



Digital Hypertension 2023: Concept, hypothesis, and new technology

Kazuomi Kario¹ · Satoshi Hoshide¹ · Masaki Mogi²

Received: 26 July 2022 / Accepted: 26 July 2022 / Published online: 22 August 2022
© The Author(s), under exclusive licence to The Japanese Society of Hypertension 2022

We will launch the special issue “Digital Hypertension 2023” in collaboration with “Digital Health”, a new journal from Springer Nature. Recent remarkable developments in information and communication technology (ICT) have greatly changed the approach to hypertension management. Worldwide guidelines recommend hypertension treatment based on 24-hour ambulatory blood pressure monitoring (ABPM) and home blood pressure measurements rather than blood pressure conventionally measured in a clinical setting, and a new system of medical care incorporating digital information processing technology is being created by linking wearable blood pressure monitors and patient background information with analysis programs [1–3]. The Japanese Society of Hypertension (JSH) has created the “JSH Future Plan” with the aim of combating hypertension, which is the biggest cause of cardiovascular diseases, and to extend healthy life expectancy in a superaging society, and has proposed a new academic field called “digital hypertension” [4–6]. Digital hypertension is a new academic field that adds value to hypertension treatment and related medical care using ICT, and it can be recognized as an academic field of digital health that comprehensively promotes hypertension treatment and services using digital

technology, clinical research, big data analysis using artificial intelligence (AI), and other approaches. This new field also features the development of new technologies and analysis methods such as sensors (wearable, cuffless, etc.), information processing, and machine learning (Figure) [1, 3, 7–13]. Digital hypertension projects may contribute to the understanding of hypertension, the development of treatment methods, and the promotion of prevention through the development of a health care platform that links and applies these technologies. There are increasing numbers of research papers on digital hypertension, including those on wearable and/or cuffless blood pressure monitoring [7–13], real-time home monitoring [1], real-world national big data analyses [14], and digital therapeutics [15, 16]. In clinical practice, the COVID-19 pandemic has facilitated the use of telemedicine and virtual management of hypertension [17, 18].

We welcome submissions of review articles and original papers related to research concepts and hypotheses on digital hypertension, sensor development, information processing, AI, clinical indicators, big data analysis, digital therapeutics, virtual management of hypertension, telemedicine, etc.

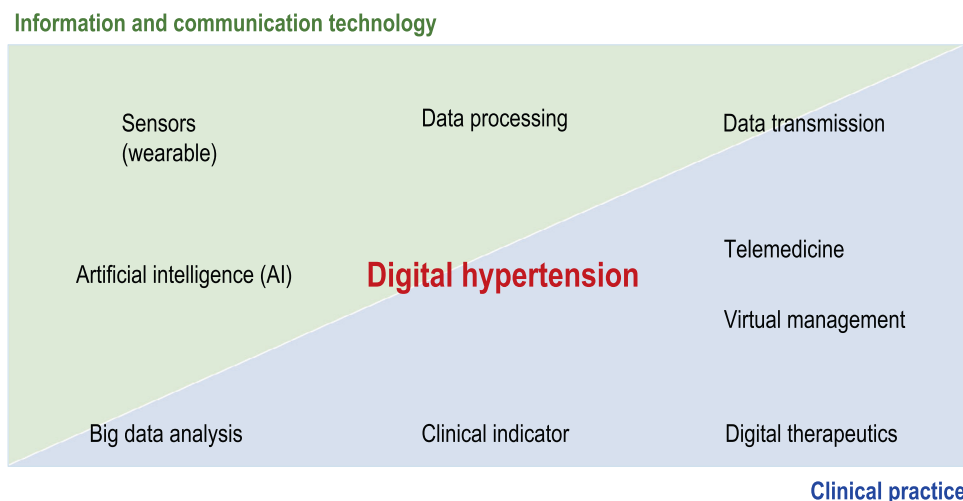
✉ Kazuomi Kario
kkario@jichi.ac.jp

¹ Division of Cardiovascular Medicine, Jichi Medical University School of Medicine, Tochigi, Japan

² Department of Pharmacology, Ehime University Graduate School of Medicine, Ehime, Japan

Graphical Opinion

Digital hypertension: Research and clinical practice



Compliance with ethical standards

Conflict of interest The authors declare no competing interests.

