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Evidence-based primary care approaches to recurrent stroke prevention following intracerebral hemorrhage

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Background: Intracerebral hemorrhage (ICH) accounts for approximately 25% of all stroke cases and results in 2.89 million deaths worldwide annually. It is associated with disproportionately high rates of mortality (30–40% at one month and 50% at one year) and significant long-term disability, with approximately 75% of survivors losing their independence. Survivors face a substantial risk of recurrence, particularly within the first year (estimated at 1% to 9%), and higher long-term risks of 10–15% over five years. Because ICH is a chronic condition requiring sustained intervention, long-term outpatient primary care management is critical to bridge the gap between acute discharge and the persistent participation restrictions experienced by over 30% of stroke survivors. Synthesizing international guidelines and clinical trials from 2019 to 2026, this review highlights that maintaining strict blood pressure targets serves as the definitive cornerstone of secondary prevention. Furthermore, managing the antithrombotic dilemma involves safely resuming antiplatelets or carefully timing anticoagulation at 7–8 weeks for patients with atrial fibrillation. Optimizing functional recovery requires initiating multidisciplinary rehabilitation within a 24-48 hour window-as ultra-early mobilization within 24 hours worsens outcomes-while routinely screening for post-stroke depression and cognitive decline. Implementing lifestyle counseling alongside digital telemonitoring significantly improves systolic blood pressure control and medication adherence. Ultimately, primary care physicians play an irreplaceable role; mitigating long-term mortality and disability demands individualized prevention protocols, active caregiver integration, and continuous, multidisciplinary outpatient follow-up.

Keywords: intracerebral hemorrhage, recurrent stroke, secondary prevention, hypertension,rehabilitation, telemedicine, primary healthcare

Аннотация. Внутримозговое кровоизлияние (ВМК) составляет около 25% всех случаев инсульта и ежегодно приводит к 2,89 миллионам смертей во всём мире. Заболевание сопровождается крайне высокой летальностью (30–40% в течение первого месяца и до 50% в течение первого года) и значительной долгосрочной инвалидизацией: примерно 75% выживших утрачивают самостоятельность. У пациентов сохраняется высокий риск рецидива, особенно в первый год (1–9%), а в долгосрочной перспективе — до 10–15% в течение пяти лет. Поскольку ВМК представляет собой хроническое состояние, требующее длительного наблюдения, амбулаторное ведение в системе первичной медико-санитарной помощи имеет ключевое значение для преемственности между острым этапом лечения и длительными функциональными ограничениями, наблюдаемыми более чем у 30% пациентов после инсульта.

На основе анализа международных клинических рекомендаций и исследований 2019–2026 годов установлено, что строгий контроль артериального давления является основным компонентом вторичной профилактики. Вопрос антикоагулянтной терапии требует индивидуального подхода, включая безопасное возобновление антиагрегантов или

отсроченное назначение антикоагулянтов (через 7–8 недель) у пациентов с фибрилляцией предсердий. Оптимизация восстановления включает раннюю мультидисциплинарную реабилитацию в течение 24–48 часов, при этом чрезмерно ранняя мобилизация (в первые 24 часа) может ухудшать исходы. Рекомендуется также регулярный скрининг постинсультной депрессии и когнитивных нарушений. Использование телемониторинга и модификации образа жизни повышает приверженность лечению и улучшает контроль артериального давления. Роль врача первичного звена является ключевой, так как индивидуализированные профилактические стратегии, участие семьи и непрерывное наблюдение существенно снижают смертность и инвалидизацию.

Ключевые слова: внутримозговое кровоизлияние, рецидив инсульта, вторичная профилактика, артериальная гипертензия, реабилитация, телемедицина, первичная медико-санитарная помощь.

