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Review Article
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RECENT ADVANCES IN HYPERTENSION MANAGEMENT

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ABSTRACT
Hypertension is a leading global health problem and a major cause of heart disease, stroke, kidney disease and premature death. Although many anti hypertensive drugs are available, a significant proportion of patients have uncontrolled or resistant hypertension. Recent advances focus on improving blood pressure measurement, optimizing drug therapy, integrating digital health technologies, and developing novel device based treatments. These innovations aim to improve blood pressure control, reduce cardiovascular risk, and provide personalized care for different patient populations. This review aims to systematically examine and critically analyze recent advances in hypertension management reported between 2022 and 2026. It evaluates the effectiveness of novel antihypertensive medications, emerging therapeutic approaches, and technological innovations in improving blood pressure control, reducing cardiovascular complications, and enhancing patient outcomes.

Keywords: *Hypertension, Blood pressure, Resistant Hypertension, SGLT2 inhibitors, Telemedicine, Renal Denervation, Artificial intelligence*

INTRODUCTION
Arterial hypertension is one of the most common and preventable risk factors for cardiovascular disease and premature death worldwide. Its prevalence is estimated at 30–45% among adults and increases with advancing age [1]. Despite the availability of effective antihypertensive therapies, blood pressure remains inadequately controlled in many patients, leading to increased cardiovascular events, hospitalizations, healthcare costs, and mortality [2]. Recent updates from the European Society of Hypertension (ESH) and the European Society of Cardiology (ESC) have introduced revised recommendations for the diagnosis and management ofhypertension [3]. This review summarizes the latest evidence and guideline recommendations to provide an updated approach to the diagnosis, treatment, and clinical management of arterial hypertension [4].

EPIDEMIOLOGY
According to the World Health Organization (WHO), approximately 1.28 billion adults aged 30–79 years worldwide have hypertension, with nearly two-thirds living in low- and middle-income countries [5]. Despite the availability of effective treatments, only about 42% of people with hypertension are diagnosed and treated, and approximately 21% achieve adequate blood pressure control [6]. The prevalence of hypertension increases with age and is influenced by risk factors such as obesity, unhealthy diet, physical inactivity, excessive salt intake, alcohol consumption, and diabetes [7].

RECENT CHANGES IN HYPERTENSION GUIDELINES
The latest recommendations published by the European Society of Hypertension (ESH) in 2023 and the European Society of Cardiology (ESC) in 2024 have introduced several important updates in the diagnosis and treatment of hypertension[8].Both guidelines continue to define hypertension as an office blood pressure of 140/90 mmHg or above and emphasize that the diagnosis should ideally be confirmed using home blood pressure monitoring (HBPM) or 24-hour ambulatory blood pressure monitoring (ABPM) [9]. These methods provide a more accurate presentation of a patient's blood pressure profile than clinic measurements alone and are valuable for detecting white-coat hypertension, masked hypertension, and abnormal nighttime blood pressure patterns [10].
One of the major changes in the 2024 ESC guideline is the introduction of the category "elevated blood pressure," which includes individuals with a systolic blood pressure of 120–139 mmHg and/or a diastolic blood pressure of 80–89 mmHg. This classification aims to identify individuals who are at increased cardiovascular risk and may benefit from

earlier preventive strategies [11]. In comparison, the 2023 ESH guideline continues to classify these blood pressure levels as normal and high-normal rather than grouping them into a single category [12].

Both guidelines highlight that lifestyle modification remains the cornerstone of hypertension prevention and management. Recommended interventions include reducing dietary salt intake, consuming a balanced diet such as the DASH or Mediterranean diet, maintaining a healthy body weight, engaging in regular physical activity, limiting alcohol consumption, avoiding tobacco use, and improving overall cardiovascular health [13].

Regarding pharmacological management, both guidelines recommend starting treatment with a single-pill combination containing two antihypertensive agents for most patients. Commonly preferred combinations include an ACE inhibitor or an angiotensin receptor blocker together with either a calcium channel blocker or a thiazide/thiazide-like diuretic. This treatment strategy has been shown to improve medication adherence, achieve faster blood pressure control, and reduce the risk of cardiovascular complications [14].

Another important recommendation is the adoption of a personalized treatment approach. Management decisions should consider the patient's age, cardiovascular risk, diabetes, chronickidney disease, frailty, and evidence of hypertension-mediated organ damage rather than relying solely on blood pressure values [15].

The updated guidelines also acknowledge the increasing role of digital health technologies in hypertension care. Remote blood pressure monitoring, telemedicine services, and mobile health applications can improve patient follow-up, medication adherence, and long-term blood pressure control [16]. Although wearable and cuffless blood pressure monitoring devices show considerable promise, additional clinical validation is required before they can be recommended for routine use. Similarly, renal denervation is recognized as a potential option for selected patients with resistant hypertension [17].

Telemedicine, smartphone applications, and remote BP monitoring are increasingly recommended to improve adherence and follow-up. Digital health tools are becoming important components of long-term hypertension management. 2025-2026 studies supported by 2024 ESC guidelines [18].

Cuffless and wearable BP monitoring devices are under investigation for continuous BP assessment. Current guidelines acknowledge their potential but recommend further validation before routine clinical use. 2025-2026 research not yet include at guidelines [19].

