin assays: Impact on myocardial infarction incidence and prognosis. *Am J Med* 2012;125:1205–1213.
134. Sandoval Y, Apple FS, Smith SW. High-sensitivity cardiac troponin assays and unstable angina. *Eur Heart J Acute Cardiovasc Care* 2018;7:120–128.

135. Morrow DA. Clinician's guide to early rule-out strategies with high-sensitivity cardiac troponin. *Circulation* 2017;135:1612–1616.
136. Twerenbold R, Boeddinghaus J, Nestelberger T, Wildi K, Rubini Gimenez M, Badertscher P, Mueller C. Clinical use of high-sensitivity cardiac troponin in patients with suspected myocardial infarction. *J Am Coll Cardiol* 2017;70:996–1012.
137. Cullen L, Mueller C, Parsonage WA, Wildi K, Greenslade JH, Twerenbold R, Aldous S, Meller B, Tate JR, Reichlin T, Hammett CJ, Zellweger C, Ungerer JPJ, Rubini Gimenez M, Troughton R, Murray K, Brown AFT, Mueller M, George P, Mosimann T, Flaws DF, Reiter M, Lamanna A, Haaf P, Pemberton CJ, Richards AM, Chu K, Reid CM, Peacock WF, Jaffe AS, Florkowski C, Deely JM, Than M. Validation of high-sensitivity troponin I in a 2-hour diagnostic strategy to assess 30-day outcomes in emergency department patients with possible acute coronary syndrome. *J Am Coll Cardiol* 2013;62:1242–1249.
138. Pickering JW, Than MP, Cullen L, Aldous S, Ter Avest E, Body R, Carlton EW, Collinson P, Dupuy AM, Ekelund U, Eggers KM, Florkowski CM, Freund Y, George P, Goodacre S, Greenslade JH, Jaffe AS, Lord SJ, Mokhtari A, Mueller C, Munro A, Mustapha S, Parsonage W, Peacock WF, Pemberton C, Richards AM, Sanchis J, Staub LP, Troughton R, Twerenbold R, Wildi K, Young J. Rapid rule out of acute myocardial infarction with a single high-sensitivity cardiac troponin T measurement below the limit of detection: A collaborative meta-analysis. *Ann Intern Med* 2017;166:715–724.
139. Mueller C, Giannitsis E, Mockel M, Huber K, Mair J, Plebani M, Thygesen K, Jaffe AS, Lindahl B; Biomarker Study Group of the ESC Acute Cardiovascular Care Association. Rapid rule out of acute myocardial infarction: Novel biomarker-based strategies. *Eur Heart J Acute Cardiovasc Care* 2017;6:218–222.
140. Boeddinghaus J, Nestelberger T, Twerenbold R, Wildi K, Badertscher P, Cupa J, Burge T, Machler P, Corbiere S, Grimm K, Rubini Gimenez M, Puelacher C, Shrestha S, Flores Widmer D, Fuhrmann J, Hillinger P, Sabti Z, Honegger U, Schaerli N, Kozhuharov N, Rentsch K, Miro O, Lopez Barbeito B, Martin-Sanchez FJ, Rodriguez-Adrada E, Morawiec B, Kawecki D, Ganovska E, Parenica J, Lohrmann J, Kloos W, Buser A, Geigl N, Keller DI, Osswald S, Reichlin T, Muller C. Direct comparison of 4 very early rule-out strategies for acute myocardial infarction using high-sensitivity cardiac troponin I. *Circulation* 2017;135:1597–1611.
141. Mockel M, Giannitsis E, Mueller C, Huber K, Jaffe AS, Mair J, Plebani M, Thygesen K, Lindahl B; Biomarker Study Group of the European Society of Cardiology Acute Cardiovascular Care Association. Rule-in of acute myocardial infarction: Focus on troponin. *Eur Heart J Acute Cardiovasc Care* 2017;6:212–217.
142. Jaffe AS, White H. Ruling-in myocardial injury and ruling-out myocardial infarction with the European Society of Cardiology (ESC) 1-hour algorithm. *Circulation* 2016;134:1542–1545.
143. Sandoval Y, Herzog CA, Love SA, Cao J, Hu Y, Wu AHB, Gilbertson D, Brunelli SM, Young A, Ler R, Apple FS. Prognostic value of serial changes in high-sensitivity cardiac troponin I and T over 3 months using reference change values in hemodialysis patients. *Clin Chem* 2016;62:631–638.
144. DeFilippi CF, Herzog CA. Interpreting cardiac biomarkers in the setting of chronic kidney disease. *Clin Chem* 2017;63:59–65.
