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MANAGEMENT OF MILITARY PILOTS WITH CORONARY ARTERY DISEASE AND CORONARY ARTERY ANOMALIES IN THE CONTEXT OF NEW MEDICAL CERTIFICATION REGULATIONS IN POLAND

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Introduction: Coronary artery disease constitutes one of the most significant health threats for experienced pilots over the age of 35. Until recently, a diagnosis of this disease in Poland resulted in the disqualification of a military pilot from flying. On 5 December 2023, significant amendments were introduced to the Regulation of the Minister of National Defence concerning the assessment of fitness for military service, which are of particular importance to military aviation. One of the key amendments is the possibility for pilots with coronary artery disease to continue flying duty. The aim of this article is to analyze the new regulations in the context of available scientific data and their practical implications for aviation medicine.

Method: A comprehensive literature review was conducted using electronic databases such as PubMed® and Google Scholar, focusing on coronary artery disease and coronary anomalies, particularly within military populations. The search included keywords such as: "coronary artery disease," "coronary syndrome," "myocardial infarction," "coronary artery anomalies," and "aerospace medicine." Relevant studies addressing coronary artery disease in the context of military medical certification were included, and the latest clinical guidelines issued by aerospace medicine regulatory authorities were analyzed in order to provide context for the management of coronary artery disease and coronary artery anomalies in pilots.

Results: The annual risk of a "cardiac event" for a male military pilot aged 35–54 is 0.15%, with myocardial infarction being the first manifestation in 34% of cases. Research data highlight the need for a comprehensive risk assessment in pilots with coronary artery disease, taking into account not only the degree of anatomical coronary artery stenosis but also

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functional tests demonstrating ischemia, as well as the summed stenosis score, which is a better predictor of cardiac events than isolated stenoses. Following a detailed cardiological evaluation and the fulfillment of specific criteria, a return to flying duty is possible six months after a myocardial infarction. Congenital coronary artery anomalies, present in approximately 1% of adults, usually do not affect health. However, certain anomalies—such as the anomalous origin of the left coronary artery from the pulmonary artery (ALCAPA) or anatomical abnormalities of coronary artery origins (AAOCA, anomalous aortic origin of a coronary artery)—can lead to serious symptoms and are considered a disqualifying factor for flying duties. Functional assessment of these anomalies to rule out myocardial ischemia is essential.

Conclusions: The conclusions emphasize the necessity of individualized risk assessment, taking into account the pilot's role within the flight crew and the specific conditions of flight operations. The changes introduced in Polish regulations are consistent with widely accepted international standards, while also presenting new diagnostic and certification challenges for physicians.

Keywords: coronary artery disease, coronary syndrome, myocardial infarction, coronary artery anomalies, aerospace medicine, military medical assessment

INTRODUCTION

On December 5, 2023, a number of significant changes were introduced to the Regulation of the Minister of National Defense concerning the assessment of fitness for military service and the procedures of military medical boards. These changes are of particular importance to military aviation. The amendments had long been advocated for, including by medical examiners of the Military Aeromedical Board in Warsaw, in response to advancements in medicine and the evolving realities of military service.

One of the key revisions is the provision allowing pilots diagnosed with coronary artery disease to continue their flying duties. This change represents an important step toward the liberalization of medical assessment regulations, while also presenting physicians with new challenges related to risk evaluation and flight safety. Due to the potential of congenital coronary artery anomalies to cause myocardial ischemia, these issues are presented together with those related to coronary artery disease.

The aim of this article is to provide a detailed discussion of the current regulations (Table 1) in light of available scientific data and their practical implications for military aviation service [15].

METHODS

A comprehensive literature review was conducted using electronic databases such as PubMed® and Google Scholar, focusing on the issue of coronary artery disease and coronary artery anomalies, particularly within military populations. The search included keywords such as: "coronary artery disease," "coronary syndrome," "myocardial infarction," "coronary artery anomalies," and "aerospace medicine." Relevant studies addressing the issue of coronary artery disease in the context of military medical assessment were taken into account. In addition, the latest clinical guidelines developed by aerospace medicine regulatory authorities were analyzed to provide context for the management of coronary artery disease and coronary artery anomalies in military aviation service.