Renal denervation has gained stronger evidence for resistant hypertension. Recent studies support its use in carefully selected patients when BP remains uncontrolled despite optimal medical therapy. 2025-2026 clinical trials [20].

AI-based risk prediction models and clinical decision-support systems are emerging to facilitate personalized hypertension management, though they are not yet part of routine guideline recommendations. 2025-2026 research not yet include in guidelines [21].

ADVANCES IN DIAGNOSIS:

Accurate diagnosis of hypertension is essential to prevent cardiovascular disease, stroke, chronic kidney disease, heart failure, and premature death [22]. Recent advances have shifted diagnosis from isolated office BP measurements to standardized BP measurement, ABPM, HBPM, digital health technologies, AI, and wearable devices [23].

Standardized Office Blood Pressure Measurement:

Office BP remains the foundation of diagnosis. Guidelines recommend validated automated devices, proper patient positioning, 5 minutes of rest, multiple readings, and confirmation on at least two visits[24].The2017 ACC/AHA defines hypertension as ≥130/80 mmHg, while the2023 ESH and 2024 ESC retain ≥140/90 mmHg and recommend confirmation with out-of-office BP monitoring [25].

Ambulatory Blood Pressure Monitoring (ABPM):

ABPM records BP over 24–48 hours **during daily activities and sleep. It is the** gold standard **for confirming hypertension and detecting** white-coat, masked, and nocturnal hypertension**, while providing better prediction of cardiovascular outcomes than office BP measurements [26].**

Home Blood Pressure Monitoring (HBPM):

HBPM enables patients to monitor BP at home using validated devices. It improves medication adherence, treatment monitoring, and detection of **white-coat and masked hypertension**, and is recommended when ABPM is unavailable [27].

ARTIFICIAL INTELLIGENCE IN HYPERTENSION DIAGNOSIS

AI analyzes BP data from office measurements, ABPM, HBPM, electronic health records, and wearable devices to identify abnormal BP patterns, predict hypertension and cardiovascular risk, and support personalized clinical decision-making [28].

WEARABLE AND DIGITAL BLOOD PRESSURE MONITORING DEVICES

Wearable devices such as **smart watches, smart rings, patches, and smartphone-based sensors** use technologies like **PPG, PTT, PAT, tonometry, and AI** to estimate BP. They enable continuous monitoring, telemedicine, and remote patient management but require further clinical validation [29].

RECENT EVIDENCE ON CUFFLESS BLOOD PRESSURE DEVICES

According to the **2025 AHA Scientific Statement** and **2025 AHA/ACC Hypertension Guideline**, **cuffless BP devices are not recommended for routine diagnosis or treatment** because their accuracy has not been sufficiently validated. Although convenient, they require further research and standardized validation. **Validated cuff-based BP devices remain the recommended standard [30].**

Future Perspectives:

Hypertension diagnosis is moving toward precision medicine **by integrating** ABPM, HBPM, telemedicine, AI, and wearable technologies**. With further validation, these innovations are expected to improve early detection, personalized treatment, and cardiovascular outcomes [31].**

Figure 01: Modern technologies improve detection, monitoring, and long term blood pressure control.

ADVANCES IN PHARMACOLOGICAL MANAGEMENT

Recent hypertension management has shifted from stepwise monotherapy to early, individualized combination therapy. The 2023 European Society of Hypertension (ESH) and 2024 European Society of Cardiology (ESC) guidelines recommend combining lifestyle modification with early pharmacological treatment to achieve rapid blood pressure (BP) control and reduce cardiovascular and renal complications.First-Line Antihypertensive Drug Classes:

- Angiotensin-converting enzyme inhibitors (ACEIs)
- Angiotensin II receptor blockers (ARBs)
- Calcium channel blockers (CCBs)
- Thiazide/thiazide-like diuretics
    - Single-Pill Combination Therapy as First-Line Treatment

  Telmisartan + Amlodipine
  Perindopril + Amlodipine
  Olmesartan + Amlodipine
  Perindopril + Indapamide

If blood pressure is not controlled with dual therapy, the guidelines recommend triple SPC therapy: ACEI or ARB + CCB + Thiazide/Thiazide-like diuretic

Examples: Telmisartan + Amlodipine + Hydrochlorothiazide

Olmesartan + Amlodipine + Hydrochlorothiazide

Valsartan + Amlodipine + Hydrochlorothiazide [32].

Novel Pharmacological Advances in Hypertension ManagementSodium–Glucose Cotransporter-2 (SGLT2) inhibitors: Drugs such as empagliflozin and dapagliflozin provide modest BP reduction and improve heart and kidney outcomes, especially in patients with diabetes,chronic disease (CKD), or heart failure [33].

Glucagon-Like Peptide-1 Receptor Agonists (GLP-1 RAs): Semaglutide, liraglutide, dulaglutide, and tirzepatide reduce BP indirectly through weight loss and lower cardiovascular risk [34].

Non-Steroidal Mineralocorticoid Receptor Antagonists (nsMRAs): Finerenone provides cardiovascular and renal protection in diabetic CKD and has fewer endocrine adverse effects than traditional mineralocorticoid receptor antagonists (MRAs) [35].

