Appendix B: DHMH Stroke Telemedicine White Paper

Improving Stroke Care through Telemedicine in Maryland

Maryland Department of Health and Mental Hygiene

Family Health Administration

Office of Chronic Disease Prevention

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Improving Stroke Care through Telemedicine in Maryland

Executive Summary

Within health care reform, Health Information Technology (HIT) is an integral part of improving access and quality to healthcare. Telemedicine is one example of an endeavor that has the potential to improve access and quality of care, while saving health care resources.

Stroke is a leading cause of death and disability in Maryland, thus a necessary focal area for any policies to improve access, quality, and efficiency of health care.[1] To address stroke care needs, the Maryland Institute for Emergency Medical Services Systems (MIEMSS) has designated 34 statewide hospitals as Primary Stroke Centers;[2] 17 of which are also accredited by the Joint Commission.[3] Yet, access to a neurologist, and/or a non-trauma neuro-ICU bed, for the acute stroke patient during a neurological crisis may not be assured in both urban and rural areas.

To improve stroke care, telemedicine will allow rural and other emergency physicians and staff to electronically consult on-call neurologists, make timely and appropriate decision-makings on optimal acute stroke care treatments, and then selectively transfer appropriate patients to a hospital capable of enhanced stroke care, including a neuro-intensive care unit (ICU) and a multi-disciplinary team to provide comprehensive stroke care. This will provide the

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[1] Maryland Vital Statistics Annual Report 2007. Department of Health and Mental Hygiene, Vital Statistics Administration, 2007. Available online at www.vsa.state.md.us/vsa/html/reports.html.
[2] See Appendix 5
[3] http://www.qualitycheck.org

best possible stroke patient triage and improve patient care. Telemedicine has the potential to improve access to quality health care and reduce associated costs.

The American Heart Association and American Stroke Association recommends the implementation of telemedicine within the stroke system of care[4] based on a comprehensive review of evidence-based research regarding the use of telemedicine for stroke care and delivery.[5] Additionally, several Maryland organizations have suggested health information technology, or telemedicine specifically, as a means of improving medical and stroke specific care: including Med-Chi, the Governor's Council on Heart Disease and Stroke, the Rural Health Council, and the Maryland Stroke Alliance.

Implementing a telemedicine system in Maryland, however, will require addressing infrastructure, financial, and medical-legal issues. To accomplish this, many other states have established leadership with a coordinating entity for telemedicine at the state level. In order to collaborate and standardize our telemedicine care and overcome the specific barriers mentioned above, there is a need in Maryland for a telemedicine network infrastructure and consortium. These organizing entities may assist in developing appropriate policies and procedures for addressing the technical and legal barriers to telemedicine, while developing a comprehensive, coordinated telemedicine system of care.

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[4] Schwamm, LH, Audebert, HJ, Amarenco, P, Chumbler, NR, et al. 2009. Recommendations for the Implementation of Telemedicine Within Stroke Systems of Care: A policy Statement From the American Heart Association. *Stroke*, 40: 2635-2660.

[5] Schwamm, LH, Holloway, RG, Amarenco, P, Audebert, HJ, et al. 2009. A Review of the Evidence for the Use of Telemedicine Within Stroke Systems of Care: A Scientific Statement From the American Heart Association./ American Stroke Association. *Stroke*, 40: 2616-2634.

Improving Stroke Care through Telemedicine in Maryland

Within health care reform, Health Information Technology (HIT) is an integral part of improving access and quality to healthcare. Telemedicine is one example of an endeavor that has the potential to improve access and quality of care, while saving health care resources. It can complement the benefits of electronic health records and health information exchange. Telemedicine harnesses the power of the HIT infrastructure to advance goals for delivering clinical care that promotes prevention and wellness as well as acute care and reaching a larger number of patients who would otherwise experience difficulties with access to quality health care.

The Burden of Stroke in Maryland

Stroke remains the third cause of death and the leading cause of disability.[6] A complete cardiovascular disease and stroke burden report is available within the Appendix. The prevalence of stroke in Maryland has varied slightly from 2005 to 2008 with the overall prevalence increasing from 2.1% in 2005 to 2.6 % in 2008. The 2008 data indicates that women have a slightly higher prevalence of stroke than men at 2.9%. Furthermore, Maryland residents aged 65 and over have the highest prevalence of stroke at 9.3%, almost three times higher than residents aged 55 to 64. Stroke prevalence increases among Maryland residents as the level of education decreases, and the same is true for income.

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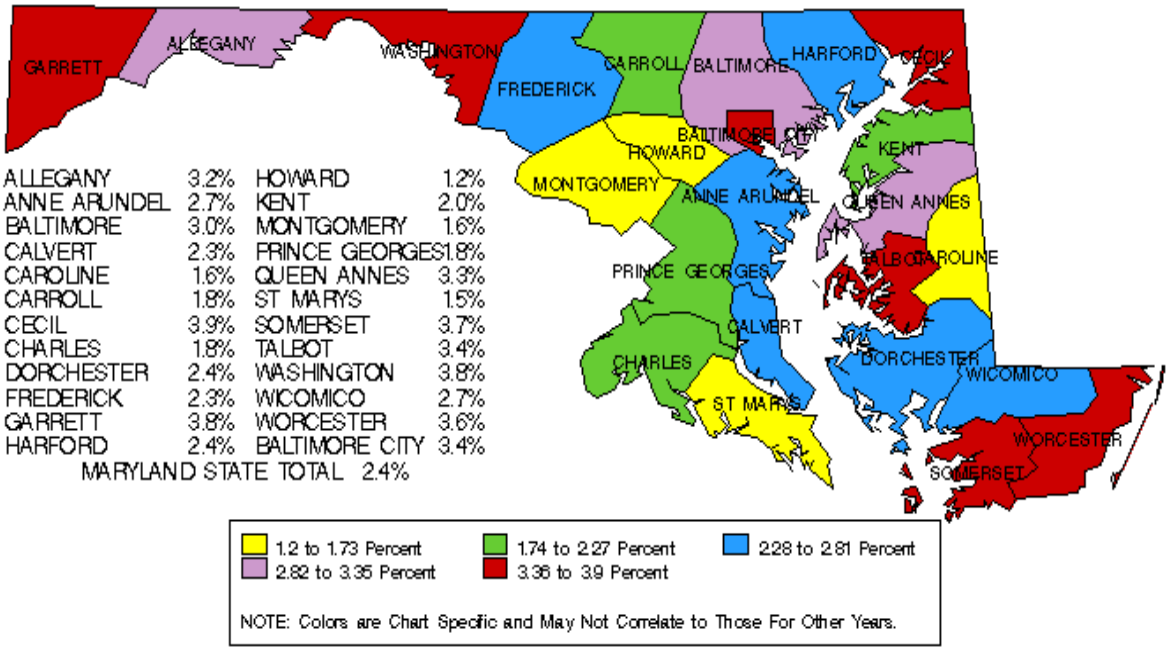
[6] Maryland Vital Statistics Annual Report 2007. Department of Health and Mental Hygiene, Vital Statistics Administration, 2007. Available online at www.vsa.state.md.us/vsa/html/reports.html.