145. Neeland IJ, Drazner MH, Berry JD, Ayers CR, deFilippi C, Seliger SL, Nambi V, McGuire DK, Omland T, de Lemos JA. Biomarkers of chronic cardiac injury and hemodynamic stress identify a malignant phenotype of left ventricular hypertrophy in the general population. *J Am Coll Cardiol* 2013;61:187–195.
146. Biner M, Mueller M, Vafaie M, Jaffe AS, Widera C, Katus HA, Giannitsis E. Diagnostic performance of rising, falling, or rising and falling kinetic changes of high-sensitivity cardiac troponin T in an unselected emergency department population. *Eur Heart J Acute Cardiovasc Care* 2013;2:314–322.

147. Amsterdam EA, Wenger NK, Brindis RG, Casey DE Jr, Ganiats TG, Holmes DR Jr, Jaffe AS, Jneid H, Kelly RF, Kontos MC, Levine GN, Liebson PR, Mukherjee D, Peterson ED, Sabatine MS, Smalling RW, Zieman SJ. 2014 AHA/ACC guideline for the management of patients with non-ST-elevation acute coronary syndromes. *J Am Coll Cardiol* 2014;64:e139–e228.
148. Bagai A, Jollis JG, Dauerman HL, Peng SA, Rokos IC, Bates ER, French WJ, Granger CB, Roe MT. Emergency department bypass for ST-segment-elevation myocardial infarction patients identified with a prehospital electrocardiogram. *Circulation* 2013;128:352–359.
149. Scirica BM, Morrow DA, Budaj A, Dalby AJ, Mohanavelu S, Qin J, Aroesty J, Hedgepeth CM, Stone PH, Braunwald E. Ischemia detected on continuous elec-trocardiography after acute coronary syndrome. *J Am Coll Cardiol* 2009;53:1411–1421.
150. Wang K, Asinger RW, Marriott HJ. ST-segment elevation in conditions other than acute myocardial infarction. *N Engl J Med* 2003;349:2128–2135.
151. de Winter RJ, Verouden NJW, Wellens HJJ, Wilde AAM. A new ECG sign of proximal LAD occlusion. *N Engl J Med* 2008;359:2071–2073.
152. de Winter RW, Adams R, Verouden NJW, de Winter RJ. Precordial junctional ST-segment depression with tall symmetric T-waves signifying proximal LAD occlusion, case reports of STEMI equivalence. *J Electrocardiol* 2016;49:76–80.
153. de Zwaan C, B€ar FWHM, Wellens HJJ. Characteristic electrocardiographic pattern indicating a critical stenosis high in left anterior descending coronary artery in patients admitted because of impending myocardial infarction. *Am Heart J* 1982;103:730–736.
154. Wong CK, Gao W, Stewart RA, Benatar J, French JK, Aylward PE, White HD; HERO-2 Investigators. aVR ST elevation: An important but neglected sign in ST elevation acute myocardial infarction. *Eur Heart J* 2010;31:1845–1853.
155. Matetzky S, Freimark D, Feinberg MS, Novikov I, Rath S, Rabinowitz B, Kaplinsky E, Hod H. Acute myocardial infarction with isolated ST-segment elevation in posterior chest leads V7-9: “Hidden” ST-segment elevations revealing acute posterior infarction. *J Am Coll Cardiol* 1999;34:748–753.
156. Wong CK, White HD. Patients with circumflex occlusions miss out on reperfusion: How to recognize and manage them. *Curr Opin Cardiol* 2012;27:327–330.
157. Lopez-Sendon J, Coma-Canella I, Alcasena S, Seoane J, Gamallo C. Electrocardiographic findings in acute right ventricular infarction: Sensitivity and specificity of electrocardiographic alterations in right precordial leads V4R, V3R, V₁, V₂ and V₃. *J Am Coll Cardiol* 1985;6:1273–1279.
158. Deluigi CC, Ong P, Hill S, Wagner A, Kispert E, Klingel K, Kandolf R, Sechtem U, Mahrholdt H. ECG findings in comparison to cardiovascular MR imaging in viral myocarditis. *Int J Cardiol* 2013;165:100–106.
159. Biagini E, Pazzi C, Olivotto I, Musumeci B, Limongelli G, Boriani G, Pacileo G, Mastromarino V, Reggiani MLB, Lorenzini M, Lai F, Berardini A, Mingardi F, Rosmini S, Resciniti E, Borghi C, Autore C, Cecchi F, Rapezzi C. Usefulness of electrocardiographic patterns at presentation to predict long-term risk of cardiac death in patients with hypertrophic cardiomyopathy. *Am J Cardiol* 2016;118:432–439.
