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Letter to the Editor

The role of telestroke among pregnant mothers: Ground-breaking innovations in maternal healthcare

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Dear Editor,

The risk of stroke increases during pregnancy, which is particularly concerning because it affects women of childbearing age. Pregnancy-related conditions can also contribute to the occurrence of stroke, making it a potentially preventable issue [1].

The highest risk of stroke occurs during the final stages of the delivery process and up to 6 weeks postpartum. This period coincides with peak instances of elevated blood pressure and pregnancy-related blood coagulation disorders. Physiological changes during pregnancy, such as alterations in coagulation, venous stasis, and hemodynamics, play a crucial role in maternal stroke [2]. Pregnancy itself is a significant factor contributing to blood pressure disorders, putting expectant mothers at risk for early cardiovascular diseases and increased likelihood of stroke [3]. In addition to hemorrhagic stroke, pregnant women face the risk of ischemic stroke due to various conditions, including cardiomyopathy, paradoxical embolism, reversible posterior encephalopathy, reversible cerebral vasoconstriction syndrome, and arterial dissection [4].

The average age of stroke occurrence in mothers falls between 22 and 33 years, with a crude incidence rate of 30 per 100,000 (95% confidence interval). Specifically, the rate of ischemic and hemorrhagic stroke during pregnancy is 12.2 per 100,000 pregnancies. For prenatal and prepartum strokes, the rate is 18.3 per 100,000 pregnancies, while for postpartum strokes, it is 14.7 per 100,000 [2]. In the United States, approximately 30 in of every 100,000 pregnancies are associated with stroke, particularly hemorrhagic stroke, posing a risk three times greater than that of stroke in young adults [4, 5]. Stroke stands as the leading cause of maternal mortality in the United States. Moreover, in Canada, the incidence of maternal stroke has risen to 16.6 per 100,000 people in 2015–2016 compared to 2003–2004 [6]. In Japan, stroke is now the second leading cause of maternal

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death, with 90% of fatal maternal strokes being hemorrhagic, and a significant proportion of deaths can be prevented with screening [7]. The economic impact of maternal stroke has not been reported, but it is significant [8].

Despite advancements in medical care and healthcare systems, pregnancy-related stroke remains a significant cause of maternal morbidity and mortality, especially within the first 6 weeks after delivery. However, it appears that acute vascular treatments for ischemic stroke, such as intravenous thrombolytics with tissue plasminogen activator or intravascular thrombolytics clot recovery, may be both safe and effective during pregnancy. Taking prompt measures after a stroke not only saves the mother's life but also prevents complications and improves her quality of life [8, 9]. Nonetheless, identification and rapidly treating pregnant women experiencing a stroke may be challenging due to the unique physiological conditions of pregnancy. This challenge is exacerbated in remote or rural areas. Hence, the transfer of pregnant women to well-equipped medical centers may be delayed, potentially endangering both the mother and the fetus and leading to irreparable consequences [10]. However, managing these mothers and their critical conditions can be facilitated by emerging technological advances, such as telestroke.

In this regard, remote health can assist in managing this challenge and may even play a crucial role in the treatment process for these mothers. Telehealth encompasses the provision and facilitation of health and health-related services, including medical care, provider and patient education, health information services, and self-care, through telecommunications and digital communication technologies [11, 12]. Examples of technologies utilized in telehealth include live video conferencing, mobile health applications, electronic "store and send" transmissions, and remote patient monitoring (RPM).

The World Health Organization defines telehealth as the utilization of telecommunications and information technology to support and promote clinical healthcare, patient professional health education, and community public health management [13]. Although telehealth is sometimes used interchangeably with telemedicine, telehealth serves as an umbrella term that encompasses telemedicine, telecare, teleconsulting, telenursing, and other related technologies and services.