RESULTS

Coronary Artery Disease

Coronary artery disease (CAD) is the leading cause of death worldwide, accounting for 19 million deaths annually [18]. CAD is also a primary reason for denial or revocation of flying privileges in both military and civilian aviation [4,12,21]. Atherosclerosis of the coronary arteries is the main cause of exercise-related cardiac events in individuals over the age of 35 [17].

The overall burden of atherosclerosis and the presence of hemodynamically insignificant coronary artery disease are part of a continuum associated with a higher incidence of events and an increased risk of death. In military flight crews, the impact of adverse cardiovascular factors may be intensified by the specific conditions of the flight

Table 1. Regulation of the Minister of National Defense of March 25, 2024, on the assessment of fitness for military service and the procedures of military medical boards in these matters, Annex No. 2 I – List of diseases and defects considered in the assessment of fitness for service in the air, ground flight support service, and aviation engineering service, along with the conditions for such assessments, Chapter X – Cardiovascular System.

§ 38.3	I A	I B	I C
Coronary artery disease	N	N	Z/N
§ 38.4			
History of myocardial infarction	N	N	Z/N
§ 38.5			
Other minor abnormalities in cardiac vascularization with normal clinical condition	N	Z/N	Z/N

I A is a subgroup that includes candidates for supersonic jet pilots as well as current supersonic jet pilots;

I B is a subgroup that includes candidates for pilots of subsonic aircraft, pilots of subsonic aircraft, candidates for pilots of turboprop aircraft equipped with an ejection seat, and pilots of turboprop aircraft equipped with an ejection seat;

I C is a subgroup that includes candidates for pilots of turboprop aircraft, pilots of turboprop aircraft, candidates for pilots of transport aircraft, pilots of transport aircraft, candidates for helicopter pilots, helicopter pilots, individuals applying for enlistment in military service, and candidates for service in units or institutions where there are service positions involving parachute jumps from altitudes above 4,000 meters, soldiers serving in units or institutions where there are service positions involving parachute jumps from altitudes above 4,000 meters, and those designated for assignment to the aforementioned service positions

in those units or institutions;

N – unfit; Z – fit.

environment and by operations in hostile settings with limited access to medical facilities, sometimes compounded by additional hemodynamic consequences in high-performance aircraft. For example, a 50% stenosis may not result in ischemia during a maximal treadmill stress test, but it could theoretically trigger myocardial ischemia under +9 Gz gravitational acceleration in a high-performance aircraft.

It is recommended that decisions regarding the return to flight duty for a pilot with coronary atherosclerosis be based on a comprehensive risk assessment of in-flight incapacitation, which must fall below the acceptable risk threshold. This risk will depend not only on cardiological evaluation but also on the pilot's operational role within the aircrew. For a pilot in a two-person crew, the currently accepted level of risk—defined as the risk of incapacitation (inability to fly)—is considered to be less than 1% per year. For pilots of high-performance or single-seat aircraft (fixed- or rotary-wing), the acceptable risk threshold is even lower. Estimating this risk presents a significant challenge for aeromedical certification, as data to support such assessments remain limited. Consequently, discrepancies exist among aviation authorities in different countries, and even between licensing organizations within the same country [6].

An international report on aerospace medicine issues recommends differentiating management strategies based on the severity of coronary artery stenosis (Table 2) [4].

An anatomical assessment of coronary artery stenosis using computed tomography angiography (CTA) or coronary angiography is generally insufficient to determine clinical significance. This should be assessed by demonstrating myocardial ischemia or by measuring the fractional flow reserve (FFR) during angiography. Such an evaluation is recommended for any lesion causing greater than 50% narrowing [8]. It may be based on non-invasive tests, such as stress echocardiography, cardiac magnetic resonance imaging, or myocardial perfusion scintigraphy, or on invasive testing during coronary angiography with direct FFR measurement. There is also increasing availability of virtual FFR assessment in coronary CTA. If a significant lesion is found—defined as FFR < 0.8 or confirmed ischemia in non-invasive studies—and revascularization is not indicated, the pilot's medical certification for flight duties should be suspended [4].