The following map graphically represents, by county, the distribution of Maryland residents who have been told by a doctor they have had a stroke, as asked on the Maryland Behavioral Risk Factor Surveillance System survey.

Map 1. Maryland Residents Ever Told by a Doctor They Had a Stroke 2005-2008

Source: Maryland BRFSS

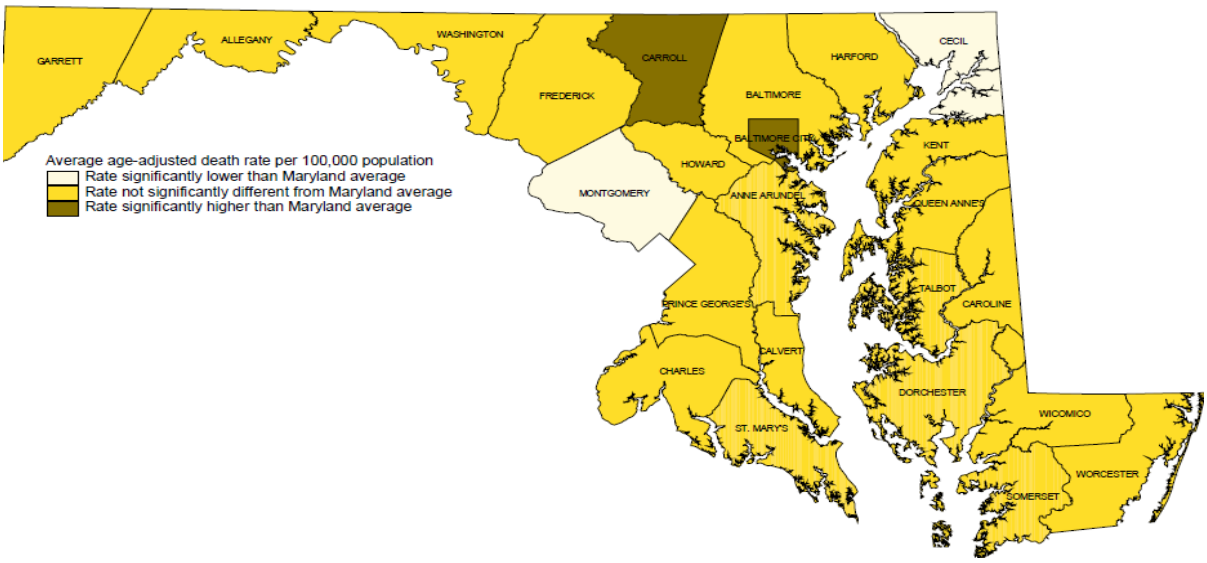


The overall death rate attributable to stroke has declined from 2005 to 2008 from 45 to 40 deaths per 100,000 residents. Black males experienced the largest decline in stroke mortality across the four years from 58.4 to 49.7 deaths. Black females also experienced a higher decline in stroke deaths than white males and females moving from 49.2 in 2005 to 41.8 in 2008. These death rates vary throughout the state and are higher in rural and urban settings.

Specifically, Carroll County and Baltimore City had a statistically higher three-year average age-adjusted death rate compared to Maryland's average.

Map 2: Comparison of County Age Adjusted Death Rates for Stroke to the Maryland Average, 2006-2008

Source: Maryland Vital Statistics Administration



Rural areas face several challenges to provide timely and comprehensive stroke care. According to Rural Healthy People 2010, "variances in [the] utilization of antithrombotic therapy, availability of technology, and specialists" are barriers to optimal stroke care in rural areas.[7] Neurologists deliver definitive stroke care, and in 2008, the Maryland Hospital

[7] Gamm, LD, Hutchison, LL, Dabney, BY, and Dorsey, AM, eds. 2003. Rural Healthy People 2010: A Companion Document to Healthy People 2010. Volume 1. College State, TX: The Texas A&M University System Health Science Center, School of Rural Public Health, Southwest Rural Health Research Center. http://srph.tamhsc.edu/centers/rhp2010/Volume1.pdf

Association and Maryland State Medical Society concluded that western Maryland and the Eastern Shore had severe shortages of these physicians.[8]

Problems with access, however, may also exist in urban and suburban areas if neurologists decide not to participate in acute stroke care because of the burden of 24/7/365 on-call schedules, poor reimbursement for the urgency and intensity of care required, disruption to their office schedules, medical-legal concerns, and demands that a sustained on-call schedule places on personal and family time.