Endothelin Receptor Antagonists: Aprocitentan is an emerging add-on therapy for resistant hypertension.

Aldosterone Synthase Inhibitors: Lorundrostat and baxdrostat are investigational drugs showing promising BP reduction in resistant hypertension [36].

Individualized Use of Additional Antihypertensive Agents: Beta-blockers are recommended mainly for patients with coronary artery disease, heart failure, previous myocardial infarction (MI), atrial fibrillation, or pregnancy. Other add-on drugs include alpha-blockers, centrally acting agents, and MRAs [37].

Mineralocorticoid Receptor Antagonists: Spironolactone is the preferred fourth-line drug for resistant hypertension, with eplerenone as an alternative [38].

Emerging Pharmacological Therapies: SGLT2 inhibitors provide additional cardiovascular and renal protection in patients with diabetes, CKD, or heart failure.[39].

Management of Resistant Hypertension: Management includes confirming adherence, excluding white-coat hypertension using ambulatory blood pressure monitoring (ABPM) or home blood pressure monitoring (HBPM), optimizing lifestyle, adding spironolactone, and considering renal denervation in selected patients [40].

Future Perspectives: Future treatment will focus on early combination therapy, precision medicine, biomarkers, genetics, and digital health technologies to provide personalized hypertension management and improve long-term outcomes [41].

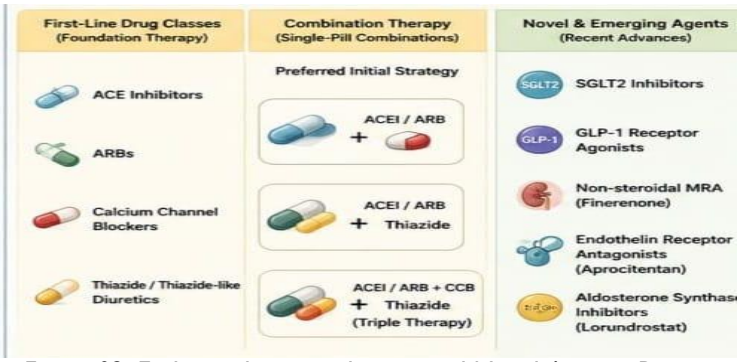

Figure 02: Early combination therapy and Novel Agents- Better BP Control and Cardiovascular and Renal Protection

DEVICE BASED THERAPIES

Recent Advances in Device-Based Therapy for Hypertension (2025–2026)

Device-based therapies are emerging as adjunctive treatments for resistant hypertension in patients whose blood pressure remains uncontrolled despite optimal lifestyle modification and antihypertensive medications. These therapies primarily target excessive sympathetic nervous system activity and are recommended only for carefully selected patients [42].

Renal Denervation (RDN): RDN is the most advanced device-based therapy. It uses catheter-based radiofrequency or ultrasound energy to ablate renal sympathetic nerves, leading to sustained blood pressure reduction. Recent trials (SPYRAL HTN and RADIANCE-HTN) have demonstrated significant efficacy, and current European guidelines recognize RDN as an adjunct to medical therapy in selected patients [43].

Baroreflex Activation Therapy (BAT): BAT electrically stimulates carotid sinus baroreceptors to reduce sympathetic activity and lower blood pressure. It hasshown long-term benefits but remains limited by its invasive nature and the need for additional clinical evidence [44].

Other Emerging Therapies: Endovascular baroreflex amplification, pacemaker-based cardiac neuromodulation, carotid body modulation, and AI-assisted blood pressure control systems have shown promising early results. However, these approaches remain investigational and require larger clinical trials before routine use [45].

Clinical Perspective: Current guidelines recommend device-based therapies only after confirming true resistant hypertension, excluding secondary causes, and optimizing pharmacological treatment. Among available options, renaldenervation has the strongest evidence and the greatest potential for routine clinical practice [46].

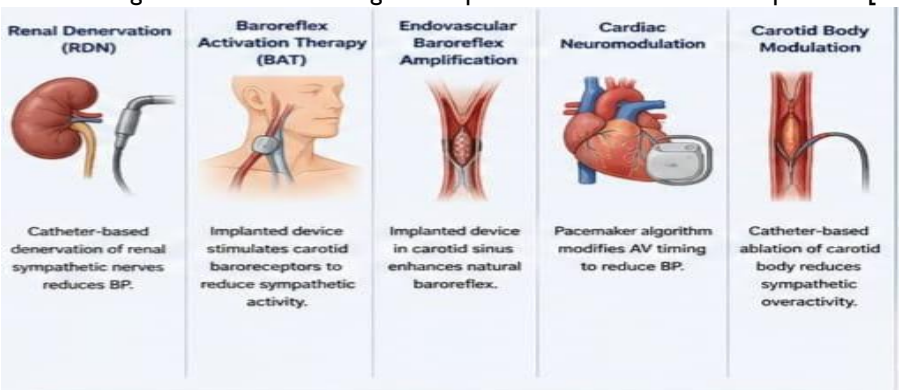

Figure 03: Adjunctive options for carefully selected patients with resistant hypertension when optional medical therapy fails.