In addition to assessing the severity of individual stenosis, aerospace medicine literature and guidelines have introduced the concept of "summed stenosis index" [4,13]. In the U.S. Air Force pilot population, severe coronary artery disease was initially defined as any single stenosis >50%, with an associated annual major adverse cardiovascular event (MACE) rate of 2.2%. However, this group was quite heterogeneous due to the possibility of multiple coronary stenoses, prompting the development of the summed stenosis index, which represents the total sum of all detected stenosis. For individuals with a summed stenosis value <50%, the annual MACE rate is 0.6%; for 50–120%, the risk is 1.1% per year; and for >120%, it increases to 3% annually. Multivariate analysis has shown that the summed stenosis index is a better predictor of MACE than family history, coronary artery calcium score, or a single lesion >50%. Several exceptions have been identified, namely: any single stenosis >70%, two stenoses >50%, and/or left main coronary artery stenosis >50%. Each of these

Table 2. Classification of coronary artery disease for aerospace medicine purposes.

	Stenosis (%)	FFR	Annual MACE (%)	Pilot aircrew disposition
Heamodynamically significant	≥70	<0.8	>3.0	Grounded †
Single vessel obstructive (non-heamodynamically significant)	50–69	>0.8	1.0–3.0	With restrictions ‡ §
Single vessel non-obstructive	30–49	>0.8	1.0–3.0	With restrictions ‡
Luminal irregularities	Up to 30	>0.8	0.5–1	Unrestricted possible ‡
Aggregate stenosis: severe	≥120	N/A	>3.0	Grounded †
Aggregate stenosis: moderate	50–119	N/A	1.0–3.0	With restrictions ‡
Aggregate stenosis: mild	<50	N/A	0.5–1.5	Unrestricted possible ‡
Left main stenosis: significant	30–49	N/A	1.0–3.0	With restrictions ‡ §
Left main stenosis	≥50	N/A	>3.0	Grounded †

† Without revascularization; a return to flight (in a limited capacity) may be possible after revascularization.

‡ With intensive risk factor modification and close monitoring, a limited return to flight duties may be possible, depending on the risk threshold accepted by the relevant regulatory authority.

§ There is significant variation in how different agencies approach this issue. The Federal Aviation Administration would permit flight duties with restrictions, while the European Union Aviation Safety Agency would permanently ground the aircrew.