Stroke Systems of Care

The American Stroke Association recommends the creation of a stroke system of care[9] with primary and comprehensive stroke centers.[10] In 2005, the Maryland State Advisory Council on Heart Disease and Stroke recommended creation of a Maryland stroke system of care.[11] The American Heart Association and American Stroke Association also recommends the implementation of telemedicine within the aforementioned stroke system of care[12] based on a comprehensive review of evidence-based research regarding the use of telemedicine for stroke care and delivery.[13] Integral components of stroke care for which there are evidence-based

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[8] MARYLAND HIT BY PHYSICIAN SHORTAGE, Silent Crisis Imperils Access to Many Medical Specialties, News Release, Maryland Hospital Association, MedChi, Jan. 7, 2008, 2pm. http://www.mdhospitals.org/mha/Health_Policy_Issues/Physician_Workforce_Study/Executive_Summary.pdf

[9] Schwamm, LH, Pancioli, A, Acker, JE, Goldstein, LB, et al. 2005. Recommendations for the establishment of stroke systems of care: recommendations from the American Stroke Association's Task Force on the Development of Stroke Systems. *Stroke*, 36:690-703.

[10] Alberts, MJ, Latchaw, RE, Selman, WR, Shephard, T, et al. 2005. Recommendations for comprehensive stroke centers: a consensus statement from the Brain Attack Coalition. *Stroke*, 36:1597-1618.

[11] Maryland State Advisory Council on Heart Disease and Stroke. 2005. "Strike out stroke": Maryland state action plan to improve stroke care. Maryland Department of Health and Mental Hygiene.

[12] Schwamm, LH, Audebert, HJ, Amarenco, P, Chumbler, NR, et al. 2009. Recommendations for the Implementation of Telemedicine Within Stroke Systems of Care: A policy Statement From the American Heart Association. *Stroke*, 40: 2635-2660.

[13] Schwamm, LH, Holloway, RG, Amarenco, P, Audebert, HJ, et al. 2009. A Review of the Evidence for the Use of Telemedicine Within Stroke Systems of Care: A Scientific Statement From the American Heart Association./ American Stroke Association. *Stroke*, 40: 2616-2634.

recommendations include neurological assessment, primary stroke prevention, emergency response, acute care, sub-acute care, and rehabilitation of stroke patients.[14] Optimal patient outcomes require timely patient access to a primary stroke center for diagnostic care decision-making and appropriate administration of IV-tPA treatment or intra-arterial recanalization therapies leading to improved patient outcomes. [15] If specialized care and an appropriate level of care is not possible, hospitals and emergency medical transportation services are required to efficiently triage and transport patients so that they will receive the indicated level of care.[16]

Maryland's Stroke System

The Maryland Institute for Emergency Medical Services Systems (MIEMSS) is an independent state agency responsible for the statewide system that coordinates emergency care including prehospital care, Emergency Departments, trauma and specialty centers. Beginning in 2007, MIEMSS initiated implementation of the Stroke System model in Maryland based on a regional approach for emergency treatment of the acute stroke patient to ensure that patients are transported to facilities capable of providing stroke care. Within this model, designated Primary Stroke Centers evaluate, stabilize and provide emergency care to patients with acute stroke. Then, depending on the patient's needs and the center's capabilities, either admit the patient to a stroke unit or transfer the patient to a receiving hospital with stroke unit resources.

As of January 1, 2010, MIEMSS has designated 34 (79%) of the State's 43 eligible hospitals as Primary Stroke Centers, with 17 also stroke-accredited by the Joint Commission.

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[14] Ibid. 2616-2634.
[15] Schwamm, LH, Pancioli, A, Acker, JE, Goldstein, LB, et al. 2005. Recommendations for the establishment of stroke systems of care: recommendations from the American Stroke Association's Task Force on the Development of Stroke Systems. *Stroke,* 36:690-703.
[16] Schwamm, LH, Pancioli, A, Acker, JE, Goldstein, LB, et al. 2005. Recommendations for the establishment of stroke systems of care: recommendations from the American Stroke Association's Task Force on the Development of Stroke Systems. *Stroke,* 36:690-703.

See complete map within the appendix. Recently, three additional hospitals have indicated their intent to apply for designation.

MIEMSS also implemented a statewide Maryland Neurological Emergencies Protocol for emergency medical service (EMS) providers with the objective of delivering patients within two hours of symptom onset to a facility capable of providing definitive stroke care. The Stroke Protocol includes identifying suspected acute stroke patients using the Cincinnati Prehospital Stroke Scale, transporting suspected stroke patients to a designated stroke center or closest Emergency Department if the Primary Stroke Center is greater than 30 minutes away, and online consultation with the receiving hospital. Data obtained from the Get with the Guideline-Stroke Registry comparing 2008-2009 findings indicates a 2.7% increase in pre-notification from EMS personnel, a 7.6% increase in eligible patients arriving within two hours of symptom onset, and an increase in treatment (IV t-PA) initiated within 3 hours of symptom onset. This data suggest improvements in consideration and utilization of thrombolytics for acute ischemic stroke.

Challenges to Ensuring Effectiveness Within the Maryland Stroke System of Care

Challenges to ensuring an effective stroke system of care include timely access to a primary stroke center, access to neurology and neurosurgery expertise, access to a neuro-ICU bed for an acute stroke patient, and cost-effective use of transportation resources.

Access to a primary stroke center. Access to primary stroke center care is the first step to securing effective care for stroke victims. Ensuring access may be problematic, especially in the rural regions of Western Maryland and the Eastern Shore. While designated stroke centers exist in most geographic areas of Maryland, the further a patient is from a primary stroke center, the more time that elapses from stroke onset to IV-tPA administration. This renders it less

effective in preserving brain function, and more dangerous by increasing the risk of intracranial bleeding complications. If patients who are qualified for IV-tPA are not treated within 4.5 hours of stroke onset, they cannot receive IV-tPA treatment. Further, robust data shows that even within the 4.5 hour treatment window, better clinical outcomes occur the earlier treatment begins. There is also a consensus that time is of the essence when pursuing intra-arterial recanalization therapies. Simply designating additional stroke centers in underserved areas may not ensure timely access if hospitals are unable to secure adequate access to neurologists and other relevant specialists, such as neuroradiological interventionalists, that are capable of performing intra-arterial therapies.