LIFESTYLE INNOVATIONS

Lifestyle modification remains the foundation of hypertension prevention and treatment and is recommended for all individuals with elevated blood pressure. It should be combined with antihypertensive medications to improve blood

pressure control and reduce cardiovascular risk [47]. Key lifestyle measures include reducing sodium intake to **<2 g/day (≈5 g salt/day)**, consuming a **DASH or Mediterranean diet** rich in fruits, vegetables, whole grains, legumes, and low-fat dairy products, and increasing potassium intake when appropriate. Adults should perform **at least 150 minutes of moderate-intensity aerobic exercise per week**, along with **2–3 sessions of resistance training**[48].Weight loss in overweight or obese individuals, smoking cessation, limiting alcohol intake, stress management, and adequate sleep further contribute to effective blood pressure control and improved cardiovascular outcomes[49].

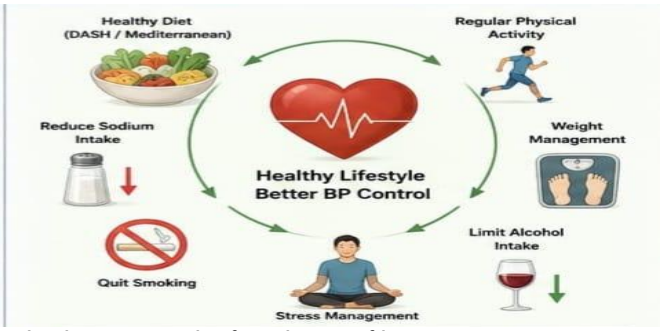

Figure 04: Lifestyle changes are the foundation of hypertension prevention and treatment

HYPERTENSION IN SPECIAL POPULATIONS

Hypertension in Older Adults: Hypertension affects **~70% of adults ≥65 years** and commonly presents as **isolated systolic hypertension**. It increases the risk of stroke, heart failure, and kidney disease. Lifestyle changes remain essential. An **SBP target <130 mmHg** is recommended if tolerated, with individualized treatment. **Thiazide diuretics and calcium channel blockers** are preferred first-line drugs [50].

Hypertension in Chronic Kidney Disease (CKD): Hypertension occurs in **80–85% of CKD patients** and accelerates kidney and cardiovascular disease. **KDIGO recommends SBP <120 mmHg** when tolerated. **ACE inhibitors or ARBs** are first-line, especially in proteinuria. Additional agents include **diuretics, calcium channel blockers, MRAs, and SGLT2 inhibitors [51].**

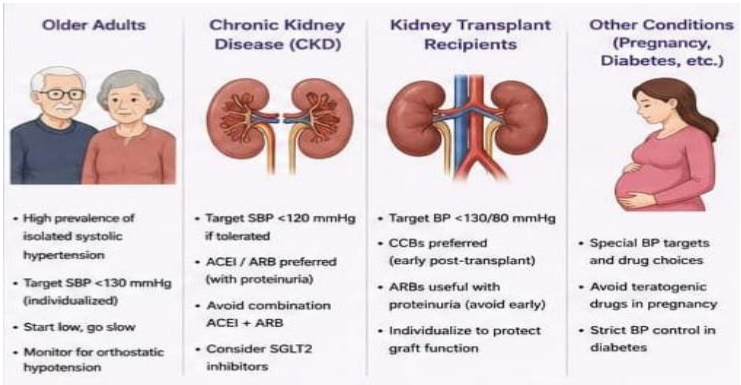

Figure 04: Management should be individualized based on co morbidities, risk factors, and treatment goals.

Hypertension in Kidney Transplant Recipients: Hypertension affects **~85% of kidney transplant recipients** and increases the risk of graft dysfunction and cardiovascular disease. **BP should be maintained below 130/80 mmHg. Dihydropyridine calcium channel blockers** are preferred first-line agents, while **ARBs** may be used in proteinuria but are usually avoided early after transplantation. Treatment should be individualized [52].

EMERGING RESEARCH AND CHALLENGES AND FUTURE DIRECTIONS

Hypertension remains a leading cause of cardiovascular disease, stroke, kidney disease, and premature mortality worldwide. Although significant advances have improved its diagnosis and treatment, blood pressure control remains inadequate due to poor adherence, delayed diagnosis, therapeutic inertia, and healthcare disparities [53].

Recent clinical trials, including SPRINT and CSPPT, support intensive blood pressure control to reduce cardiovascular events. Ongoing research is expanding the understanding of hypertension pathophysiology, highlighting the roles of oxidative stress, inflammation, immune dysfunction, epigenetic changes, and the gut microbiome as potential therapeutic targets[54].Future hypertension management will increasingly rely on precision medicine, using genetic, molecular, and clinical data to provide personalized treatment. Emerging therapies such as RNA-based drugs, gene-editing technologies, and other targeted treatments may offer new options for resistant hypertension[55].

Digital health technologies, including wearable blood pressure monitors, telemedicine, remote patient monitoring, and artificial intelligence, are expected to improve early detection, treatment adherence, risk prediction, and individualized care. Continued research focusing on age, sex, ethnicity, chronic kidney disease, and population-based prevention strategies will further enhance hypertension management and reduce the global burden of cardiovascular disease [56].