FFR – fractional flow reserve

MACE – major adverse cardiovascular event

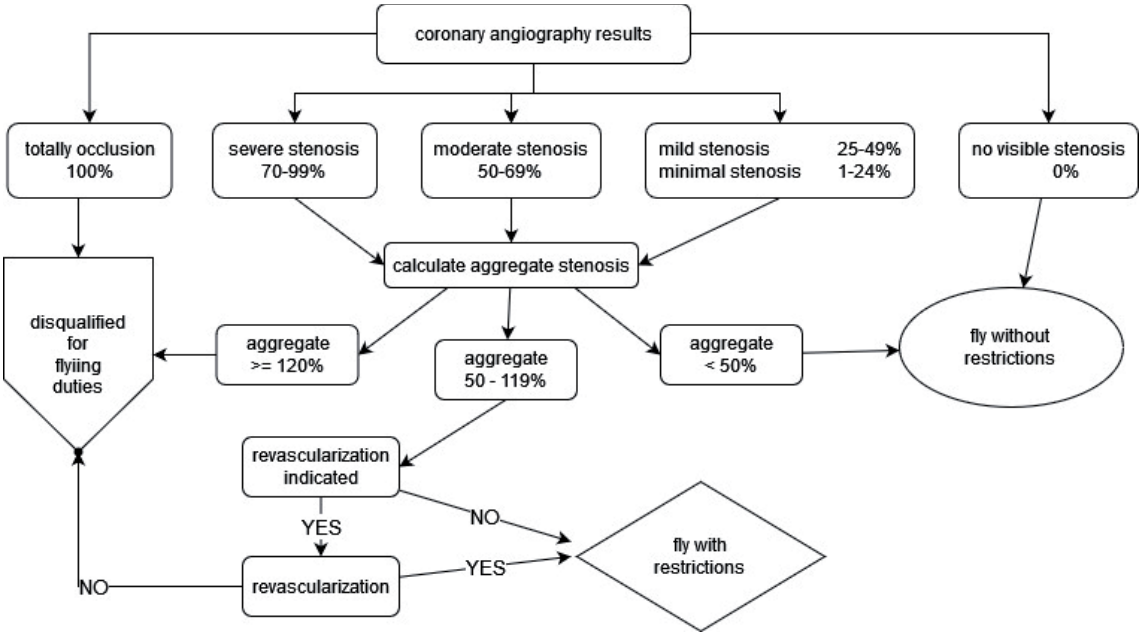

Fig. 1. Management algorithm for military pilots with coronary artery disease. Fly with restrictions – restrictions include multi-crew operations and exclusion from high-performance or single-seat aircraft.

scenarios carries an annual MACE risk >3% and should be considered disqualifying for continued flight duties [8]. According to civil aviation regulations in the United Kingdom, a pilot's license is revoked if two or more coronary artery stenoses between 30% and 50% are identified. In the U.S. Air Force, flying restrictions are imposed when the summed stenosis index exceeds 50%. An algorithm for evaluating the severity of coronary artery disease and guiding management—based on both the degree of arterial narrowing and functional assessment using FFR—is presented in Figure 1.

The Coronary Artery Calcium Score (CACS) is another parameter that has found utility in aerospace medicine for evaluating the extent of coronary artery atherosclerosis. Based on studies conducted for the United States Air Force (USAF), a CACS of 10–99 corresponds to an annual MACE risk of approximately 0.5%, while a CACS >100 correlates with a summed stenosis >50% and an annual MACE risk exceeding 1% [8]. The CONFIRM CTCA registry demonstrates a similar correlation between CACS and stenosis severity and the associated increase in MACE risk [3]. However, a study

conducted on British military pilots found that 4% of those with a CACS of 0 had >50% stenoses detected on CTCA, highlighting the limitations of relying solely on calcium scoring to detect significant coronary lesions [14].

The risk of MACE is influenced not only by the anatomical severity of stenosis but also by the management of modifiable atherosclerotic risk factors. MACE risk reduction can be achieved, for example, by lowering cholesterol levels. Statins—widely available, effective, and inexpensive—have been shown to safely reduce cholesterol and are considered safe for use in all pilots [1,4]. Additional MACE risk mitigation strategies include: regular exercise, smoking cessation, optimal treatment of hypertension, achieving a healthy body weight, and dietary modifications [16].

Observational studies by American researchers have shown that the annual risk of a cardiac event in male military pilots aged 35–54 years is approximately 0.15%. For 34% of those affected, myocardial infarction (MI) is the first manifestation of coronary artery disease [8]. An MI is a disqualifying event for all pilots, necessitating temporary suspension from flight duties. However, current international and U.S. aviation cardiology guidelines allow for a return to flying after MI under specific conditions [5,8]. This may occur no earlier than 6 months post-event, provided the following criteria are met:

- normal left ventricular ejection fraction (LVEF),
- absence of ischemia on functional testing,
- optimal management of coronary artery disease and all cardiovascular risk factors,
- flight restricted to low-performance aircraft (with maximum G-forces up to +2.5 Gz) and multi-crew operations,
- and regular cardiology follow-up.