Annotatsiya. Parenximatoz qon quyilish barcha insult holatlarining taxminan 25% ini tashkil etadi va har yili dunyo bo‘yicha 2,89 million o‘limga sabab bo‘ladi. Kasallik yuqori o‘lim ko‘rsatkichi bilan kechadi (birinchi oyda 30–40%, bir yil ichida esa 50% gacha) hamda uzoq muddatli nogironlik bilan bog‘liq bo‘lib, bemorlarning taxminan 75% i mustaqil hayot kechirish qobiliyatini yo‘qotadi. Qaytalanish xavfi ayniqsa birinchi yil davomida yuqori (1–9%), uzoq muddatda esa 5 yil ichida 10–15% gacha yetadi. Parenximatoz qon quyilish surunkali holat bo‘lib, uzoq muddatli kuzatuvni talab qiladi, shu sababli birlamchi tibbiy-sanitariya yordam tizimida ambulator boshqaruv o‘tkir davolashdan keyingi bosqich va uzoq davom etuvchi funksional cheklovlar o‘rtasida uzviylikni ta’minlashda muhim ahamiyatga ega. Bu cheklovlar insultdan keyin bemorlarning 30% dan ortig‘ida kuzatiladi.

2019–2026 yillardagi xalqaro klinik tavsiyalar va tadqiqotlar tahliliga ko‘ra, qat’iy arterial bosim nazorati ikkilamchi profilaktikaning asosiy poydevori hisoblanadi. Antitrombotik terapiya masalasi individual yondashuvni talab qiladi, jumladan antitrombotsitar dorilarni qayta boshlash yoki atrial fibrillyatsiyasi bo‘lgan bemorlarda antikoagulyantlarni 7–8 haftadan keyin ehtiyotkorlik bilan qo‘llash tavsiya etiladi. Tiklanishni optimallashtirish uchun 24–48 soat ichida multidisiplinar reabilitatsiyani boshlash muhim, biroq juda erta (24 soat ichida) faol harakatga keltirish salbiy natijalarga olib kelishi mumkin. Shuningdek, postinsult depressiya va kognitiv buzilishlarni muntazam skrining qilish tavsiya etiladi. Telemonitoring va sog‘lom turmush tarzini shakllantirish qon bosimini nazorat qilish va davolanishga rioya qilishni yaxshilaydi. Birlamchi bo‘g‘in shifokorlarining roli juda muhim bo‘lib, individual profilaktika strategiyalari, oilani jalb qilish va uzluksiz kuzatuv o‘lim va nogironlikni sezilarli kamaytiradi.

Kalit so‘zlar: Parenximatoz qon quyilish, qayta insult, ikkilamchi profilaktika, arterial gipertenziya, reabilitatsiya, telemeditsina, birlamchi tibbiy yordam.

Introduction. Intracerebral hemorrhage (ICH) represents the most devastating and deadly manifestation of acute stroke, characterized by spontaneous bleeding into the brain parenchyma typically arising from hypertensive vasculopathy or cerebral amyloid angiopathy. While ICH accounts for approximately 10% to 15% of all strokes in Western nations and nearly 28% of new strokes globally, its clinical impact is disproportionately severe, resulting in an estimated 2.89 million deaths worldwide annually. The functional burden of ICH is equally catastrophic; half of all disability-adjusted life-years (DALYs) lost due to stroke are attributable to hemorrhagic events. Acute mortality remains high, ranging from 30% to 40% within the first month and rising to 50% at one year, while nearly 75% of survivors suffer a permanent loss of functional independence. Beyond the clinical toll, ICH imposes an immense socioeconomic burden, with the global value of lost welfare estimated at $883 billion annually, primarily driven by long-term disability and loss of productivity among survivors.The clinical reality for ICH survivors is further complicated by a high and persistent risk of recurrence, which dramatically accelerates neurological decline and multiplies mortality rates. Research indicates that the annualized risk of recurrent hemorrhage ranges from 1.8% to 7.4% within the first year, with cumulative five-year recurrence rates reaching as high as