CONCLUSION

Hypertension continues to be a major global health challenge and a leading risk factor for cardiovascular and renal diseases. Recent advances emphasize a comprehensive approach that combines lifestyle modifications, evidence-based pharmacological therapy, and individualized management for special populations. Device-based therapies, such as renal denervation, offer additional options for resistant hypertension. Emerging developments in precision medicine, artificial intelligence, digital health, and novel therapeutic targets are expected to improve early diagnosis, treatment personalization, and long-term blood pressure control. Continued research and effective implementation of these strategies are essential to reduce the global burden of hypertension and improve patient outcomes.

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REFERENCES

1. Marx N, Federici M, Schütt K, Müller-Wieland D, Ajjan RA, Antunes MJ, Christodorescu RM, Crawford C, Di Angelantonio E, Eliasson B, Espinola-Klein C. 2023 ESC Guidelines for the management of cardiovascular disease in patients with diabetes: Developed by the task force on the management of cardiovascular disease in patients with diabetes of the European Society of Cardiology (ESC). European heart journal. 2023 Oct 14;44(39):4043-140.
2. Joglar, J. A., Chung, M. K., Armbruster, A. L., Benjamin, E. J., Chyou, J. Y., Cronin, E. M., Deswal, A., Eckhardt, L. L., Goldberger, Z. D., Gopinathannair, R., Gorenek, B., Hess, P. L., Hlatky, M., Hogan, G., Ibeh, C., Indik, J. H., Kido, K., Kusumoto, F., Link, M. S., . . . Van Wagoner, D. R. (2023). 2023 ACC/AHA/ACCP/HRS Guideline for the Diagnosis and Management of Atrial Fibrillation: A report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Circulation, 149(1), e1–e156. https://doi.org/10.1161/cir.0000000000001193
3. Parati, G., Stergiou, G. S., Asmar, R., Bilo, G., De Leeuw, P., Imai, Y., Kario, K., Lurbe, E., Manolis, A., Mengden, T., O'Brien, E., Ohkubo, T., Padfield, P., Palatini, P., Pickering, T., Redon, J., Revera, M., Ruilope, L. M., Shennan, A., . . . Mancia, G. (2008). European Society of Hypertension guidelines for blood pressure monitoring at home: a summary report of the Second International Consensus Conference on Home Blood Pressure Monitoring. Journal of Hypertension, 26(8), 1505–1526. https://doi.org/10.1097/hjh.0b013e328308da66Members
4. Members, A. F., Baumgartner, H., Bonhoeffer, P., De Groot, N. M. S., De Haan, F., Deanfield, J. E., Galie, N., Gatzoulis, M. A., Gohlke-Baerwolf, C., Kaemmerer, H., Kilner, P., Meijboom, F., Mulder, B. J. M., Oechslin, E., Oliver, J. M., Serraf, A., Szatmari, A., Thaulow, E., Vouhe, P. R., . . . Westby, J. (2010). ESC Guidelines for the management of grown-up congenital heart disease (new version 2010): The Task Force on the Managementof Grown-up Congenital Heart Disease of the European Society of Cardiology (ESC). European Heart Journal, 31(23), 2915–2957. https://doi.org/10.1093/eurheartj/ehq249Cheng,
5. Y., Gu, K., Ji, W., Hu, Z., Yang, Y., & Zhou, Y. (2025). Two-Year hypertension incidence risk prediction in populations in the desert regions of northwest China: Prospective cohort study. Journal of Medical Internet Research, 27, e68442. https://doi.org/10.2196/68442
6. Members, A. F., Perk, J., De Backer, G., Gohlke, H., Graham, I., Reiner, Z., Verschuren, M., Albus, C., Benlian, P., Boysen, G., Cifkova, R., Deaton, C., Ebrahim, S., Fisher, M., Germano, G., Hobbs, R., Hoes, A., Karadeniz, S., Mezzani, A., . . . Wolpert, C. (2012). European Guidelines on cardiovascular disease prevention in clinical practice (version 2012): The Fifth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice (constituted by representatives of nine societies and by invited experts) * Developed with the special contribution of the European Association for Cardiovascular Prevention & Rehabilitation (EACPR). *European Heart Journal*, *33*(13), 1635–1701. https://doi.org/10.1093/eurheartj/ehs092
7. Ewald, D. R., & Haldeman, L. A. (2016). Risk factors in adolescent hypertension. *Global Pediatric Health*, *3*, 2333794X15625159. https://doi.org/10.1177/2333794x15625159