Many experts consider midwifery consultations to fall within the scope of teleconsultation. Literature reviews have shown that teleconsultation can serve as an alternative to face-to-face visits, particularly for the follow-up of patients with chronic diseases, and can lead to high levels of patient and staff satisfaction [14]. During the COVID-19 pandemic, remote midwifery consultations played a crucial role in managing anxiety, providing support for expectant mothers, delivering prenatal care, offering counseling for women of reproductive age and menopause, supporting postpartum women, managing postpartum depression, identifying high-risk mothers, providing pregnancy prevention counseling, and training and preparing pregnant mothers for childbirth [15, 16].

One of the primary branches within telehealth is telestroke [9, 10]. With technological advancements and its integration into healthcare systems, telestroke, a subset of telehealth, has transformed the treatment of stroke patients, particularly in rural and remote areas distant from specialized stroke care centers [17]. Telestroke enables doctors to begin treating ischemic stroke patients remotely, using technology, even before they arrive at the hospital [18]. Initially introduced for stroke patient education and care, telestroke is now garnering increased attention for its distinctive ability to deliver medical services, especially to stroke patients in rural areas.

One of the key benefits of telestroke is its ability to overcome geographical barriers. In rural and underserved communities, access to stroke expertise may be limited or unavailable. Telestroke programs allow healthcare facilities in these areas to link up with stroke specialists in urban centers, ensuring that patients receive timely evaluation and treatment.

With these interventions, healthcare providers minimize the time lost in patient transfers and expedite prompt decision-making, thereby enhancing outcomes [19]. It is conceivable that by integrating telestroke with tele-midwifery services, not only can strokes in pregnant mothers be managed, but also the health of the fetus can be improved, ensuring a safe pregnancy process for the mother simultaneously.

Stroke is a time-sensitive complication, where swift intervention is crucial to minimize brain damage and save lives. Telestroke allows specialists to remotely evaluate patients in real-time, offering round-the-clock access to stroke expertise [20]. This immediate accessibility ensures that patients undergo rapid assessment, receive an accurate diagnosis, and are promptly administered appropriate treatment such as clot-busting drugs or interventional procedures [21]. At the same time, the movements and condition of the fetus can be monitored, mini-

mizing the need to transfer the mother and the risks associated with movement [22].

This technology-enabled medium allows midwives to bridge the gap in maternal healthcare, providing real-time assistance and expert guidance to expectant mothers who lack access to specialized services. Tele stroke can help identify mothers at risk, provide training to prevent and detect early signs of stroke, and offer essential medical services during pregnancy. However, it should be emphasized that the potential of Tele stroke during pregnancy to prevent or treat stroke has been overlooked and requires serious attention.

Overall, Tele stroke has the potential to revolutionize maternal healthcare by providing timely and specialized care to pregnant women at risk of stroke, regardless of their geographic location. By integrating Tele stroke into midwifery services, healthcare professionals can improve outcomes for both mothers and their babies, ensuring a safer and healthier pregnancy. Therefore, it is suggested to conduct studies on the role of telestroke in the prevention and timely treatment of stroke in pregnant mothers, and the evidence about the potentials and capacities of telestroke should be identified.

Conflict of interest

The authors declare no conflicts of interest.