10% to 15%. The risk is particularly pronounced in patients with cerebral amyloid angiopathy, who face a recurrence rate of 7.4% per year compared to 1.1% in those with non-amyloid-related deep hemorrhages. Recurrent events are often more severe than the index stroke, characterized by more extensive tissue destruction, higher rates of cognitive impairment, and a transition from functional independence to total dependence. Furthermore, survivors of ICH are at an increased risk not only for recurrent hemorrhage but also for ischemic stroke and other major vascular events, necessitating complex, multifaceted secondary prevention strategies.Given that stroke is fundamentally a chronic condition requiring lifelong intervention, the primary healthcare setting and the family physician serve as the essential cornerstones for long-term survival and recovery. The transition from acute inpatient care to the community is a high-risk period where the continuity of care is often fractured. Effective long-term management relies on the primary care physician's ability to provide continuous outpatient risk-factor modulation, specifically through the achievement of aggressive blood pressure targets below 130/80 mmHg. Primary care providers are uniquely positioned to monitor medication adherence for antihypertensive and antithrombotic therapies, provide supervised counseling on lifestyle modifications, and coordinate multidisciplinary follow-up to address evolving medical and social needs. Sustained engagement within primary healthcare is the most effective mechanism to break the cycle of physical inactivity and recurrent vascular events.Despite the known benefits of structured follow-up, critical gaps persist in the outpatient phase of ICH management, often leading to avoidable clinical failures. Significant proportions of survivors experience poorly controlled hypertension, which remains the primary driver of both lobar and nonlobar recurrence. Furthermore, rehabilitation services are frequently underutilized or delayed; for example, in some regions, access to essential post-stroke rehabilitation is as low as 40%. Neglect of neuropsychiatric and cognitive dimensions is another major failure, as over 50% of survivors suffer from apathy or clinical depression at one year post-stroke, and cognitive impairment persists in up to 88% of cases. There is also a documented drop-off in secondary prevention compliance, with survivors often spending the vast majority of their time in sedentary behaviors that exacerbate cardiovascular risk and accelerate functional decline.The clinical necessity of bridging these gaps through evidence-based outpatient protocols is paramount to improving the trajectory of ICH recovery.

The aim of this review is to summarize current evidence on recurrent stroke prevention after intracerebral hemorrhage and to present practical primary care strategies for reducing mortality and disability [1-6].

Materials and methods. A rigorous and systematic search of the medical literature was conducted across the PubMed, Scopus, and Google Scholar electronic databases to identify high-quality clinical evidence regarding the long-term management of survivors of intracerebral hemorrhage. To ensure a comprehensive identification of relevant studies, the reference lists of identified clinical guidelines and systematic reviews were manually screened for additional primary research articles. The search focused on capturing data relevant to outpatient care trajectories and secondary prevention protocols. The database search utilized specific Boolean logic and keyword combinations designed to optimize the retrieval of evidence-based interventions. The search string incorporated the following primary terms: "intracerebral hemorrhage," "hemorrhagic stroke," "recurrent stroke," "secondary prevention," "hypertension," "telemedicine," and "rehabilitation. These terms were systematically combined to identify studies specifically addressing the intersection of chronic stroke management and primary healthcare delivery. The review included English-language publications from 2019–2026 focusing on adult populations. Eligible sources comprised clinical guidelines, systematic reviews, meta-analyses, and large prospective cohort studies reporting outcomes related to stroke recurrence, mortality, or functional recovery. Case reports, small case series, pediatric studies, duplicates, and non–peer-reviewed materials (editorials, commentaries) were excluded. Abstract-only publications without full texts were also removed to ensure full methodological assessment.

Results and discussion. Uncontrolled Hypertension.Chronic hypertension induces mechanical stress on cerebral small vessels, leading to arteriolar wall damage, fibrinoid necrosis,

and formation of Charcot–Bouchard microaneurysms. Progressive impairment of cerebral autoregulation makes blood flow pressure-dependent, increasing vulnerability to vessel rupture. Therefore, strict blood pressure control is central to preventing recurrent ICH.

Vascular Remodeling.Vascular remodeling in hypertension and small vessel disease is characterized by lipohyalinosis, smooth muscle loss, and luminal narrowing. In cerebral amyloid angiopathy, β-amyloid deposition further weakens cortical vessels. These structural changes create a high-risk substrate for recurrent hemorrhagic and ischemic events.

Endothelial Dysfunction.Endothelial dysfunction involves reduced nitric oxide availability, oxidative stress, and elevated homocysteine levels, leading to impaired vasodilation and prothrombotic states. Activation of MMP-9 disrupts the blood-brain barrier by degrading tight junction proteins, increasing vascular permeability and brain vulnerability.