Access to neurologists. Maryland has 21 counties that are federally designated Health Professional Shortage Areas (HPSA) in the disciplines of primary medical care, dental, and mental health.[17] Of these, 12 are rural HPSAs.[18] In addition, the Upper Eastern Shore, Garrett county, and St. Mary's county are federally designated non-metropolitan statistical areas (non-MSA)), as defined by the US census bureau.[19] Furthermore, the Maryland Hospital Association and the Maryland State Medical Society (Med Chi) released a study that concludes, "Maryland is 16% below the national average for the number of physicians per capita in clinical practice. The most severe problems occur in rural parts of the state and will worsen by 2015." Specifically, the report highlighted Southern Maryland with critical shortages in 25 of the 30 physician categories (83.3%); Western Maryland 20 of 30 (66.7%) and the Eastern Shore 18 of 30 (60%). They assert that this will increase the burden and cost to emergency departments secondary to the rerouting of patients from remote hospitals for care.

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[17] http://hpsafind.hrsa.gov/HPSASearch.aspx [accessed 02/25/09]
[18] http://hpsafind.hrsa.gov/HPSASearch.aspx [accessed 02/25/09]
[19] U.S. Dept. of Labor, Bureau of Labor Statistics, Occupational Employment Statistics, May 2007 Metropolitan and Nonmetropolitan Area Occupational Employment and Wage Estimates. http://www.bls.gov/oes/current/oessrcma.htm [accessed 02/25/09]

Several reasons for this shortage are offered including an aging/retiring physician workforce; non-competitive physician reimbursement; lack of loan forgiveness programs to encourage physicians to practice in rural areas; and projected insufficient number of resident physicians choosing to stay in Maryland to practice medicine. A chart of physician specialties that was assessed in the Maryland study is in the Appendix.[20]

Specific to stroke, MIEMSS requires primary stroke centers to have either neurosurgical services available 24 hours-a-day with appropriate equipment and personnel, or an agreement with another hospital that meets these requirements. To date, four of the 34 designated hospitals lack the required neurosurgical services and thus have agreements with other hospitals to provide those services. Also, initially-designated MIEMSS Primary Stroke Centers may not be able to sustain their local stroke teams over time if the availability of neurologists and other expertise cannot be maintained.

Access to neuro-ICU beds for Acute Stroke Patient. Even under the best of circumstances, when patients arrive at a primary stroke center and a neurologist is available to assess and treat, transfers to another hospital with a neuro-intensive care unit (ICU may be necessary. In Maryland, four hospitals have a dedicated Neuro Intensive Care Unit with 58 non-trauma neuro-ICU beds. These hospitals include: Johns Hopkins; University of Maryland; Johns Hopkins Bayview and Holy Cross. This is considered an insufficient number of non-trauma neuro-ICU beds based upon a capacity assessment conducted by MIEMSS. Based upon a capacity assessment conducted by MIEMSS, 46 times per month the non-trauma availability of neuro-ICU beds for the acute stroke patients are at capacity. Telemedicine also allows patients

[20] MARYLAND HIT BY PHYSICIAN SHORTAGE, Silent Crisis Imperils Access to Many Medical Specialties, News Release, Maryland Hospital Association, MedChi, Jan. 7, 2008, 2pm. http://www.mdhospitals.org/mha/Health_Policy_Issues/Physician_Workforce_Study/Executive_Summary.pdf

from both rural and urban communities access to both primary and specialty care physicians by obviating the need for costly and difficult transportation.[21] Associated with access to a neuro-ICU is the availability of neurosurgical and interventional neuroradiological expertise to provide appropriate patient support in conjunction with their neurological colleagues.

Foundation for a Comprehensive Telemedicine System of Care in Maryland

The previously mentioned Maryland Hospital Association and MedChi study on the medical provider shortage areas proposed several solutions. Specifically, the report recommended medical liability reform so that Maryland is competitive with other states, there is an increase in the number of residency positions, and an emphasis on health information technology. Health information technology options are the focus of our review.

The Governor's Council for Heart Disease and Stroke has recommended a telemedicine initiative to address deficits in accessing quality stroke care in Maryland. The Maryland State Advisory Council on Heart Disease and Stroke had its beginning in 1972 with the Hypertension Detection Follow-up Program (HDFP), a study to evaluate the effectiveness of a statewide, coordinated, multidisciplinary approach to identifying, treating and following–up individuals with hypertension. On July 2, 2001, the Maryland General Assembly took action to rename the Council the "State Advisory Council on Heart Disease and Stroke." The broadening of the Council's scope and membership reflects the State's recognition that stroke is the number three cause of death and disability in Maryland, heart disease being the number one.

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[21] Maryland Rural Health Plan, Maryland DHMH, FHA, Office of Health Policy and Planning, State Office of Rural Health, June 2007, (chapter: Promoting Access To Care (page 25)), http://www.ruralforvm.state.md.us/News/Rural_Health_Plan_07.pdf

Specifically, the 2007 annual report indicated that the Council recommended beginning the process for telemedicine in Maryland, and suggested forming a coalition. The Council recognized that telemedicine technology began approximately in 1997 with the availability of closed circuit TV transmission from point A, a small community hospital, to point B, a larger hospital. Technology then migrated to the internet. The technology has advanced so physicians can see the patient, have imaging studies such as CT scans, and have the ability to document and archive the clinical encounter.

Additionally, in June 2007, the Maryland Rural Health Plan identified access to specialty care as one of the priority areas in improving healthcare in rural Maryland.[22] After presenting the plan in seven rural areas, local communities identified telemedicine as one of top three strategies in addressing rural access to health care. The October 2008 Rural Health Roundtable delineated a primary action plan for telehealth:

> "To develop a statewide telehealth consortium to support state level telehealth adoption; to share and pursue resources; to educate stakeholders on advancing of telehealth; and to facilitate the development of statewide policies, procedures, and protocols."[23]

Consequently in February 2009, the Rural Maryland Council and State Office of Rural Health convened a robust professional group, the Maryland Rural Telehealth Roundtable, to assess the feasibility for a telehealth consortium. As mentioned, The Maryland State Advisory Council on

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[22] Maryland Rural Health Plan. Department of Health and Mental Hygiene, Family Health Administration, 2007.

