



Unwavering excellence: How to be a competent cardiovascular doctor in “panvascular medicine +”

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It is essential to create a sustainable and all-encompassing panvascular ecosystem that integrates medical care, industry-academia research, prevention, and management, necessitating the in-depth participation of every cardiovascular doctor on their journey of unwavering excellence. “From doctors, by researchers/engineers, for patients” is the foundation of sustainable development in the “panvascular medicine +” ecosystem. Medical education can make knowledge tangible and serve as a conduit for inheritance and innovation. Prevention covers intelligent decision-making, primary prevention, and the popularization of knowledge. Furthermore, management is a potent tool for promoting development through overall coordination with social governance. Thus, in the “panvascular medicine +” ecosystem, cardiovascular doctors need to prioritize the doctor-patient collaboration, serving patients while possessing capabilities in scientific research, engineering applications, education, prevention, and management. This enables them to promote comprehensive and lifelong health management for patients.

In the rapidly evolving field of panvascular medicine,¹ the role of the cardiovascular doctor has expanded beyond the boundaries of traditional disciplines to encompass a comprehensive understanding of the entire cardiovascular system. In the early 1990s, a “vascular tree” concept was proposed clinically and was analyzed by computer simulation. At the end of the 20th century, the concept of “vascular network” was put forward, and in 2002, Lanzer and Topol et al. formally introduced the concept of panvascular disease.² Panvascular medicine is a holistic approach to diagnosing, treating, and preventing panvascular diseases affecting multiple organs, mainly involving atherosclerosis. It entails conducting clinically driven research, establishing panvascular disease databases, developing a panvascular health index, and implementing risk stratification and follow-up for comprehensive disease management. Thus, a competent cardiovascular doctor must embody essential traits that go beyond mere medical knowledge and technical skills.

In the era of panvascular medicine, the keys to success as a cardiovascular doctor are an unwavering commitment to excellence, a dedication to independent innovation and research, a deep understanding of the pathophysiology and clinical manifestations of various panvascular diseases, and the ability to integrate multiple disciplines into a patient-centered approach to care. In the field of panvascular medicine, the principle of “from the doctors, by the researchers/engineers, for the patients” is of utmost importance. On the one hand, doctors provide invaluable clinical insight into the challenges faced by patients and the limitations of current treatments. On the other hand, researchers and engineers leverage cutting-edge technologies and innovative methodologies to develop new treatments and interventions that can address these challenges. Ultimately, panvascular medicine aims to improve the lives of patients suffering from panvascular diseases. Doctors, researchers, and engineers can collaborate to translate scientific discoveries into real-world solutions that significantly impact patients’ health and well-being by adhering to this principle. However, the collaborative efforts between interdisciplinary fields do not imply that experts in a particular field only require knowledge of their field. The most effective approach is for specialists in a particular field to thoroughly grasp their professional expertise while also cultivating a certain level of understanding and famil-

ilarity with other relevant interdisciplinary areas. This will enable them to have a more accurate grasp of the market pain points and know where to seek help and cooperation when providing targeted solutions. Collectively, panvascular interdisciplinary collaboration involves integrating various resources to conduct panvascular disease research that is clinically driven, conducting basic medical research to uncover the pathophysiological mechanisms of panvascular disease, developing innovative medical drugs/devices,³ and establishing panvascular disease databases.

Moreover, the competence of a cardiovascular doctor in panvascular medicine requires a keen sense of adaptability and a willingness to embrace new technologies and treatment modalities. As such, medical education ensures continuous learning and professional development for doctors, keeping them at the forefront of this dynamic field. Clinical treatment aims to provide care for existing patients, while research and development focus on safeguarding the well-being of future patients. Additionally, dependable medical education serves to establish a solid groundwork for the present and to hold promise for the future. Cardiovascular doctors should therefore be participants and practitioners in medical education.⁴ Essentially, education equips doctors with the means to navigate the intricate complexities of life sciences, extracting medical principles from this intricate chaos. They then refine and condense these principles into logical, understandable, and applicable forms, often using visual aids such as flowcharts and diagrams, which is commonly referred to as “graphic science.” Moreover, when looking at the bigger picture, education also encompasses the richness of history and humanities. Cardiovascular doctors can learn from the history of panvascular medicine to draw experience and inspiration from historical innovations, summarize paradigms and create new ones (such as guidelines⁵). In 1929, Werner Forssmann pioneered cardiac catheterization by bravely inserting a catheter into his own arm vein, maneuvering it all the way to his heart. The humanistic side of cardiovascular doctors is more concerned with patients and the public. Apart from their expertise, cardiovascular doctors should improve their communication and education skills to better connect with patients and make their knowledge of graphic science more accessible to the public. This could involve presenting medical information in more engaging formats, such as talk shows, to increase public health awareness and health literacy. Such initiatives will not only promote disease prevention but will also familiarize the public with the medical industry, fostering mutual trust and enabling improved treatments in the future.