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

References

- Kario K, Essential manual of perfect 24-hour blood pressure management from morning to nocturnal hypertension: Up-to-date for anticipation medicine. UK: Wiley Black Well; 1–374. 2022.
- Omboni S, McManus RJ, Bosworth HB, Chappell LC, Green BB, Kario K, et al. Evidence and recommendations on the use of telemedicine for the management of arterial hypertension: an international expert position paper. *Hypertension*. 2020;76:1368–83.
- Kario K, Harada N, Okura A. State-of-the-art rapid review of the current landscape of digital hypertension. *Conn Health*. 2022;1:46–58.
- Node K, Kishi T, Tanaka A, Itoh H, Rakugi H, Ohya Y, et al. The Japanese Society of Hypertension-Digest of plan for the future. *Hypertens Res*. 2018;41:989–90.
- Rakugi H. Further promotion of “the JSH plan for the future” conscious of new normal after/with COVID-19: message from the new president of the Japanese Society of Hypertension. *Hypertens Res*. 2021;44:4–6.
- Matsuoka R, Akazawa H, Koderia S, Komuro I. The dawning of the digital era in the management of hypertension. *Hypertens Res*. 2020;43:1135–40.
- Kario K. Management of Hypertension in the digital era: small wearable monitoring devices for remote blood pressure monitoring. *Hypertension*. 2020;76:640–50.
- Kario K, Mogi M, Hoshide S. Latest hypertension research to inform clinical practice in Asia. *Hypertens Res*. 2022; 45:555–72.
- Hoshide S, Yoshihisa A, Tsuchida F, Mizuno H, Teragawa H, Kasai T, et al. Pulse transit time-estimated blood pressure: a comparison of beat-to-beat and intermittent measurement. *Hypertens Res*. 2022;45:1001–7.
- Tomitani N, Kanegae H, Kario K. Self-monitoring of psychological stress-induced blood pressure in daily life using a wearable watch-type oscillometric device in working individuals with hypertension. *Hypertens Res*. 2022. <https://doi.org/10.1038/s41440-022-00946-9>. Online ahead of print.PMID: 35672456
- Kario K, Tomitani N, Morimoto T, Kanegae H, Lacy P, Williams B. Relationship between blood pressure repeatedly measured by a wrist-cuff oscillometric wearable blood pressure monitoring device and left ventricular mass index in working hypertensive patients. *Hypertens Res*. 2022;45:87–96.
- Schutte AE, Kollias A, Stergiou GS. Blood pressure and its variability: classic and novel measurement techniques. *Nat Rev Cardiol*. 2022:1–12.
- Kishi T. Benefit of wearable blood pressure monitoring device in Society 5.0. *Hypertens Res*. 2022;45:546–7.
- Waki T, Miura K, Tanaka-Mizuno S, Ohya Y, Node K, Itoh H, et al. Prevalence of hypertensive diseases and treated hypertensive patients I Japan: A nationwide administrative claims database study. *Hypertens Res*. 2022;45:1123–33. <https://doi.org/10.1038/s41440-022-00924-1>. Epub 2022 Jun 10.PMID: 35681039
- Kario K, Nomura A, Harada N, Okura A, Nakagawa K, Tanigawa T, et al. Efficacy of a digital therapeutics system in the management of essential hypertension: the HERB-DH1 pivotal trial. *Eur Heart J*. 2021;42:4111–22.
- Kario K, Harada N, Okura A. Digital therapeutics in hypertension: evidence and perspectives. *Hypertension*. 2022 Jun:HYPERTENSIONAHA12219414. <https://doi.org/10.1161/HYPERTENSIONAHA.122.19414>.
- Shibata S, Arima H, Asayama K, Hoshide S, Ichihara A, Ishimitsu T, et al. Hypertension and related diseases in the era of COVID-19: a report from the Japanese Society of Hypertension Task Force on COVID-19. *Hypertens Res*. 2020;43:1028–46.
- Khan NA, Stergiou GS, Omboni S, Kario K, Renna N, Chapman N, et al. Virtual management of hypertension: lessons from the COVID-19 pandemic-International Society of Hypertension position paper endorsed by World Hypertension League and European Society of Hypertension. *J Hypertens*. 2022;40:1435–48.