8. Bagherikholenjani, F., Shahidi, S., Khosravi, A., Mansouri, A., Ashoorion, V., &Sarrafzadegan, N. (2024). Update of the clinical guideline for hypertension diagnosis and treatment in Iran. *Clinical Hypertension*, *30*(1), 13. https://doi.org/10.1186/s40885-024-00269-6
9. Sarafidis, P., Schmieder, R., Burnier, M., Persu, A., Januszewicz, A., Halimi, J., Arici, M., Ortiz, A., Wanner, C., Mancia, G., & Kreutz, R. (2024). A European Renal Association (ERA) synopsis for nephrology practice of the 2023 European Society of Hypertension (ESH) Guidelines for the Management of Arterial Hypertension. *Nephrology Dialysis Transplantation*, *39*(6), 929–943. https://doi.org/10.1093/ndt/gfae041
10. White WB. Blood pressure monitoring in cardiovascular medicine and therapeutics. Humana Pr Inc; 2007 Aug 8.
11. Gupta, R., Maheshwari, A., Verma, N., Narasingan, S. N., Tripathi, K., Joshi, S., &Manoria, P. C. (2026). Indian Society of Hypertension (INSH) Consensus Guideline for the Management of Hypertension, 2025. *Hypertension Journal*, *11*(4), 76–138. https://doi.org/10.61081/htnj/25v11i401
12. Moura KD. *Prevalência de pressão arterial elevada e suas associações com fatores ambientais e estilo de vida em crianças da América do Sul no SAYCARE cohort study* (Doctoral dissertation, Universidade de São Paulo).
13. Riemann-Lorenz, K., Alberty, A., Balke, M., Gorsler, A., Elias-Hamp, B., Keller, A. M., Lührs, A., & Rosenkranz, S. C. (2026). Preventive strategies in neuroimmunology. Neurological Research and Practice, 8(1). https://doi.org/10.1186/s42466-026-00490-8
14. Prejbisz, A., Dobrowolski, P., Doroszko, A., Olszanecka, A., Tycińska, A., Tykarski, A., Adamczak, M., Begier-Krasińska, B., Chrostowska, M., Dzida, G., Filipiak, K. J., Gaciong, Z., Gąsecki, D., Gierlotka, M., Grabowski, M., Grodzicki, T., Jankowski, P., Kamiński, K., Kapłon-Cieślicka, A., . . . Wolf, J. (2024). Guidelines for the management of hypertension in Poland 2024 — the position of the Polish Society of Hypertension/Polish Cardiac Society Experts. *Arterial Hypertension*, *28*(0), 91–146. https://doi.org/10.5603/ah.103916
15. Bartoli, S., Cortese, F., Sartelli, M., & Sganga, G. (2024). Infections in surgery. In Updates in surgery/Updates in surgery series. https://doi.org/10.1007/978-3-031-60462-1
16. Tromp, J., Jindal, D., Redfern, J., Bhatt, A., Séverin, T., Banerjee, A., Ge, J., Itchhaporia, D., Jaarsma, T., Lanas, F., Lopez-Jimenez, F., Mohamed, A., Perel, P., Perez, G. E., Pinto, F., Vedanthan, R., Verstrael, A., Yeo, K. K., Zulfiya, K., . . . Cowie, M. R. (2022). World Heart Federation Roadmap for Digital Health in Cardiology. *Global Heart*, *17*(1), 61. https://doi.org/10.5334/gh.1141
17. Wijendran, N. (2025). Optimizing an electrode interface and methods for arterial blood pressure estimation. In *TSpace (University of Toronto)*. https://hdl.handle.net/1807/150430
18. Bonney, W. (2016). Mobile health Technologies: Theories and Applications. BoD – Books on Demand.
19. Cisnal, A., Podder, I., Grossmann, L., Dheman, K., Elgendi, M., Valgimigli, M., & Paez-Granados, D. (2026). Towards trustworthy AI-driven cuffless blood pressure monitoring. Npj Digital Medicine. https://doi.org/10.1038/s41746-026-02898-7
20. Zhou, N., Zhong, S., Gao, P., He, F., & Zhang, C. (2026). Hypertension-Induced Renal Injury: From pathophysiology to therapeutic Perspectives. Biomedicines, 14(3), 595. https://doi.org/10.3390/biomedicines14030595
21. Altynova, S., Saliev, T., Asanova, A., Kozybayeva, Z., Rakhimzhanova, S., & Bolatov, A. (2026). Artificial intelligence and predictive modelling for precision dosing of immunosuppressants in kidney transplantation. Pharmaceuticals, 19(1), 165. https://doi.org/10.3390/ph19010165
22. Task Force on the Management of Grown-up Congenital Heart Disease of the European Society of Cardiology (ESC. ESC Guidelines for the management of grown-up congenital heart disease (new version 2010). European Heart Journal. 2010 Dec;31(23):2915-57.
23. Bachlitzanaki, M., Aletras, G., Papakonstantinopoulou, K., Vasilaki, N., Bachlitzanaki, E., Stratinaki, M., & Lydakis, C. (2026). Hypertension: a proximal clinical signature and promoter of early cardiorenal disease? *Journal of CardioRenal Medicine*, *2*(1), 2. https://doi.org/10.3390/jcrm2010002
24. Blonde, L., Umpierrez, G. E., Reddy, S. S., McGill, J. B., Berga, S. L., Bush, M., Chandrasekaran, S., DeFronzo, R. A., Einhorn, D., Galindo, R. J., Gardner, T. W., Garg, R., Garvey, W. T., Hirsch, I. B., Hurley, D. L., Izuora, K., Kosiborod, M., Olson, D., Patel, S. B., . . . Weber, S. L. (2022). American Association of Clinical Endocrinology Clinical Practice Guideline: Developing a Diabetes Mellitus Comprehensive Care Plan—2022 Update. *Endocrine Practice*, *28*(10), 923–1049. https://doi.org/10.1016/j.eprac.2022.08.002
25. De Araujo Moura, K. (2024). Prevalência de pressão arterial elevada e suasassociações com fatoresambientais e estilo de vidaemcrianças da América do Sul no SAYCARE cohort study. https://doi.org/10.11606/t.6.2024.tde-02102024-165945
26. Chinese Society of Cardiology, Chinese Medical Association, Hypertension Committee of Cross-Straits Medicine Exchange Association, Cardiovascular Disease Prevention and Rehabilitation Committee, Chinese Association of Rehabilitation Medicine. Clinical practice guideline for the management of hypertension in China. Chinese Medical Journal. 2024 Dec 20;137(24):2907-52.
27. Fan, L., Ding, L., Nie, J., Wang, J., Zhang, M., & Zhang, J. (2026). Hypertensive disorders of pregnancy: A comprehensive review of pathophysiology, diagnosis, treatment, and long-term cardiovascular implications. *Clinical and Experimental Hypertension*, *48*(1), 2641542. https://doi.org/10.1080/10641963.2026.2641542