Recommended functional imaging tests post-MI for assessing ischemia include: single-photon emission computed tomography (SPECT), stress echocardiography, positron emission tomography (PET), and stress cardiac magnetic resonance imaging (MRI). These methods are highly sensitive and specific for detecting ischemia and localizing its extent. Standard exercise ECG testing is not recommended, as its sensitivity for detecting ischemia is only approximately 45% [5]. In addition to functional testing, pilots should also undergo: 24-hour Holter monitoring and echocardiography as part of routine follow-up. If a pilot fails to comply with prescribed medication regimens, or does not achieve adequate control of blood pressure, cholesterol, body weight, or smoking cessation, the pilot's license should be suspended due to the resulting unacceptably high MACE risk [5].

Coronary Artery Anomalies

Congenital coronary artery anomalies (CAAs) occur in approximately 1% of adults [7]. They are most often identified incidentally during coronary artery imaging performed via conventional coronary angiography or computed tomography (CT). Most coronary artery anomalies are benign anatomical variants that do not affect an individual's health. However, some may cause symptoms such as angina-like chest pain, dyspnea, arrhythmias, syncope, or even sudden cardiac death. In athletes under 35 years of age, congenital coronary anomalies are the second most common cause of sudden death [10]. Some anomalies are recognized as contraindications to competitive sports participation and should similarly be considered medical disqualifiers for aviation duties. Among the potentially dangerous anomalies are: anomalous origin of the left coronary artery from the pulmonary artery (ALCAPA) and anomalous aortic origin of a coronary artery (AAOCA) [2].

Initial and periodic evaluations in pilots currently do not include routine assessment of coronary artery anatomy. At present, asymptomatic pilot candidates or active-duty pilots do not undergo imaging tests aimed at identifying coronary anomalies. In asymptomatic individuals, these anomalies can be suspected only indirectly, based on findings such as: arrhythmias on electrocardiogram (ECG), positive exercise ECG stress test, or regional wall motion abnormalities detected by echocardiography (ECHO). Because of this, coronary anomalies are most often discovered incidentally, during imaging performed for unrelated reasons.

Such incidental findings—particularly if the anomaly has never produced symptoms—may pose interpretative challenges for military aeromedical evaluation boards. Management in these cases should be guided by established cardiology recommendations regarding known anomalies, or based on functional assessment of newly detected anomalies, in order to rule out myocardial ischemia. If functional testing confirms that the anomaly does not impair myocardial perfusion, it should not be considered grounds for disqualification from flight service.

CONCLUSIONS

The amendment of Polish medical certification regulations allowing Class IC pilots diagnosed with coronary artery disease (CAD) or with a his-

tory of myocardial infarction (MI) to continue flight duty is consistent with the current body of literature on the management of these conditions. Due to the considerable variability in the clinical consequences of prior myocardial infarction and coronary artery disease—including differences in the degree of coronary artery stenosis and the extent of atherosclerotic burden—this analysis may serve as a valuable aid in the decision-making process for military aeromedical certification boards.

The current certification regulations, which permit Class I B and I C pilots diagnosed with coronary artery anomalies to remain on active flight status, are likewise aligned with international guidelines available in the medical literature.

Ongoing advances in the treatment of coronary artery disease, improved identification of risk factors, and the development of tools for monitoring disease progression have enabled effective interventions that have significantly improved patient prognosis. A modern approach to primary prevention, incorporating both lifestyle modifications and pharmacologic therapy in accordance with contemporary clinical guidelines, has led to a reduction in the age-standardized incidence rate of coronary atherosclerosis among patients with suspected chronic coronary syndrome (CCS) [20].

Advances in pharmacotherapy—including antithrombotic agents, anti-inflammatory drugs, statins, and novel lipid-lowering, metabolic, and anti-obesity medications—have significantly improved survival in patients managed conservatively. As a result, the benefits of early invasive interventions have become more difficult to demonstrate [11]. Nevertheless, revascularization, particularly through percutaneous coronary intervention (PCI), remains a key therapeutic strategy in patients with hemodynamically significant coronary stenosis and a high risk of cardiovascular events. In such cases, this intervention not only alleviates symptoms but may also prevent spontaneous myocardial infarction and cardiac death, and in select patient populations, may improve long-term survival [20].