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References

[1] Miller EC, Leffert L. Stroke in pregnancy: a focused update. Anesthesia and Analgesia. 2020;130(4):1085.
[2] Camargo EC, Singhal AB. Stroke in pregnancy. Current Obstetrics and Gynecology Reports. 2023;22:1-2.
[3] Elgendy IY, Gad MM, Mahmoud AN, Keeley EC, Pepine CJ. Acute stroke during pregnancy and puerperium. Journal of the American College of Cardiology. 2020;75(2):180-90.
[4] Swartz RH, Cayley ML, Foley N, Ladhani NNN, Leffert LR, Bushnell C, et al. The incidence of pregnancy-related stroke: a systematic review and meta-analysis. Int J Stroke. 2017;12(7):687-97
[5] Mann S, Hollier LM, McKay K, Brown H. What we can do about maternal mortality—and how to do it quickly. N Engl J Med. 2018;379(18):1689-91.
[6] Liu S, Chan WS, Ray JG, Kramer MS, Joseph KS, for the Canadian Perinatal Surveillance System (Public Health Agency of Canada). Stroke and cerebrovascular disease in pregnancy. Stroke. 2019;50(1):13-20.
[7] Katsuragi S, Tanaka H, Hasegawa J, Nakamura M, Kanayama N, Nakata M, et al. Analysis of preventability of stroke-related maternal death from the nationwide registration system of maternal deaths in Japan. J Matern Fetal Neonatal Med. 2018;31(16):2097-104.
[8] Zambrano MD, Miller EC. Maternal stroke: an update. Current Atherosclerosis Reports. 2019;21:1-2.
[9] Del Zotto E, Giossi A, Volonghi I, Costa P, Padovani A, Pezzini A. Ischemic stroke during pregnancy and puerperium. Stroke Research and Treatment. 2011;27:2011.
[10] Karjalainen L, Tikkanen M, Rantanen K, Aarnio K, Korhonen A, Saaros A, Laivuori H, Gissler M, Ijäs, P. Stroke in pregnancy and puerperium: validated incidence trends with risk factor analysis in Finland 1987–2016. Neurology. 2021;96(21):e2564-75.
[11] Landais A, Chaumont H, Dellis R. Thrombolytic therapy of acute ischemic stroke during early pregnancy. Journal of Stroke and Cerebrovascular Diseases. 2018;27(2):e20-3.
[12] Shariat A, Hajialiasgari F, Alizadeh A, Anastasio AT. The role of telehealth in the care of musculoskeletal pain conditions after COVID-19. Work. 2022;(Preprint):1-4.
[13] Catalyst NE. What is telehealth?. NEJM Catalyst. 2018;4(1).
[14] Rousseau A, Gaucher L, Gautier S, Mahrez I, Baumann S. How midwives implemented teleconsultations during the COVID-19 health crisis: a mixed-methods study. BMJ Open. 2022;12(4):e057292.
[15] Chen L, Li Q, Zheng D, et al. Clinical characteristics of pregnant women with Covid-19 in Wuhan, China. N Engl J Med. 2020;382:e100. 10.1056/NEJMc2009226
[16] Greiner AL. Telemedicine applications in obstetrics and gynecology. Clin Obstet Gynecol. 2017;60:853-66. 10.1097/GRF.0000000000000328
[17] World Health Organization. WHO-ITU global standard for accessibility of telehealth services. 2019.
[18] Fischer SH, Ray KN, Mehrotra A, Bloom EL, Uscher-Pines, L. Prevalence and characteristics of telehealth utilization in the United States. JAMA Network Open. 2020;3(10):e2022302.
[19] Cason J. Telehealth: A rapidly developing service delivery model for occupational therapy. International Journal of Telerehabilitation. 2014;6(1):29.
[20] Sharma R, Zachrison KS, Viswanathan A, Matiello M, Estrada J, Anderson CD, Etherton M, Silverman S, Rost

NS, Feske SK, Schwamm LH. Trends in telestroke care delivery: a 15-year experience of an academic hub and its network of spokes. Circulation: Cardiovascular Quality and Outcomes. 2020;13(3):e005903.

[21] Nakhostin Ansari N, Bahramnezhad F, Anastasio AT, Hassanzadeh G, Shariat A. Telestroke: A Novel Approach for Post-Stroke Rehabilitation. Brain Sciences. 2023;13(8):1186.

[22] Guzik AK, Martin-Schild S, Tadi P, Chapman SN, Al Kasab S, Martini SR, Meyer BC, Demaerschalk BM, Wozniak MA, Southerland AM. Telestroke across the continuum of care: lessons from the COVID-19 pandemic. Journal of Stroke and Cerebrovascular Diseases. 2021;30(7):105802.