28. Ifenze, O. M., Okanumee, C. J., Nkuma-Udah, K. I., Mbonu, E. S., &Ndubuka, G. I. N. (2025). Wearable technology in cardiovascular Health Monitoring: current trends and future directions. *European Journal of Biology and Medical Science Research*, *13*(3), 37–60. https://doi.org/10.37745/ejbmsr.2013/vol13n33760
29. Eappen, P., Vajjhala, N. R., Zikos, D., & Davidson, K. P. (2025). Remote monitoring and wearable devices in healthcare. Springer Nature.
30. Kahali, D., & Roy, D. (2025). *Cardiology Update 2025: Two Volume Set*. JP Medical Ltd.
31. Lopes, M. a. C. Q., De Oliveira, G. M. M., Ribeiro, A. L. P., Pinto, F., Rey, H. C. V., Branda~O, A. A., Zimerman, L. I., Hajjar, L. A., Rochitte, C. E., Bacal, F., Polanczyk, C. A., Halperin, C., Araújo, E. C., Mesquita, E. T., Arruda, J. A., Rohde, L. E. P., Grinberg, M., Moretti, M., Caramori, P. R. A., . . . De Rezende, W. F. (2019). Guidelines os the Brazilian Society of Cardiology on Telemedicine in Cardiology – 2019. ArquivosBrasileiros De Cardiologia, 113(5), 1006–1056. https://doi.org/10.5935/abc.20190205
32. Cabré, F., & Cascante, M. (2026). Present and Future options for pharmacotherapy in cardiovascular disease: Hemodynamic and mechanistic therapeutic targets. *Medical Sciences*, *14*(2), 331. https://doi.org/10.3390/medsci14020331
33. Blonde, L., Umpierrez, G. E., Reddy, S. S., McGill, J. B., Berga, S. L., Bush, M., Chandrasekaran, S., DeFronzo, R. A., Einhorn, D., Galindo, R. J., Gardner, T. W., Garg, R., Garvey, W. T., Hirsch, I. B., Hurley, D. L., Izuora, K., Kosiborod, M., Olson, D., Patel, S. B., . . . Weber, S. L. (2022). American Association of Clinical Endocrinology Clinical Practice Guideline: Developing a Diabetes Mellitus Comprehensive Care Plan—2022 Update. Endocrine Practice, 28(10), 923–1049. https://doi.org/10.1016/j.eprac.2022.08.002
34. Abasheva, D., Ortiz, A., & Fernandez-Fernandez, B. (2024). GLP-1 receptor agonists in patients with chronic kidney disease and either overweight or obesity. Clinical Kidney Journal, 17(Supplement_2), ii19–ii35. https://doi.org/10.1093/ckj/sfae296
35. Hussain, M. S., Iyer, S., Liew, Y. J., Win, M. L., McCrimmon, R. J., Lang, C. C., & Mordi, I. R. (2026). Heart Failure in Type 1 vs. Type 2 Diabetes Mellitus: Shared Pathways, Distinct Challenges. Journal of Diabetes Research, 2026(1), e7460084. https://doi.org/10.1155/jdr/7460084
36. Cabré, F., & Cascante, M. (2026). Present and Future options for pharmacotherapy in cardiovascular disease: Hemodynamic and mechanistic therapeutic targets. Medical Sciences, 14(2), 331. https://doi.org/10.3390/medsci14020331
37. Hadidi, S. E., Rosano, G., Tamargo, J., Agewall, S., Drexel, H., Kaski, J. C., Niessner, A., Lewis, B. S., Coats, A. J. S., & Savarese, G. (2020). Potentially inappropriate prescriptions in heart failure with reduced ejection fraction: ESC position statement on heart failure with reduced ejection fraction-specific inappropriate prescribing. European Heart Journal – Cardiovascular Pharmacotherapy, 8(2), 187–210. https://doi.org/10.1093/ehjcvp/pvaa108
38. Elmula, F. E. M. F., Mariampillai, J. E., Heimark, S., Kjeldsen, S. E., &Burnier, M. (2023). Medical measures in hypertensives considered resistant. American Journal of Hypertension, 37(5), 307–317. https://doi.org/10.1093/ajh/hpad118
39. Hallow, K. M., Helmlinger, G., Greasley, P. J., McMurray, J. J. V., & Boulton, D. W. (2017). Why do SGLT2 inhibitors reduce heart failure hospitalization? A differential volume regulation hypothesis. Diabetes Obesity and Metabolism, 20(3), 479–487. https://doi.org/10.1111/dom.13126
40. Malachias, M., Souza, W., Plavnik, F., Rodrigues, C., Brandão, A., Neves, M., Bortolotto, L., Franco, R., Figueiredo, C., Jardim, P., Amodeo, C., Barbosa, E., Koch, V., Gomes, M., Paula, R., Póvoa, R., Colombo, F., Filho, S. F., Miranda, R., . . . Júnior, H. M. (2016). Capítulo 3 – Avaliação Clínica e Complementar. ArquivosBrasileiros De Cardiologia, 107(3), 14–17. https://doi.org/10.5935/abc.20160153
41. Moore, J. B. (2020). From personalised nutrition to precision medicine: the rise of consumer genomics and digital health. Proceedings of the Nutrition Society, 79(3), 300–310. https://doi.org/10.1017/s0029665120006977
42. Mcl/Cr, H., Souhrada, J., Chan, S., Woolcock, C., Sullivan, J., C, Schat, Patterson, R., Kloner, R., Falk, Comstock, G., Hdwards, P., Bernstein, I., Settipane, Schoenleld, F., Ilamolsky, M., Settipane, C., Ilamolsky, M, . . . Bethel, R. (1995). VII. Special conditions. Journal of Allergy and Clinical Immunology, 96(5), 821–870. https://doi.org/10.1016/s0091-6749(16)60014-3
43. Heuser, R. R., Schlaich, M., & Sievert, H. (2014). Renal denervation: A New Approach to Treatment of Resistant Hypertension. Springer.
44. Chiesa, R., Ducci, S., & Ciappi, S. (2008). Profiling hackers: The Science of Criminal Profiling as Applied to the World of Hacking. CRC Press.
45. Sridhar, A., Lewis, S., Blancou, P., & Conde, S. V. (2022). Bioelectronic Medicines – new frontiers in autonomic neuromodulation. Frontiers Media SA.
46. Gupta, R., Maheshwari, A., Verma, N., Narasingan, S. N., Tripathi, K., Joshi, S., &Manoria, P. C. (2026). Indian Society of Hypertension (INSH) Consensus Guideline for the Management of Hypertension, 2025. Hypertension Journal, 11(4), 76–138. https://doi.org/10.61081/htnj/25v11i401
47. Pharmacists, A. S. O. H. (2007). Best Practices for hospital & Health-system pharmacy: Position and Guidance Documents of ASHP.

