Executive Summary

Stroke is the fifth leading cause of death and the top preventable cause of disability in the United States. There are many factors and stakeholders to consider in stroke prevention, detection, treatment, and rehabilitation. The 2016-17 Health for America (HFA) at MedStar Health fellows studied various facets of stroke care as part of the program's exploration phase, identifying obstacles and gaps that affect stroke stakeholders. The HFA fellows produced a landscape analysis to share their related research, which will inform their creation of a patient-centered, novel solution that improves stroke care. This executive summary highlights the emerging innovation opportunities they detail in their report that may bring them closer to a solution.

Gaps in Stroke Literacy

A highly aware and educated public is more likely to be healthy. Unfortunately, despite educational efforts, public knowledge of common risk factors for, and early signs of, stroke is lacking, leading to increased risk of disability or death. Many stroke survivors HFA fellows interviewed during the exploration phase called loved ones first before dialing 911, wasting precious care time. Additionally, it became apparent that hypertension is common among stroke survivors, though many did not know the condition was a risk factor prior to their stroke. Stakeholders interviewed repeatedly emphasized the need to spread awareness about the importance of hypertension detection and management, especially in underserved minority populations. Gaps in stroke literacy also include misconceptions such as: 1) all strokes are the same; 2) doctors always know the cause of stroke in an individual patient; and 3) strokes only affect the elderly.

Challenges in Managing Risk

90% of stroke risk can be attributed to modifiable factors such as hypertension, diabetes, and cholesterol. However, patient encounters revealed that many stroke survivors had not consistently seen a primary care doctor prior to their stroke. Conversations with stakeholders also identified medication compliance as a common issue, both in primary/secondary stroke prevention and rehabilitation. Managing risk necessitates lifestyle and behavior changes, which can be difficult due to lack of motivation and general healthcare barriers such as cost and access to care.

Barriers to Accessing Prevention and Care Resources

Patient access to affordable, high-quality stroke prevention and care resources varies widely. Food deserts, failing public schools, and limited access to parks may help explain why low-income minority populations suffer from disparities in stroke outcomes. Research shows that low-income and racial minority patients are also less likely to receive the critical clot-busting drug tissue plasminogen activator (tPA) for ischemic stroke, and more likely to experience longer emergency department wait times compared to white counterparts. Stakeholder conversations highlighted a strong need for social workers who can connect stroke survivors with financial and social support. Need is especially high in rural communities that do not have primary and comprehensive stroke centers and specialists that can deliver the most effective treatments.

Difficulties in Detection and Diagnosis

Stroke is the leading *preventable* cause of disability in the United States. Stakeholders emphasized that shortening the period between the onset of symptoms and the delivery of acute medical care has the potential to prevent or significantly reduce the extent of stroke-induced disability. This acute treatment, consisting of clot-busting medication and clot-retrieving surgery, can only be administered within a few hours of symptom onset. Clinical shadowing revealed patients often struggle to recall their "last known normal," especially if the symptoms began during sleep. Another challenge is that tPA treatment can only help those affected by ischemic stroke, and can cause further severe damage if administered to patients experiencing hemorrhagic-

stroke. The majority of hospitals across the United States use CT scans to rule out hemorrhagic stroke. However, when the HFA fellows shadowed at MedStar Washington Hospital Center, they learned that MRI imaging is superior because it not only rules out cranial bleeding, but also helps identify the clot location accurately and precisely.

Systematic Hospital Inefficiencies in Acute Stroke Care Coordination

Communication, coordination, and workflow of emergency medical services (EMS) and the emergency department (ED) affect how quickly patients receive life-saving stroke treatment. The time from when patients enter the ED to when they receive treatment is often referred to as the "door-to-needle" time. Conversations with HFA physician mentors highlighted how door-to-needle time can be lengthened by communication inefficiencies, both in EMS delivering a patient to an appropriate stroke center, and in the ED team promptly coordinating a "Code 1" response. A lack of universal stroke protocols across hospitals further contributes to lengthened door-to-needle times.

Challenges in Transitioning to the "New Normal" After Stroke

As one of the stroke survivor caregivers the HFA fellows met said, "There is life after stroke." While optimistic in tone, this statement hinges on the reality that life after stroke is significantly altered for many. The transition from inpatient care to a home setting can come as a shock. The "real world," complete with unpredictable and overwhelming stimuli, contrasts sharply with the supervised, controlled environment of therapy. During the HFA fellows' interviews, stroke survivors explained that putting activities of daily living into practice upon returning home was unexpectedly difficult—even after practicing them in a therapy setting. In addition to the fatigue and frustration stroke survivors experience as a result of the brain's healing and rewiring process, they also face challenges with accessibility and transportation. Stroke survivors face the heavy burden of both navigating life with newly-acquired disabilities and recovering.

Post-Stroke Psychological Health and Well-Being

It is crucial to consider how stroke affects psychological well-being. A significant proportion of stroke survivors suffers from depression and anxiety, and often experiences changes in emotional responsiveness. The demanding nature of the recovery process itself can become unbearable when coupled with the weight of mood disorders, and rehabilitation specialists explained the combination can decrease patient motivation. Managing psychological health post-stroke with neuropsychological counseling, medications, and the support of care networks is essential for successful rehabilitation and recovery.

Challenges in Implementing Stroke Innovation

Implementing new, innovative technologies in stroke care can often be difficult. Discussions with HFA physician mentors underscored that factors such as stakeholder buy-in and interoperability can affect the success of new technologies. In telestroke care, for instance, hospitals may not have the resources to afford select teleconferencing equipment. Even with the right technology, medical personnel might not be able to utilize these resources if it drastically disrupts their workflow or if they are not reimbursed for virtual consultations. One comment the HFA fellows heard repeatedly from stakeholders was: "If you've seen one stroke…you've seen one stroke." This insight demonstrates the challenge of treating and innovating for varied stroke incidences and outcomes. Additional design constraints come with patients who are older and/or poorer, whose technical savvy and access may be limited.

More information, including citations, can be found in the HFA "Stroke Landscape Analysis," finalized in November 2016.