160. Guerra F, Rrapaj E, Pongetti G, Fabbrizioli A, Pelizzoni V, Giannini I, Aschieri D, Costantini C, Capucci A. Differences and similarities of repolarization patterns during hospitalization for takotsubo cardiomyopathy and acute coronary syn-drome. *Am J Cardiol* 2013;112:1720–1724.
161. Savage RM, Wagner GS, Ideker RE, Podolsky SA, Hackel DB. Correlation of postmortem anatomic findings with electrocardiographic changes in patients with myocardial infarction: Retrospective study of patients with typical anterior and posterior infarcts. *Circulation* 1977;55:279–285.
162. Horan LG, Flowers NC, Johnson JC. Significance of the diagnostic Q wave of myocardial infarction. *Circulation* 1971;43:428–436.

163. Chaitman BR, Hardison RM, Adler D, Gebhart S, Grogan M, Ocampo S, Sopko G, Ramires JA, Schneider D, Frye RL; Bypass Angioplasty Revascularization Investigation 2 Diabetes (BARI 2D) Study Group. The Bypass Angioplasty Revascularization Investigation 2 Diabetes randomized trial of different treatment strategies in type 2 diabetes mellitus with stable ischemic heart disease. *Circulation* 2009;120:2529–2540.
164. Burgess DC, Hunt D, Zannino D, Williamson E, Davis TME, Laakso M, Kesaniemi YA, Zhang J, Sy RW, Lehto S, Mann S, Keech AC. Incidence and predictors of silent myocardial infarction in type 2 diabetes and the effect of fenofibrate: An analysis from the Fenofibrate Intervention and Event Lowering in Diabetes (FIELD) study. *Eur Heart J* 2010;31:92–99.
165. Kwong RY, Sattar H, Wu H, Vorobiof G, Gandla V, Steel K, Siu S, Brown KA. Incidence and prognostic implication of unrecognized myocardial scar characterized by cardiac magnetic resonance in diabetic patients without clinical evidence of myocardial infarction. *Circulation* 2008;118:1011–1020.
166. Sgarbossa EB, Pinsky SL, Barbagelata A, Underwood DA, Gates KB, Topol EJ, Califf RM, Wagner GS; GUSTO-1 (Global Utilization of Streptokinase and Tissue Plasminogen Activator for Occluded Coronary Arteries) Investigators. Electrocardiographic diagnosis of evolving acute myocardial infarction in the presence of left bundle branch block. *N Engl J Med* 1996;334:481–487.
167. Cai Q, Mehta N, Sgarbossa EB, Pinski SL, Wagner GS, Califf RM, Barbagelata A. The left bundle-branch block puzzle in the 2013 ST-elevation myocardial infarction guideline: From falsely declaring emergency to denying reperfusion in a high-risk population. Are the Sgarbossa Criteria ready for prime time? *Am Heart J* 2013;166:409–413.
168. Widimsky P, Rohac F, Stasek J, Kala P, Rokytka R, Kuzmanov B, Jakl M, Poloczek M, Kanovsky J, Bernat I, Hlinomaz O, Belohlavek J, Krkal A, Mrázek V, Grigorov V, Djambazov S, Petr R, Knot J, Břilková D, Fischerová M, Vondrák K, Maly M, Lorencová A. Primary angioplasty in acute myocardial infarction with right bundle branch block: Should new onset right bundle branch block be added to future guidelines as an indication for reperfusion therapy? *Eur Heart J* 2012;33:86–95.
169. Brandt RR, Hammill SC, Higano ST. Electrocardiographic diagnosis of acute myocardial infarction during ventricular pacing. *Circulation* 1998;97:2274–2275.
170. Pradhan R, Chaudhary A, Donato AA. Predictive accuracy of ST depression during rapid atrial fibrillation on the presence of obstructive coronary artery disease. *Am J Emerg Med* 2012;30:1042–1047.
171. Androulakis A, Aznaouridis KA, Aggeli CJ, Roussakis GN, Michaelides AP, Kartalis AN, Stougiannos PN, Dilaveris PE, Misovoulos PI, Stefanidis CI, Kallikazaros IE. Transient ST-segment depression during paroxysms of atrial fibrillation in otherwise normal individuals. *J Am Coll Cardiol* 2007;50:1909–1911.
172. Vakil K, Gandhi S, Abidi KS, Tholakanahalli V, Sharma A, Zaharova M, Madlon-Kay R. Deep T-wave inversions: Cardiac ischemia or memory? *J Cardiovasc Dis* 2014;2:116–119.