48. Harry, N. (2020). The Complete DASH Diet Cookbook 2020: Easy and Flavorful Low Sodium DASH Diet Recipes to Lower Blood Pressure and Live Healthy.
49. Sloane, P. D. (2008). Essentials of family medicine. Lippincott Williams & Wilkins.
50. Massimo, G. (2014). Hypertension, hypercholesterolemia, hyperaldosteronism: a genetic perspective for personalized therapy. In AMS Dottorato Institutional Doctoral Theses Repository (University of Bologna). https://doi.org/10.6092/unibo/amsdottorato/6473
51. Massimo, G. (2014). Hypertension, hypercholesterolemia, hyperaldosteronism: a genetic perspective for personalized therapy. In AMS Dottorato Institutional Doctoral Theses Repository (University of Bologna). https://doi.org/10.6092/unibo/amsdottorato/6473
52. Ambrosetti M, Abreu A, Corrà U, Davos CH, Hansen D, Frederix I, Iliou MC, Pedretti RF, Schmid JP, Vigorito C, Voller H. Secondary prevention through comprehensive cardiovascular rehabilitation: From knowledge to implementation. 2020 update. A position paper from the Secondary Prevention and Rehabilitation Section of the European Association of Preventive Cardiology. European journal of preventive cardiology. 2021 May 1;28(5):460-95.
53. Ak, S. Á., Mendieta, R. D. Z., Lucas, C. W. F., Acevedo, L. M. M., Tolay, J. O., Godínez, E. F., Villagran, G. A., & Pérez, J. a. P. (2026). Contemporary therapeutic approaches in the Cardiorenal-Metabolic continuum: current perspectives on diabetes, chronic kidney disease, and cardiovascular dysfunction. International Science Journal, 3(1). https://doi.org/10.64784/247
54. Andreadis EA, editor. Hypertension and cardiovascular disease. Springer; 2016 Sep 20.
55. Meiliana, A., Dewi, N. M., & Wijaya, A. (2016). Personalized Medicine: the future of health care. The Indonesian Biomedical Journal, 8(3), 127.
56. Dores H, Ferreira Santos J, Gil V, Gonçalves PD. Cardiovascular prevention: current gaps and future directions. Diagnostics. 2025 Dec 20;16(1):16.
57. Blonde L, Umpierrez GE, Reddy SS, McGill JB, Berga SL, Bush M, Chandrasekaran S, DeFronzo RA, Einhorn D, Galindo RJ, Gardner TW. American Association of Clinical Endocrinology clinical practice guideline: developing a diabetes mellitus comprehensive care plan-2022 update. Endocrine Practice. 2022 Oct 1;28(10):923-1049.