[23] http://www.ruralforvm.state.md.us/Roundtables/RRT4_08.html [accessed April 2009].

Heart Disease and Stroke also endorses State use of telemedicine and members of the Council participated in the Roundtable event.[24]

The Possibilities of Telemedicine

What is telemedicine and telehealth?

Telemedicine will improve access to neurologists and improve the quality of stroke care in Maryland. Telemedicine is defined by the American Telemedicine Association (ATA) as the "use of medical information exchanged from one site to another via electronic communications to improve patients' health status."[25] Telemedicine can be categorized into synchronous and asynchronous care. Synchronous care, also known as real-time telemedicine, is the use of live, continuous medical information exchange between health care provider and patient for diagnosis and/or treatment. Maryland specific examples include two-way videoconferencing applications such as telestroke, telemental health, and e-ICU. Asynchronous care encompasses both "store-and-forward" and home telehealth monitoring technology in which a patient's medical information is captured and stored for subsequent healthcare provider interpretation, diagnosis, and disposition. Examples include teleradiology, teledermatology, telepathology, and diabetic retinopathy telescreening.

Telehealth is a related but broader term. Telehealth encompasses clinical aspects aforementioned and non-clinical aspects of telemedicine such as continuing medical education, medical research, medical translation services, and healthcare systems administration and management. Telehealth enables the wrap around services associated with telemedicine without

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[24] Maryland State Advisory Council on Heart Disease and Stroke 2007 Annual Report. Department of Health and Mental Hygiene, Family Health Administration, 2007.
[25] American Telemedicine Association, 2009, *About Telemedicine*, available online: http://www.americantelemed.org/i4a/pages/index.cfm?pageID=3331 [accessed 02/11/09]

providing specific clinical services. There are numerous instances of telehealth being carried out throughout Maryland.

The delivery methods of telemedicine and telehealth are diverse and range from the most advanced technical use of high-speed internet to simple phone consultations. The ATA estimates that more than 200 telemedicine networks and more than 3,500 healthcare institutions are being used for telemedicine in the United States today.

What is the evidence for telemedicine?

Access to Care. Telemedicine can improve access to medical services. Subspecialist care can be provided to rural communities that have a difficult time recruiting or retaining physicians. Even when specialists are readily available, some specialties are in such high demand that the medical education system may not be able to produce a timely increase in physician supply.[26] Hence, even urban and suburban communities can benefit from telemedicine. Finally, certain critical care and stroke services require year round 24/7 specialist coverage to deliver optimal care. Specifically, two applications of telemedicine that address access to such care are telestroke and eICU. They utilize neurologists and critical care physicians respectively.

Quality of Care. Telemedicine facilitates the delivery of higher quality health care to increase rates of screening programs and preventive services, and to increase availability and adherence to the highest standard of medical care. The standard of care is a legal definition in medical malpractice cases. Synthesis of medical literature to form national best practices and guidelines (often by respected organizations in distinct medical specialties or fields, such as the

[26] Workforce Issues in Health Care Reform: Assessing the Present and Preparing for the Future. March 12, 2009, at 10:00 a.m., in 215 Dirksen Senate Office Building. http://finance.senate.gov/sitepages/hearing031209.htm

American Stroke Association or the American Diabetes Association[27]) is used along with medical experts to define the specific or local standard of care. It is generally accepted that the communities which lack access to needed specialist medical care or equipment consequently practice within a local standard of medicine that is within their abilities. Telemedicine can overcome this discrepancy by allowing specialists to teleconsult with referred patients in these areas, thereby elevating the local standard of medical care. Importantly, since medically complex patients often require multi-disciplinary care, telemedicine can facilitate a real time patient evaluation amongst several providers to define an optimal management plan.

Cost Savings. By improving quality of care through more efficient healthcare delivery, telemedicine and HIT can reduce costs through a reduction in redundant physician services and patient transportation expenditures.[28] As aforementioned, telemedicine that reaches underserved populations will enhance medical standards of care. This will produce superior outcomes, reduce morbidity and mortality, and diminish costly end-stage medical expenses. Visual impairment and blindness, for example, dramatically alter a person's quality of life. Related direct and indirect medical costs total $51.4 billion dollars.[29] In the United States, diabetic retinopathy is a major cause of visual impairment and blindness. Secondary prevention with retina telescreening systems will increase diabetic screening rates, enable timely detection of diabetic retinopathy, and guarantee cost-effective interventions.

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[27] Standards of Medical Care in Diabetes 2009, American Diabetes Association, http://care.diabetesjournals.org/content/32/Supplement_1/S13.full

[28] Vo AH, *The Telehealth Promise Better Healthcare and Cost Savings for the 21 Century*, AT&T Center for Telehealth Research and Policy Electronic Health Network University of Texas Medical Branch Galveston, Texas. May 2008.