Chronic Inflammation.Post-hemorrhagic inflammation is driven by microglial activation and release of proinflammatory cytokines (TNF-α, IL-1β, IL-6), promoting ongoing vascular injury and gliosis. Elevated systemic inflammatory markers sustain a chronic state of vascular fragility, increasing the risk of recurrent cerebrovascular events.[7, 8].

Primary care strategies for secondary prevention. Blood Pressure Control. Hypertension is definitively established as the most potent, modifiable risk factor for both the index occurrence and the subsequent recurrence of intracerebral hemorrhage (ICH). Epidemiological data indicate that uncontrolled hypertension accounts for a staggering 73.6% of the global population-attributable risk for ICH. Longitudinal evidence from large-scale prospective cohorts, such as the China Stroke Center Alliance (CSCA), underscores that inadequate blood pressure management following an initial event significantly increases the risk of recurrence; specifically, poorly controlled patients face a 3.53-fold increased risk for lobar recurrence and a 4.23-fold increased risk for nonlobar events. The relationship between systolic blood pressure (SBP) and recurrence is continuous, with the risk of hemorrhagic events increasing by 33% for every 10-mmHg rise in SBP for lobar ICH and by 54% per 10-mmHg rise for nonlobar ICH. To mitigate these catastrophic risks, current international clinical guidelines and primary care protocols mandate aggressive long-term management with a specific recommended target:BP < 130/80 mmHg.The clinical justification for this stringent target is rooted in landmark trial evidence, most notably the PROGRESS trial (Perindopril Protection Against Recurrent Stroke Study), which demonstrated that achieving a sustained reduction in blood pressure led to a 42% relative risk reduction in major vascular events among patients with a history of ICH. Complementary evidence from secondary analyses of the PRoFESS trial confirmed that survivors maintained at an SBP ≥160 mmHg faced a significantly higher recurrence hazard (HR 2.07) compared to those kept within the 130–139 mmHg range. Pharmacological management in the primary care setting should prioritize drug classes that ensure smooth, sustained control and minimize blood pressure variability, which itself serves as a predictor of unfavorable outcomes. The PROGRESS regimen, which utilized a combination of the ACE inhibitor perindopril and the thiazide-type diuretic indapamide, yielded a number needed to treat (NNT) of only 18 to prevent one ICH recurrence over a five-year period. Calcium channel blockers, such as amlodipine or nicardipine, and angiotensin receptor blockers (ARBs) are preferred adjuncts for patients requiring more intensive management. Furthermore, the use of single-pill combinations is increasingly advocated to achieve rapid target attainment while simultaneously reducing regimen complexity for the patient. Successful long-term management must transition from periodic clinical visits to mandatory patient self-monitoring supported by modern technology. A systematic review and meta-analysis of telemedical strategies in cerebrovascular prevention demonstrated that telemonitoring achieves a statistically significant reduction in SBP (p=0.003) compared to standard outpatient care, which directly correlates with a reduced risk of mortality. Finally, securing long-term medication adherence is a primary responsibility of the family physician. Evidence-based interventions, including intensive patient and caregiver education focused on the "silent" nature of hypertensive risk and the implementation of reminder systems based on the Health Belief Model,

have been shown to significantly improve adherence and health behaviors from baseline through six months post-stroke.

Evaluation of Antithrombotic Therapy. The clinical dilemma of restarting antithrombotic therapy in patients with underlying cerebral microvascular pathologies—specifically arteriolosclerosis and cerebral amyloid angiopathy (CAA)—is a central focus of recent neurovascular research.For patients with nonvalvular atrial fibrillation (AF), contemporary data strongly favor direct oral anticoagulants (DOACs) over traditional vitamin K antagonists. Meta-analyses and observational cohorts indicate that DOACs (e.g., apixaban, rivaroxaban) significantly reduce intracranial bleeding rates and are associated with smaller hematoma volumes if bleeding occurs. Regarding antiplatelet therapy, the RESTART trial provided critical randomized controlled data demonstrating that restarting antiplatelets post-ICH does not significantly elevate the risk of recurrent hemorrhage. Extended seven-year follow-up data from the RESTART cohort confirmed a significant reduction in major vascular events without an increase in hemorrhagic recurrence.Current consensus guidelines indicate that the optimal net clinical benefit for oral anticoagulation initiation typically occurs between 7 to 8 weeks post-ICH. However, for exceptionally high-risk cardiac substrates, such as mechanical heart valves, literature suggests earlier resumption (as early as day 6) may be warranted if the risk of valve thrombosis outweighs the threat of early hematoma expansion.Magnetic resonance imaging (MRI) markers have become fundamental in stratifying these risks. Studies demonstrate that patients presenting with strictly lobar microbleeds or disseminated cortical superficial siderosis have a high probability of underlying CAA, carrying an annual recurrence risk of approximately 7.4%, compared to only 1.1% for non-CAA hypertensive deep territory hemorrhages. Consequently, current clinical frameworks advise that patients with a high lobar microbleed burden (greater than 10) should be managed with extreme caution, often pointing to non-pharmacological interventions like left atrial appendage closure. Conversely, in deep territory hemorrhages secondary to hypertensive vasculopathy, the literature suggests the benefits of secondary ischemic prevention generally outweigh long-term recurrent bleeding risks.