These therapeutic advances and the associated improvements in prognosis have direct implications for the medical management of military pilots diagnosed with coronary artery disease. The possibility of effectively controlling the disease through pharmacologic treatment and/or invasive procedures makes it feasible, in selected cases, to maintain flight fitness, in accordance with current medical certification standards.

AUTHORS' DECLARATION

Study Design: Michał A. Kurek, Magdalena Rola, Łukasz Dziuda. **Data Collection:** Michał A. Kurek, Magdalena Rola. **Manuscript Preparation:** Michał A. Kurek, Magdalena Rola. The authors declare that there is no conflict of interest.

REFERENCES

1. Baigent C, Keech A, Kearney PM, Blackwell L, Buck G, Pollicino C, Kirby A, Sourjina T, Peto R, Collins R, Simes R; Cholesterol Treatment Trialists' (CTT) Collaborators. Efficacy and safety of cholesterol-lowering treatment: prospective meta-analysis of data from 90,056 participants in 14 randomised trials of statins. Lancet. 2005 Oct 8;366(9493):1267-78. doi: 10.1016/S0140-6736(05)67394-1. Epub 2005 Sep 27. Erratum in: Lancet. 2005 Oct 15-21;366(9494):1358. Erratum in: Lancet. 2008 Jun 21;371(9630):2084. PMID: 16214597.

2. Baumgartner Helmut, Julie De Backer, Sonya V Babu-Narayan, Werner Budts, Massimo Chessa, Gerhard-Paul Diller, Bernard lung, Jolanda Kluin, Irene M Lang, Folkert Meijboom, Philip Moons, Barbara J M Mulder, Erwin Oechslin, Jolien W Roos-Hesselink, Markus Schwerzmann, Lars Sondergaard, Katja Zeppenfeld, ESC Scientific Document Group , 2020 ESC Guidelines for the management of adult congenital heart disease: The Task Force for the management of adult congenital heart disease of the European Society of Cardiology (ESC). Endorsed by: Association for European Paediatric and Congenital Cardiology (AEPC), International Society for Adult Congenital Heart Disease (ISACHD), European Heart Journal, Volume 42, Issue 6, 7 February 2021, Pages 563–645, doi: 10.1093/eurheartj/ehaa554.

3. Cho I, Chang HJ, Sung JM, Pencina MJ, Lin FY, Dunning AM, Achenbach S, Al-Mallah M, Berman DS, Budoff MJ, Callister TQ, Chow BJ, Delago A, Hadamitzky M, Hausleiter J, Maffei E, Cademartiri F, Kaufmann P, Shaw LJ, Raff GL, Chinnaiyan KM, Villines TC, Cheng V, Nasir K, Gomez M, Min JK; CONFIRM Investigators. Coronary computed tomographic angiography and risk of all-cause mortality and nonfatal myocardial infarction in subjects without chest pain syndrome from the CONFIRM Registry (coronary CT angiography evaluation for clinical outcomes: an international multicenter registry). Circulation. 2012 Jul 17;126(3):304-13. doi: 10.1161/CIRCULATIONAHA.111.081380. Epub 2012 Jun 9. PMID: 22685117.

4. Davenport ED, Gray G, Rienks R, et al Management of established coronary artery disease in aircrew without myocardial infarction or revascularisation Heart 2019;105:s25-s30.

5. Davenport ED, Syburra T, Gray G, et al Management of established coronary artery disease in aircrew with previous myocardial infarction or revascularisation Heart 2019;105:s31-s37.

6. Hisada T, Miyagawa T, Tsujimoto T, Maekawa K, Sakai M, Sakurai Y, Ohsuzu F. Waivers for cardiovascular diseases in military aircrew: differences between Japanese and U.S. protocols. Aviat Space Environ Med. 2009 Feb;80(2):139-43. doi: 10.3357/asem.2379.2009. PMID: 19198201.

7. King NM, Tian DD, Munkholm-Larsen S, Buttar SN, Chow V, Yan T. The Aberrant Coronary Artery - The Management Approach. Heart Lung Circ. 2018 Jun;27(6):702-707. doi: 10.1016/j.hlc.2017.06.719. Epub 2017 Jul 3. PMID: 28784571.