[29] The Economic Impact of Vision Problems. The Toll of Major Adult Eye Disorders, Visual Impairment, and Blindness on the U.S. Economy. Prevent Blindness America. 2007 http://www.preventblindness.org/research/Impact_of_Vision_Problems.pdf

A successful example of the cost savings of telemedicine is the University of Texas Medical Branch – Galveston (UTMB). They provide over 200 remote medical exams each day and since inception have provided over 345,000 telemedicine consultations.[30] Since 1994 they have saved over $780 million dollars in their telemedicine services to the Texas Department of Corrections.[25] The Center for Information Technology Leadership developed a national provider-provider telemedicine implementation model and concluded that after the initial funding for a hybrid telemedicine system was recouped in year 5, a net annual savings of $4.28 billion dollars would accrue.[26,31] This savings is derived from reductions in patient transfers, face-face visits, and duplicative tests due to teleconsultation which accounted for the greatest percentage of savings with $3.61 billion dollars annually.[26, 27]

Reducing unnecessary hospital readmission rates by improving post-hospital discharge care may save money. The Obama Administration estimates that $26 billion could be saved over 10 years.[32] The Obama Administration continued to propose a solution in which Medicare bundled payments would be provided to cover post-acute providers in the 30 days of care after the hospitalization, as well as payment reductions if patients are re-admitted to the hospital within the same 30-day period.[27]

Home telehealth monitoring services, as part of a system of care-coordination, is one tactic to help hospitals achieve this desired outcome by allowing patients with chronic disease to receive more timely and cost-efficient healthcare monitoring in their home after

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[30] Vo AH, *The Telehealth Promise Better Healthcare and Cost Savings for the 21 Century*, AT&T Center for Telehealth Research and Policy Electronic Health Network University of Texas Medical Branch Galveston, Texas. May 2008.

[31] *Cusack CM, Pan E, Hook JM, Vincent A, Kaelber DC, Bates DW, & Middleton B. The Value of Provider-to-Provider Telehealth Technologies. Center for Information Technology Leadership. 2007. Charlestown, MA.*

[32] President Obama's Fiscal 2010 Budget; Transforming and Modernizing America's Health Care System. OMB Home; President's Budget; Fact Sheets. http://www.whitehouse.gov/omb/fy2010_key_healthcare/ [accessed May 2009]

hospitalizations.[33] In fact, the Veterans Health Administration recently reported results of a large national study that showed the significant benefits of their care coordination/home telehealth (CCHT) program. According to the study, "CCHT involves the systematic implementation of health informatics, home telehealth, and disease management technologies."[34] They report benefits from a cohort of 17,025 CCHT patients as follows: "25% reduction in numbers of bed days of care, 19% reduction in numbers of hospital admissions, and mean satisfaction score rating of 86% after enrolment into the program." [35] CCHT costs $1,600 per patient per year according to the study, which is less than nursing home care or other non-institutional care.[36,37]

The Telestroke Solution

To improve stroke care, telemedicine will allow rural and other emergency physicians and staff to electronically consult on-call neurologists and other pertinent specialists, make timely and appropriate decision-making on optimal acute stroke care treatments, and then

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[33] See S.457 – Fostering Independence Through Technology Act of 2009 for proposals of funding home telehealth monitoring pilot projects. http://www.govtrack.us/congress/billtext.xpd?bill=s111-457

[34] Adam Darkins, M.D., Patricia Ryan, R.N., M.S., Rita Kobb, M.N., A.P.R.N., Linda Foster, M.S.N., R.N., Ellen Edmonson, R.N., M.P.H., Bonnie Wakefield, Ph.D., R.N., and Anne E. Lancaster, B.Sc. *Care Coordination/Home Telehealth: The Systematic Implementation of Health Informatics, Home Telehealth, and Disease Management to Support the Care of Veteran Patients with Chronic Conditions*. TELEMEDICINE and e-HEALTH DECEMBER 2008, page 1118-1126.

[35] Adam Darkins, M.D., Patricia Ryan, R.N., M.S., Rita Kobb, M.N., A.P.R.N., Linda Foster, M.S.N., R.N., Ellen Edmonson, R.N., M.P.H., Bonnie Wakefield, Ph.D., R.N., and Anne E. Lancaster, B.Sc. *Care Coordination/Home Telehealth: The Systematic Implementation of Health Informatics, Home Telehealth, and Disease Management to Support the Care of Veteran Patients with Chronic Conditions*. TELEMEDICINE and e-HEALTH DECEMBER 2008, page 1118-1126.

[36] The MetLife Market Survey of Nursing Home & Assisted Living Costs. MetLife Mature Market Institute® in conjunction with LifePlans, Inc. October 2008. http://www.metlife.com/assets/cao/mmi/publications/studies/mmi-studies-2008-nhal-costs.pdf

[37] Genworth Financial 2008 Cost of Care Survey. Home Care Providers, Adult Day Health Care Facilities, Assisted Living Facilities, and Nursing Homes. April 2008. http://www.genworth.com/content/etc/medialib/genworth/us/en/Long_Term_Care.Par.14291.File.dat/37522%20CoC%20Brochure.pdf

identify appropriate patients for transfer to a hospital capable of comprehensive stroke care; including a neuro-intensive care unit and a multi-disciplinary team. This will ensure widespread availability of stroke treatment resources, increase the effectiveness of the Maryland Stroke System and improve stroke care throughout the state.

A September 2008 article in Lancet Neurology concluded that, "stroke telemedicine consultations result in more accurate decision making compared with telephone consultations and can serve as a model for the effectiveness of telemedicine in other medical specialties. The more appropriate decisions, high rates of thrombolysis use, improved data collection, low rate of intracerebral hemorrhage, low technical complications, and favorable time requirements all support the efficacy of telemedicine for making treatment decisions, and might enable more practitioners to use this medium in daily stroke care."[38] A commentary of this Lancet Neurology trial notes that while telestroke is not better than immediate patient transfer to a stroke center, "telemedicine consultation can be reasonably used when transfer to a stroke center is not possible." [39]

In May 2009, the American Heart Association released a favorable policy statement for the implementation of telestroke systems of care.[40] It reviewed evidence for telestroke in improving access to stroke neurologists and ameliorating decision-making for timely t-PA use in patients far from primary stroke centers:

- "It is recommended that a stroke specialist using high-quality videoconferencing provide a medical opinion in favor of or against the use of intravenous tPA in patients with

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[38] Efficacy of site-independent telemedicine in the Stroke DOC trial: a randomized, blinded, prospective study. The Lancet Neurology, Volume 7, Issue 9, Pages 787 - 795, September 2008.
[39] See Appendix 2
[40] http://stroke.ahajournals.org/cgi/reprint/STROKEAHA.109.192361v1.pdf

suspected acute ischemic stroke when on-site stroke expertise is not immediately available (Class I, Level of Evidence B)."[41,42]

- "Implementation of telestroke consultation in conjunction with stroke education and training for healthcare providers can be useful for increasing the use of intravenous tPA at community hospitals without access to adequate onsite stroke expertise (Class IIa, Level of Evidence B)." [43]
- A statewide telestroke initiative will facilitate rural and other hospital patients' timely access to a stroke neurologist consultation for determination of IV-tPA administration and the advisability for other advanced treatment strategies with the transfer of select patients for enhanced acute stroke care services. This will enable timely delivery of state-of-the-art stroke care within established national stroke treatment guidelines while saving transport resources.

