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TELENEUROLOGY: REMOTE DIAGNOSIS, TELESTROKE NETWORKS, AND DIGITAL CONSULTATION IN RESOURCE-LIMITED SETTINGS

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ABSTRACT

Neurological disorders — including stroke, epilepsy, Parkinson's disease, and headache — impose a disproportionate burden in low- and middle-income countries where access to specialist neurology care is severely constrained by workforce shortages and geographic barriers. Teleneurology — the delivery of neurological diagnostic and management services through video consultation, store-and-forward image transmission, and digital decision support — offers a scalable mechanism for extending specialist neurology care to underserved populations. This review analyses 45 studies of teleneurology programmes published between 2015 and 2024, with particular focus on evidence from low- and middle-income country settings and implications for Uzbekistan. Telestroke networks have demonstrated door-to-needle time reductions of 15–35 minutes and equivalent thrombolysis outcomes to in-person assessment, with implementation in over 50 countries. Tele-epilepsy and tele-Parkinson programmes demonstrate equivalent diagnostic accuracy and treatment quality to



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in-person consultation for appropriate patient populations. Implementation challenges including digital infrastructure, regulatory frameworks, and clinical acceptance are evaluated.

Keywords: teleneurology; telestroke; epilepsy; telehealth; remote consultation; resource-limited settings; Uzbekistan

1. INTRODUCTION

The global burden of neurological disease is enormous and predominantly borne by low- and middle-income countries (LMICs), where 80% of neurological disability and 80% of neurological deaths occur (Feigin et al., 2020). Yet neurological specialist workforce density in LMICs is dramatically lower than in high-income countries: sub-Saharan Africa has approximately 0.03 neurologists per 100,000 population compared with 4–8 per 100,000 in Western Europe and North America. Uzbekistan has approximately 0.8 neurologists per 100,000 population, significantly lower than optimal levels and with severe geographic maldistribution concentrating specialist services in Tashkent.

Teleneurology — encompassing synchronous video consultation between patients or general practitioners and remote neurologists, asynchronous store-and-forward teleconsultation for structured clinical information review, and telestroke networks enabling emergency neurological assessment of acute stroke patients at hospitals without on-site stroke neurologists — offers a fundamentally scalable approach to this access gap. The COVID-19 pandemic generated a dramatic acceleration of teleneurology adoption globally, providing an unprecedented natural experiment in the feasibility and effectiveness of remote neurological assessment.



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Telestroke — the application of telemedicine to acute ischaemic stroke management — has emerged as one of the best-evidenced teleneurology applications, with established programmes in the United States, Europe, and increasingly in LMICs demonstrating equivalent outcomes to in-person specialist assessment. This review evaluates the evidence for teleneurology across neurological subspecialties and assesses its relevance for Uzbekistan's neurology services.

2. MATERIALS AND METHODS

A systematic search of PubMed, Scopus, and WHO Global Health Observatory identified 45 studies of teleneurology programmes published between 2015 and 2024. Inclusion criteria required original research, reporting of clinical outcomes or process metrics, teleneurology as the primary intervention, and comparison against in-person care or no teleneurology. Studies were categorised by neurological subspecialty, telemedicine modality, and health system setting.

3. RESULTS

Telestroke programmes demonstrated door-to-needle time reductions of 15–35 minutes compared with telephone-only consultation in 12 of 14 studies, with no significant difference in thrombolysis-related complication rates or 90-day functional outcomes between telestroke and in-person assessment. Remote NIHSS scoring showed concordance of 0.85–0.97 with in-person assessment. Tele-epilepsy programmes demonstrated equivalent seizure control outcomes to in-person follow-up for stable patients in three randomised controlled trials, with higher patient satisfaction scores (mean 4.3/5 vs. 3.9/5) attributed to reduced travel burden. Tele-Parkinson consultations showed equivalent medication



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adjustment quality and patient-reported outcome scores to in-person visits for stable patients.

LMIC-specific studies — available from India, Bangladesh, Tanzania, and Kazakhstan — demonstrated feasibility of teleneurology consultation using standard smartphone video calling platforms with bandwidth requirements compatible with 4G mobile internet, suggesting applicability in Uzbekistan's current telecommunications infrastructure.

4. DISCUSSION

The evidence base for teleneurology is strongest for telestroke, where randomised and prospective data support equivalent outcomes to in-person assessment with meaningful process metric improvements. For chronic neurological conditions including epilepsy and Parkinson's disease, teleneurology provides equivalent management quality for stable patients while substantially reducing access barriers — a particularly significant benefit for patients in geographically remote regions of Uzbekistan. The Kazakhstan teleneurology pilot provides direct regional evidence of implementation feasibility in a comparable Central Asian healthcare system context.

5. CONCLUSION

Teleneurology programmes demonstrate evidence-based effectiveness across telestroke, epilepsy, and Parkinson's disease management, with equivalent clinical outcomes to in-person consultation for appropriate patient populations and significant process improvements including reduced door-to-needle time and access barrier reduction. For Uzbekistan's neurology services, teleneurology represents a high-priority implementation target to address specialist access inequalities between Tashkent and regional populations. Priority implementation



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actions include development of a national telestroke network connecting regional hospitals with Tashkent stroke centres, tele-epilepsy consultation services, and telehealth regulation and reimbursement frameworks.

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