8. Knuuti Juhani, William Wijns, Antti Saraste, Davide Capodanno, Emanuele Barbato, Christian Funck-Brentano, Eva Prescott, Robert F Storey, Christi Deaton, Thomas Cuisset, Stefan Agewall, Kenneth Dickstein, Thor Edvardsen, Javier Escaned, Bernard J Gersh, Pavel Svitil, Martine Gilard, David Hasdai, Robert Hatala, Felix Mahfoud, Josep Masip, Claudio Muneretto, Marco Valgimigli, Stephan Achenbach, Jeroen J Bax, ESC Scientific Document Group , 2019 ESC Guidelines for the diagnosis and management of chronic coronary syndromes: The Task Force for the diagnosis and management of chronic coronary syndromes of the European Society of Cardiology (ESC), European Heart Journal, Volume 41, Issue 3, 14 January 2020, Pages 407–477, doi: 10.1093/eurheartj/ehz425.

9. Marijon E, Mirabel M, Celermajer DS, Jouven X. Rheumatic heart disease. Lancet. 2012 Mar 10;379(9819):953-964. doi: 10.1016/S0140-6736(11)61171-9. PMID: 22405798.

10. Maron BJ. Sudden death in young athletes. N Engl J Med. 2003 Sep 11;349(11):1064-75. doi: 10.1056/NEJMra022783. PMID: 12968091.

11. Maron DJ, Hochman JS, Reynolds HR, Bangalore S, O'Brien SM, Boden WE, Chaitman BR, Senior R, López-Sendón J, Alexander KP, Lopes RD, Shaw LJ, Berger JS, Newman JD, Sidhu MS, Goodman SG, Ruzyllo W, Gosselin G, Maggioni AP, White HD, Bhargava B, Min JK, Mancini GBJ, Berman DS, Picard MH, Kwong RY, Ali ZA, Mark DB, Spertus JA, Krishnan MN, Elghamaz A, Moorthy N, Hueb WA, Demkow M, Mavromatis K, Bockeria O, Peteiro J, Miller TD, Szwed H, Doerr R, Keltai M, Selvanayagam JB, Steg PG, Held C, Kohsaka S, Mavromichalis S, Kirby R, Jeffries NO, Harrell FE Jr, Rockhold FW, Broderick S, Ferguson TB Jr, Williams DO, Harrington RA, Stone GW, Rosenberg Y; ISCHEMIA Research Group. Initial Invasive or Conservative Strategy for Stable Coronary Disease. N Engl J Med. 2020 Apr 9;382(15):1395-1407. doi: 10.1056/NEJMoa1915922. Epub 2020 Mar 30. PMID: 32227755; PMCID: PMC7263833.

12. McCrary BF, Van Syoc DL. Permanent flying disqualifications of USAF pilots and navigators (1995-1999). Aviat Space Environ Med. 2002 Nov;73(11):1117-21. PMID: 12433238.

13. Paratz ED, Sprott T, Preitner C, Anbalagan G, Manderson K, Hochberg T. Navigating Coronary Artery Disease in Aviation Cardiology in Australia and New Zealand. Heart Lung Circ. 2024 Sep;33(9):1242-1249. doi: 10.1016/j.hlc.2024.05.004. Epub 2024 Jun 12. PMID: 38871530.

14. Parsons I, Pavitt C, Chamley R, d'Arcy J, Nicol E. CT Coronary Angiography vs. Coronary Artery Calcium Scoring for the Occupational Assessment of Military Aircrew. Aerosp Med Hum Perform. 2017 Feb 1;88(2):76-81. doi: 10.3357/AMHP.4636.2017. PMID: 28095950.

15. Rozporządzenie Ministra Obrony Narodowej z dnia 25 marca 2024 r. w sprawie orzekania o zdolności do służby wojskowej i trybu postępowania wojskowych komisji lekarskich w tych sprawach (Journal of Laws 2024, item 466).