173. Stillman AE, Oudkerk M, Bluemke D, Bremerich J, Esteves FP, Garcia EV, Gutberlet M, Hundley WG, Jerosch-Herold M, Kuijpers D, Kwong RK, Nagel E, Lerakis S, Oshinski J, Paul JF, Underwood R, Wintersperger BJ, Rees MR. Assessment of acute myocardial infarction: Current status and recommendations from the North American Society for Cardiovascular Imaging and the European Society of Cardiac Radiology. *Int J Cardiovasc Imaging* 2011;27:7–24.
174. Scirica BM. Acute coronary syndrome: Emerging tools for diagnosis and risk assessment. *J Am Coll Cardiol* 2010;55:1403–1415.
175. Kontos MC, Diercks DB, Kirk JD. Emergency department and office-based evaluation of patients with chest pain. *Mayo Clin Proc* 2010;85:284–299.
176. Lewis WR. Echocardiography in the evaluation of patients in chest pain units. *Cardiol Clin* 2005;23:531–539.

177. Flachskampf FA, Schmid M, Rost C, Achenbach S, de Maria AN, Daniel WG. Cardiac imaging after myocardial infarction. *Eur Heart J* 2011;32:272–283.
178. Zamorano J, Wallbridge DR, Ge J, Drozd J, Nesser J, Erbel R. Non-invasive assessment of cardiac physiology by tissue Doppler echocardiography. *Eur Heart J* 1997;18:330–339.
179. Kaul S, Miller JG, Grayburn PA, Hashimoto S, Hibberd M, Holland MR, Houle HC, Klein AL, Knoll P, Lang RM, Lindner JR, McCulloch ML, Metz S, Mor-Avi V, Pearlman AS, Pellikka PA, DeMars Plambeck N, Prater D, Porter TR, Sahn DJ, Thomas JD, Thomenius KE, Weissman NJ. A suggested roadmap for cardiovascular ultrasound research for the future. *J Am Soc Echocardiogr* 2011;24:455–464.
180. O'Connor MK, Hammell T, Gibbons RJ. In vitro validation of a simple tomographic technique for estimation of percentage myocardium at risk using methoxyisobutyl isonitrile technetium 99m (sestamibi). *Eur J Nucl Med* 1990;17:69–76.
181. Carrio I, Cowie MR, Yamazaki J, Udelson J, Camici PG. Cardiac sympathetic imaging with mIBG in heart failure. *JACC Cardiovasc Imaging* 2010;3:92–100.
182. Nahrendorf M, Sosnovik DE, French BA, Swirski FK, Bengel F, Sadeghi MM, Lindner JR, Wu JC, Kraitchman DL, Fayad ZA, Sinusas AJ. Multimodality cardiovascular molecular imaging, Part II. *Circ Cardiovasc Imaging* 2009;2:56–70.
183. Kramer CM, Sinusas AJ, Sosnovik DE, French BA, Bengel FM. Multimodality imaging of myocardial injury and remodelling. *J Nucl Med* 2010;51:107S–121S.
184. Taegtmeyer H. Tracing cardiac metabolism in vivo: One substrate at a time. *J Nucl Med* 2010;51:80S–87S.
185. Kim HW, Faraneh-Far A, Kim RJ. Cardiovascular magnetic resonance in patients with myocardial infarction. *J Am Coll Cardiol* 2009;55:1–16.
186. Beek AM, van Rossum AC. Cardiovascular magnetic resonance imaging in patients with acute myocardial infarction. *Heart* 2010;96:237–243.
187. Locca D, Bucciarelli-Ducci C, Ferrante G, La Manna A, Keenan NG, Grasso A, Barlis P, del Furia F, Prasad SK, Kaski JC, Pennell DJ, di Mario C. New universal definition of myocardial infarction applicable after complex percutaneous coronary interventions? *JACC Cardiovasc Interv* 2010;3:950–958.
188. Schuleri KH, George RT, Lardo AC. Assessment of coronary blood flow with computed tomography and magnetic resonance imaging. *J Nucl Cardiol* 2010;17:582–590.
189. Dedic A, Lubbers MM, Schaap J, Lammers J, Lamfers EJ, Rensing BJ, Braam RL, Nathoe HM, Post JC, Nielen T, Beelen D, le Cocq d'Armandville MC, Rood PP, Schultz CJ, Moelker A, Ouhous M, Boersma E, Nieman K. Coronary CT angiography for suspected ACS in the era of high-sensitivity troponins: Randomized multicenter study. *J Am Coll Cardiol* 2016;67:16–26.