Furthermore, with teamwork, decision-making, and crisis communication in public relations, promising cardiovascular candidates should undertake the work of scientific research and medical treatment, as well as that of prevention and prediction in daily practice of panvascular medicine, building feasible solutions for inherent and unpredictable problems from both clinicians and the public, and enhancing the collaboration between medical science and social governance. The use of prevention and prediction strategies can assist in identifying critical junctures in disease treatment and can aid in clinical decision-making by improving risk assessment and pre-processing. This approach significantly boosts cardiovascular doctors’ ability to detect and respond to the risks of panvascular diseases, thereby facilitating the sustainable implementation of comprehensive panvascular healthcare management with increased prospective and sensitivity. Cardiovascular doctors ought to establish a panvascular



Figure 1. The competitiveness of a cardiovascular doctor within the “panvascular medicine +” ecosystem In the field of “panvascular medicine +,” the core revolves around the connection between “doctor” and “patient.” Cardiovascular doctors are required to possess abilities in scientific research, engineering applications, education, and prevention and, finally, to employ management skills to coordinate everything. “From doctors, by researchers/engineers, for patients” is the foundation for sustainable development. Education includes science popularization and graphic science. Graphic science involves deducing and summarizing usable processes or mechanisms from chaotic principles, ready to be used for future innovations under suitable conditions. Furthermore, prevention includes two key components: databases and digital twins. Databases can utilize big data to integrate epidemiological and follow-up data for preventive and therapeutic decision-making. Digital twins can create personalized medical advice through three-dimensional, data-driven health records for individuals.

database that includes sufficient follow-up and risk classification while concurrently developing a comprehensive and automated evaluation system for a panvascular health index. This will enable them to better participate in public education and health promotion initiatives. As another crucial component of prevention and prediction, cardiovascular doctors and other healthcare professionals should further interpret and utilize data for developing digital twins effectively.⁶ The digital twin is a virtual model of an object, process, or system created with real-world data to gain insights into its real-world counterpart. The role of a cardiovascular doctor in utilizing digital twins involves creating personalized treatment strategies based on panomics data, monitoring the patient’s digital twin in real time, and adjusting treatment plans accordingly. The pivotal role of cardiovascular doctors lies in their adept utilization of digital twins to educate patients and deliver primary preventive healthcare. By leveraging their clinical expertise, cardiovascular doctors can optimize the use of digital twins to provide high-quality, personalized care to their patients.

The aforementioned patient-centered medical-industrial cooperation is, in fact, a magnification of the integration between the upstream and downstream of the “panvascular medicine +” industry, which requires the collaboration of various innovative entities, including enterprises, universities, research institutions, and medical organizations. It is essential to incorporate innovative elements like government, industry, and financial capital, establishing a platform for in-depth communication among diverse entities and elements. Such integration and communication can facilitate a comprehensive understanding and incorporation of clinical practice, scientific research, and industrialization, improving the innovation and development of panvascular medicine. Therefore, in the panvascular industry collaboration, it is imperative to have a well-versed coordinator with a medical background who possesses at least an understanding of or a familiarity with various fields of expertise and proficient knowledge in the specific discipline. Such a coordinator plays a crucial role in balancing and coordinating the interests of all parties involved, facilitating mutual benefits, and promoting a collaborative

and constructive approach. Since cardiovascular doctors deal with practical clinical issues and are the ultimate end users of medical products, their participation in this role brings substantial advantages to the team. However, considering the time constraints of doctors and the promotional aspects of product development, the assistance of professionals with solid economic and legal knowledge is also indispensable. In summary, it is essential to create a sustainable and all-encompassing panvascular ecosystem that amalgamates medical care, industry-academia research, prevention, and management, necessitating the in-depth participation of every cardiovascular doctor during their journey of unwavering excellence (Figure 1).

REFERENCES

1. Zhou, X., Yu, L., Zhao, Y., et al. (2022). Panvascular medicine: an emerging discipline focusing on atherosclerotic diseases. *Eur. Heart J.* **43**, 4528–4531.
2. Lanzer, P., and Topol, E.J. (2002). *Pan Vascular Medicine: Integrated Clinical Management* (Springer).
3. Dai, N., Hu, Y., and Ge, J. (2023). When the future cardiac catheterization laboratory meets the Metaverse. *Eur. Heart J.* **44**, 2652–2653.
4. Rose, S. (2020). Medical Student Education in the Time of COVID-19. *JAMA* **323**, 2131–2132.
5. Chu, X., Feng, B., Ge, J., et al. (2022). Chinese expert consensus on the risk assessment and management of panvascular disease inpatients with type 2 diabetes mellitus (2022 edition). *Cardiol. Plus* **7**, 162–177.

6. Laubenbacher, R., Sluka, J.P., and Glazier, J.A. (2021). Using digital twins in viral infection. *Science* **371**, 1105–1106.

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DECLARATION OF INTERESTS

The authors declare no competing interests.