16. Simons R, Maire R, Van Drongelen A, Valk P. Grounding of Pilots: Medical Reasons and Recommendations for Prevention. Aerosp Med Hum Perform. 2021 Dec 1;92(12):950-955. doi: 10.3357/AMHP.5985.2021. PMID: 34986933.

17. Thompson PD, Franklin BA, Balady GJ, Blair SN, Corrado D, Estes NA 3rd, Fulton JE, Gordon NF, Haskell WL, Link MS, Maron BJ, Mittleman MA, Pelliccia A, Wenger NK, Willich SN, Costa F; American Heart Association Council on Nutrition, Physical Activity, and Metabolism; American Heart Association Council on Clinical Cardiology; American College of Sports Medicine. Exercise and acute cardiovascular events placing the risks into perspective: a scientific statement from the American Heart Association Council on Nutrition, Physical Activity, and Metabolism and the Council on Clinical Cardiology. Circulation. 2007 May 1;115(17):2358-68. doi: 10.1161/CIRCULATIONAHA.107.181485. PMID: 17468391.

18. Tsao CW, Aday AW, Almarzooq ZI, Anderson CAM, Arora P, Avery CL, Baker-Smith CM, Beaton AZ, Boehme AK, Buxton AE, Commodore-Mensah Y, Elkind MSV, Evenson KR, Eze-Nliam C, Fugar S, Generoso G, Heard DG, Hiremath S, Ho JE, Kalani R, Kazi DS, Ko D, Levine DA, Liu J, Ma J, Magnani JW, Michos ED, Mussolino ME, Navaneethan SD, Parikh NI, Poudel R, Rezk-Hanna M, Roth GA, Shah NS, St-Onge MP, Thacker EL, Virani SS, Voeks JH, Wang NY, Wong ND, Wong SS, Yaffe K, Martin SS; American Heart Association Council on Epidemiology and Prevention Statistics Committee and Stroke Statistics Subcommittee. Heart Disease and Stroke Statistics-2023 Update: A Report From the American Heart Association. Circulation. 2023 Feb 21;147(8):e93-e621. doi: 10.1161/CIR.0000000000001123. Epub 2023 Jan 25. Erratum in: Circulation. 2023 Feb 21;147(8):e622. Erratum in: Circulation. 2023 Jul 25;148(4):e4. PMID: 36695182.

19. United States Air Force Aerospace Medicine Waiver Guide Compendium. 01.01.2023.

20. Vrints Christiaan, Felicita Andreotti, Konstantinos C Koskinas, Xavier Rossello, Marianna Adamo, James Ainslie, Adrian Paul Banning, Andrzej Budaj, Ronny R Buechel, Giovanni Alfonso Chiariello, Alaide Chieffo, Ruxandra Maria Christodorescu, Christi Deaton, Torsten Doenst, Hywel W Jones, Vijay Kunadian, Julinda Mehilli, Milan Milojevic, Jan J Piek, Francesca Pugliese, Andrea Rubboli, Anne Grete Semb, Roxy Senior, Jurrien M ten Berg, Eric Van Belle, Emeline M Van Craenenbroeck, Rafael Vidal-Perez, Simon Winther, ESC Scientific Document Group , 2024 ESC Guidelines for the management of chronic coronary syndromes: Developed by the task force for the management of chronic coronary syndromes of the European Society of Cardiology (ESC) Endorsed by the European Association for Cardio-Thoracic Surgery (EACTS), European Heart Journal, Volume 45, Issue 36, 21 September 2024, Pages 3415–3537, doi: 10.1093/eurheartj/ehae177.

21. Zeng J, Zhao Y, Gao D, Lu X, Dong JJ, Liu YB, Shen B. Medical appraisal of Chinese military aircrew with abnormal results of coronary computed tomographic angiography. World J Cardiol. 2024 Sep 26;16(9):522-530. doi: 10.4330/wjc.v16.i9.522. PMID: 39351334; PMCID: PMC11439103.