190. Eitel I, de Waha S, Woerle J, Fuernau G, Lurz P, Pauschinger M, Desch S, Schuler G, Thiele H. Comprehensive prognosis assessment by CMR imaging after ST-segment elevation myocardial infarction. *J Am Coll Cardiol* 2014;64:1217–1226.
191. Hoffmann U, Truong QA, Schoenfeld DA, Chou ET, Woodard PK, Nagurney JT, Pope JH, Hauser TH, White CS, Weiner SG, Kalanjian S, Mullins ME, Mikati I, Peacock WF, Zakrofsky P, Hayden D, Goehler A, Lee H, Gazelle GS, Wiviott SD, Fleg JL, Udelson JE; ROMICAT-II Investigators. Coronary CT angiography versus standard evaluation in acute chest pain. *N Engl J Med* 2012;367:299–308.
192. Puchner SB, Liu T, Mayrhofer T, Truong QA, Lee H, Fleg JL, Nagurney JT, Udelson JE, Hoffmann U, Ferencik M. High-risk plaque detected on coronary CT angiography predicts acute coronary syndromes independent of significant stenosis in acute chest pain: Results from the ROMICAT-II trial. *J Am Coll Cardiol* 2014;64:684–692.
193. Ferencik M, Liu T, Mayrhofer T, Puchner SB, Lu MT, Maurovich-Horvat P, Pope JH, Truong QA, Udelson JE, Peacock WF, White CS, Woodard PK, Fleg JL, Nagurney JT, Januzzi JL, Hoffmann U. hs-Troponin I followed by CT angiography improves acute coronary

- syndrome risk stratification accuracy and work-up in acute chest pain patients: Results from ROMICAT II Trial. *JACC Cardiovasc Imaging* 2015;8:1272–1281.
194. Amsterdam EA, Kirk JD, Bluemke DA, Diercks D, Farkouh ME, Garvey JL, Kontos MC, McCord J, Miller TD, Morise A, Newby LK, Ruberg FL, Scordo KA, Thompson PD. Testing of low-risk patients presenting to the emergency department with chest pain: A scientific statement from the American Heart Association. *Circulation* 2010;122:1756–1776.
195. European Medicines Agency/Committee for Medicinal Products for Human Use (CHMP). Reflection paper on assessment of cardiovascular safety profile of medical products. EMA/CHMP/50549/2015. http://www.ema.europa.eu/docs/en_GB/document_library/Scientific_guideline/2016/03/WC500203804.pdf (25 Feb 2016).
196. Hicks KA, Mahaffey KW, Mehran R, Nissen SE, Wiviott SD, Dunn B, Solomon SD, Marler JR, Teerlink JR, Farb A, Morrow DA, Targum SL, Sila CA, Hai MTT, Jaff MR, Joffe HV, Cutlip DE, Desai AS, Lewis EF, Gibson CM, Landray MJ, Lincoff AM, White CJ, Brooks SS, Rosenfield K, Domanski MJ, Lansky AJ, McMurray J JV, Tcheng JE, Steinhubl SR, Burton P, Mauri L, O'Connor CM, Pfeffer MA, Hung H MJ, Stockbridge NL, Chaitman BR, Temple RJ; Standardized Data Collection for Cardiovascular Trials Initiative (SCTI). 2017 Cardiovascular and stroke endpoint definitions for clinical trials. *Circulation* 2018;137:961–972; *J Am Coll Cardiol* 2018;71:1021–1034.
197. Leening MJ, Elias-Smale SE, Felix JF, Kors JA, Deckers JW, Hofman A, Stricker BH, Witteman JC. Unrecognised myocardial infarction and long-term risk of heart failure in the elderly: The Rotterdam Study. *Heart* 2010;96:1458–1462.
198. Karnegis JN, Matts J, Tuna N. Development and evolution of electrocardio-graphic Minnesota Q-QS codes in patients with acute myocardial infarction. *Am Heart J* 1985;110:452–459.
199. Goyal A, Gluckman TJ, Tcheng JE. What's in a Name? The New ICD-10 (10th Revision of the International Statistical Classification of Diseases and Related Health Problems) codes and type 2 myocardial infarction. *Circulation* 2017;136:1180–1182.
200. Rosamond W, Chambliss L, Heiss G, Mosley T, Coresh J, Whitsel E, Wagenknecht L, Ni H, Folsom A. Twenty-two year trends in incidence of myocardial infarction, CHD mortality, and case-fatality in 4 US communities, 1987- 2008. *Circulation* 2012;125:1848–1857.
201. Luepker R, Duval S, Jacobs D, Smith L, Berger A. The effect of changing diagnostic algorithms on acute myocardial infarction rates. *Ann Epidemiol* 2011;21:824–829.