Metabolic and Lipid Optimization. Lipid management post-ICH is governed by what the literature frequently terms the "statin controversy." Data from the landmark SPARCL trial identified an increased risk of recurrent ICH in patients treated with high-dose atorvastatin, particularly those with a history of prior hemorrhagic events. In contrast, multiple recent observational studies and meta-analyses correlate statin use with improved overall survival and enhanced functional recovery, a divergence widely attributed to the pleiotropic, anti-inflammatory, and neuroprotective effects of statins. Furthermore, epidemiological data document an inverse relationship between low serum cholesterol/LDL-C levels and increased ICH risk, suggesting extreme lipid-lowering might compromise microvascular integrity. Current AHA/ASA secondary prevention guidelines reconcile these findings by recommending an individualized approach, targeting an LDL-C reduction of 50% or more or a threshold below 70 mg/dL for high-risk vascular patients, while advising heightened vigilance in patients with imaging markers of CAA.

Glycemic control represents another vital component of vascular stabilization. Diabetes mellitus and chronic hyperglycemia drive accelerated arteriolosclerosis via lipohyalinosis and maladaptive vascular remodeling, increasing structural vessel fragility. Outpatient protocols prioritize structured HbA1c monitoring and the early identification of impaired glucose regulation, which observational data identify as a robust predictor of poor long-term outcomes. However, trial data emphasize the dangers of overly aggressive glycemic regulation. While the QASC trial demonstrated that structured, nurse-initiated hyperglycemia management protocols significantly decrease death and disability, the NICE-SUGAR trial highlighted that intensive glucose management frequently precipitates dangerous hypoglycemic events (below 40–60 mg/dL; 2.2–3.3 mmol/L). These glycemic drops are mechanistically linked to poor survival and increased acute bleeding risks.

Behavioral Interventions and Care Delivery Models. Recent epidemiological data identify tobacco use as a leading behavioral contributor to global stroke disability-adjusted life years (DALYs), directly correlating it with early hematoma expansion and aneurysm rupture. Clinical guidelines emphasize the necessity of structured cessation services and smoke-free environments. Dietary interventions focus heavily on strict sodium restriction to prevent intermittent blood pressure spikes and progressive vascular hardening. Clinical trial data support the adoption of cardioprotective nutritional models, specifically the Mediterranean diet—characterized by high intake of vegetables, fruits, and fish rich in long-chain omega-3 fatty acids, alongside the minimization of red meat and refined sugars.To counteract post-stroke functional decline, recent trials support transitioning patients from sedentary behavior to tailored exercise regimens. Evidence shows that structured outpatient counseling aimed at reducing daily sitting time and improving cardiorespiratory fitness significantly enhances functional recovery and reduces recurrent vascular risks. Weight control and BMI optimization remain core recommendations for long-term blood pressure stability.

The translation of these strategies into clinical success relies heavily on structured adherence and educational delivery systems. Clinical trials evaluating reminder systems based on the Health Belief Model report significant improvements in patient adherence and health behaviors by six months post-stroke. Furthermore, clinical evidence underlines the role of the home caregiver; studies show that providing caregivers with targeted psychosocial education and practical training (e.g., assisting with standing balance) significantly improves the patient's daily activity metrics and overall quality of life.Finally, recent literature highlights the utility of digital health integrations. Telemedical strategies—including structured telephone follow-ups and mobile application- or WeChat-based services—have been shown to enhance health literacy, optimize real-time medication titration, and maintain continuity of care. Current consensus favors the utilization of standardized post-stroke checklists within a multidisciplinary outpatient framework to address the evolving medical, psychological, and social needs of the ICH survivor in a coordinated, patient-centered model.