Examples of Telemedicine in Maryland

Healthcare practitioners and organizations have pioneered diverse telemedicine applications in Maryland. Since November 2008,[44] the Maryland Telepsychiatry Program has offered psychiatry professional services to rural counties in Maryland in collaboration with the

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[41] See Appendix 2

[42] *A Review of the Evidence for the Use of Telemedicine Within Stroke Systems of Care. A Scientific Statement From the American Heart Association/American Stroke Association* Lee H. Schwamm MD, FAHA, Co-Chair; Robert G. Holloway MD, MPH, Co-Chair; Pierre Amarenco MD, FAHA; Heinrich J. Audebert MD; Tamilyn Bakas RN, DNS, FAHA, FAAN; Neale R. Chumbler PhD; Rene Handschu MD; Edward C. Jauch MD, MS, FAHA; William A. Knight IV MD; Steven R. Levine MD, FAHA; Marc Mayberg MD, FAHA; Brett C. Meyer MD; Philip M. Meyers MD, FAHA; Elaine Skalabrin MD; Lawrence R. Wechsler MD, FAHA; on behalf of the American Heart Association Stroke Council and the Interdisciplinary Council on Peripheral Vascular Disease http://stroke.ahajournals.org/cgi/reprint/STROKEAHA.109.192360v1.pdf

[43] See Appendix 2

[44] R. White, Telepsychiatry Now: Your Connection to Excellence in Psychiatric Care, InPsych (a publication of the University of Maryland Dept. of Psychiatry), Issue 10, Winter/Spring 2009. http://www.umm.edu/psych/pdf/newsletter_win_spr09.pdf

University of Maryland School of Medicine Dept. of Psychiatry, Mid-Shore Mental Health Systems (MSMHS) Inc. (private, non-profit organization), Maryland Dept. of Health and Mental Hygiene (Mental Hygiene Administration), Garrett County Core Service Agency, and St. Mary's County Dept. of Human Services.[45] Counties served through this program include: St. Mary's, Garrett, Dorchester, Talbot, Kent, and Caroline.[46] This program utilizes videoconferencing equipment from Tandberg, Inc. to provide interactive psychiatry services to patients. Telepsychiatry is used to provide an alternative for rural communities that have difficulty accessing in-person psychiatric care particularly for child and adolescent psychiatry. Funding for the program is provided by the Health Resources and Services Agency (HRSA), Office of Rural Health Policy and Dept. of Health and Mental Hygiene/Mental Hygiene Administration (DHMH/MHA).[47] MSMHS recognizes that such programs are necessary in addressing professional shortages, especially in rural areas. Telepsychiatry addresses the shortage of psychiatric subspecialist care as well as the expense, effort, and time of reaching that care from rural communities.[48, 49]

Additional University of Maryland initiatives include the use of telemedicine in the Dept. of Obstetrics and Gynecology to provide high-risk pregnancy consultations with St. Mary's

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[45] 2009 GUIDE to Public Mental Health Services in Caroline, Dorchester, Kent, Queen Anne's and Talbot Counties Maryland, Mid-Shore Mental Health Systems, inc., October 2008, http://www.kentcounty.com/lmb/pdf/2009%20Resource%20Guide%20email%20version%20as%2010-27-08.pdf [accessed March 2009]

[46] 2009 GUIDE to Public Mental Health Services in Caroline, Dorchester, Kent, Queen Anne's and Talbot Counties Maryland, Mid-Shore Mental Health Systems, inc., October 2008, http://www.kentcounty.com/lmb/pdf/2009%20Resource%20Guide%20email%20version%20as%2010-27-08.pdf [accessed March 2009]

[47] R. White, Telepsychiatry Now: Your Connection to Excellence in Psychiatric Care, InPsych (a publication of the University of Maryland Dept. of Psychiatry), Issue 10, Winter/Spring 2009. http://www.umm.edu/psych/pdf/newsletter_win_spr09.pdf

[48] Maryland Vital Statistics Annual Report 2007. Department of Health and Mental Hygiene, Vital Statistics Administration, 2007. Available online at www.vsa.state.md.us/vsa/html/reports.html.

[49] MARYLAND HIT BY PHYSICIAN SHORTAGE, Silent Crisis Imperils Access to Many Medical Specialties, News Release, Maryland Hospital Association, MedChi, Jan. 7, 2008, 2pm. http://www.mdhospitals.org/mha/Health_Policy_Issues/Physician_Workforce_Study/Executive_Summary.pdf

Hospital, Union Hospital in Elkton and Calvert Memorial Hospital in Prince Frederick County.[50] St. Mary's Hospital also consults with Children's National Medical Center in Washington, D.C. for high-risk pregnancy telemedicine.[51] In the UMMC Greenebaum Cancer Center, radiation oncologists use telemedicine to consult on cases from the Central Maryland Oncology Center in Columbia, Montgomery General Hospital in Olney and Baltimore Washington Medical Center in Glen Burnie. [52]

Johns Hopkins University has the Johns Hopkins International Medical Second Opinion program in which reports and live video conferences are sent via telemedicine (approximately 600 cases per year). Howard County General Hospital in Columbia uses Johns Hopkins pediatric teleradiologists to read their neonatal intensive care unit x-rays. [53] Johns Hopkins Dept. of Infectious Diseases teleconsults with the Maryland state prison system for inmate care.