Rehabilitation and long-term follow-up. Telemonitoring and Care Continuum.Current research identifies telemonitoring as a vital tool to bridge geographic and socioeconomic barriers for rural or underserved stroke survivors. Meta-analyses involving over 21,000 patients demonstrate that telemedical strategies—including mobile health applications and remote data transmission—yield a statistically significant reduction in systolic blood pressure. Remote transmission of physiological data (e.g., weight and blood pressure) alongside digital diaries and phone-based interventions (such as WeChat coaching) significantly enhances medication adherence, improves health literacy, and correlates with a reduced risk of mortality.Rehabilitation PathwaysEvidence-based guidelines support outpatient functional task training and Early Supported Discharge (ESD) models for mild-to-moderate ICH, linking hospital care with community services to increase independent living at three months. While rehabilitation should initiate 24 to 48 hours post-onset, data indicate that aggressive mobilization within the first 24 hours worsens 14-day mortality. To sustain quality of care, clinical standards require outpatient therapy plans to be certified by a physician and reviewed every 30 days to align with evolving functional goals.

Cognitive and Depression Screening.Vascular cognitive impairment affects over one-third of stroke survivors at one year post-ictus, necessitating routine screening via the Montreal Cognitive Assessment (MoCA) or Mini-Mental State Examination (MMSE). While MoCA offers high specificity, rapid tools under five minutes are more practical for busy clinics; significant deficits warrant formal neuropsychological referral.Parallelly, post-stroke depression (PSD) affects up to 33% of survivors, with recurrence risks escalating from 28% in the second year to nearly 100% by the fifteenth year. Standardized screening via the Patient Health Questionnaire-9 (PHQ-9) or Hospital Anxiety and Depression Scale (HADS) should occur at regular intervals. Moderate-to-severe depression requires mental health referral for psychotherapy or pharmacotherapy, though

clinicians must exercise caution with selective serotonin reuptake inhibitors (SSRIs) due to a potential risk of recurrent hemorrhage.

Multidisciplinary Collaborative Care.Optimizing outcomes requires a collaborative ecosystem led by the family physician, integrating a neurologist for cerebrovascular health, a cardiologist for cardiac comorbidities (e.g., atrial fibrillation), and a physiatrist for sensorimotor recovery. Clear clinical triggers for specialist referral include new-onset seizures, refractory spasticity, or vocational and driving safety evaluations. This model emphasizes the active training of home caregivers in practical interventions (e.g., standing balance exercises) to improve patient activity metrics and overall quality of life[9-14].

Conclusion. Post-intracerebral hemorrhage (ICH) management demands a critical paradigm shift from acute crisis stabilization to structured, aggressive, and long-term outpatient secondary prevention. Evidence synthesized across contemporary clinical literature confirms that maximizing survival and optimizing functional outcomes depend directly on the proactivity of primary care delivery.First and foremost, stringent hemodynamic control remains the mechanical cornerstone of secondary prevention; primary care physicians must aggressively maintain a target threshold of BP < 130/80 mmHg to arrest progressive cerebral small vessel disease and prevent catastrophic hematoma recurrence. Furthermore, navigating high-stakes challenges—such as the clinical dilemma of restarting antithrombotic therapy—requires replacing empirical delays with precision stratification that balances neuroimaging biomarkers against systemic thromboembolic risks.Ultimately, minimizing the long-term global burden of ICH relies on a multidisciplinary ecosystem led by family physicians. Mechanistically integrating digital health telemonitoring, maintaining rigid tracking schedules for metabolic profiles, and embedding routine screening for post-stroke cognitive impairment and depression are non-negotiable steps. At the community level, implementing these structured, evidence-based monitoring algorithms and personalized therapeutic protocols offers the definitive pathway to transforming the survival trajectory of ICH survivors.

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