In April 2008, Maryland e-Care announced the largest collaboration of independent hospitals to provide intensive medical care in the country. This collaboration includes six hospitals-- Atlantic General Hospital, Calvert Memorial Hospital, Civista Medical Center, Peninsula Regional Medical Center, St. Mary's Hospital, and Washington County Health System. As part of this collaborative, Christiana Care Hospital provides intensive medical care coverage for the ICU in these hospitals during overnight hours and during weekends/holidays

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[50] A. Dessoff, Techlink: MD hospitals use telemedicine, advanced video technology, The Baltimore Daily Record, Aug, 30, 2006, Dolan Media Newswires. http://findarticles.com/p/articles/mi_qn4183/is_20060830/ai_n16698145?tag=content;col1 [Accessed March 2009]

[51] Healthy Living 2003: Spring 2003 Cover Story, Beautiful Surrounds to Welcome Your New Baby, http://www.smhwecare.com/news_healthyliving_pasttopics2003.html , St. Mary's Hospital News. [accessed March 2009]

[52] A. Dessoff, Techlink: MD hospitals use telemedicine, advanced video technology, The Baltimore Daily Record, Aug, 30, 2006, Dolan Media Newswires. http://findarticles.com/p/articles/mi_qn4183/is_20060830/ai_n16698145?tag=content;col1 [Accessed March 2009]

[53] A. Dessoff, Techlink: MD hospitals use telemedicine, advanced video technology, The Baltimore Daily Record, Aug, 30, 2006, Dolan Media Newswires.

using a telemedicine application called eICU, from VISICU (a Philips Company; Baltimore, MD).

eICU allows intensivist physicians and critical care nurses at Christiana Care Hospital to monitor ICU patients remotely using video cameras and to communicate with the nurses at the remote ICU hospitals to provide guidance for further tests or medical interventions. This system has been studied and shown to decrease patient mortality and ICU length of stay.[54] It is in use in over 200 hospitals throughout the country. The reason cited for the Maryland e-Care collaborative is the shared difficulty of rural hospitals in recruiting and retaining enough intensivist physicians to provide optimal care in their ICUs.[55] Maryland e-Care was initiated by a $3 million grant from Maryland CareFirst, independent licensee of the Blue Cross and Blue Shield Association.[56] The eICU program will be sustained with a business model that charges each hospital a fee of $37,700 per intensive care bed each year. [57, 58]

Telemedicine also has the potential to assist in the delivery of clinical care in certain specialty treatment areas, such as perinatal care and trauma care. As such, Maryland hospitals with clinical expertise in specialty care areas can be linked with providers in outlying hospitals to augment the care capabilities at the outlying hospital, meet immediate patient needs and identify patients who need to be transferred to specialty care centers.

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[54] Clinical Benefits of the eICU® Program, http://visicu.mediaroom.com/index.php?s=41 [accessed March 2009]. Clinical and Financial Evidence for Improving Quality and Efficiency in Your ICU, Dec. 2007, http://visicu.mediaroom.com/file.php/95/Folio+Booklet+%28Sequential%29.pdf [accessed March 2009]

[55] M. Greenwell, Doctors To Monitor ICU Patients Electronically, http://www.washingtonpost.com/wp-dyn/content/article/2008/04/28/AR2008042801225.html, Washington Post, April 29, 2008.

[56] CareFirst Funds $3 Million for 24-Hour ICU Care in Rural MD, News Releases, http://www.carefirst.com/media/NewsReleasesDetails/NewsReleasesDetails_20080429.html [accessed March 2009]

[57] M. Greenwell, Doctors To Monitor ICU Patients Electronically, http://www.washingtonpost.com/wp-dyn/content/article/2008/04/28/AR2008042801225.html, Washington Post, April 29, 2008.

[58] 2009 GUIDE to Public Mental Health Services in Caroline, Dorchester, Kent, Queen Anne's and Talbot Counties Maryland, Mid-Shore Mental Health Systems, inc., October 2008, http://www.kentcounty.com/lmb/pdf/2009%20Resource%20Guide%20email%20version%20as%2010-27-08.pdf [accessed March 2009]

Despite successful telemedicine pilot programs and the potential for use in additional clinical areas, there are significant barriers that should be addressed to develop and implement a statewide telemedicine system that could routinely and systematically improve medical care.

Barriers to Telemedicine

The "Telemedicine-Use and Reimbursement Study," as required under Maryland Senate Bill 728 (2006), concludes that barriers to telemedicine implementation in Maryland are the same as the national barriers: which include infrastructure, financial, and legal and regulatory issues.[59]

Infrastructure Barrier:

The first barrier is to determine if the development of a telemedicine network is necessary. Supporters of a telemedicine network suggest that this network must be redundant, reliable, secure, high-speed (≥45 Mbs/sec), private, standardized, and able to connect to the Internet2/LambdaRail backbone for eventual interstate telemedicine and disaster recovery efforts. The creation of such a network has been fostered by grants from the federal government such as the Rural Health Care Pilot Program from the Federal Communications Commission (FCC) and the Telecommunications Reform Act of 1996 through the Universal Services Fund (USF). Both of these grants have delivered hundreds of millions of dollars to states to develop such a network to reach rural communities.

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[59] *Baquet CR*, Required under Maryland SB 728 (2006), "Telemedicine-Use and Reimbursement Study", University of Maryland School of Medicine. Baltimore, MD.

Maryland has not received funding from the FCC grant, but the Dept. of Budget and Management used state capital funds to deploy networkMaryland™, which is a "statewide high-speed network for public sector use."[60] The network was created from an initiative to utilize resource shared fiber optic cable assets throughout the state to provide affordable, high-speed bandwidth to all areas of the State and to provide a cost savings to the citizens of the State of Maryland.[60] This network is continuing to build-out and has reached large parts of Maryland including rural communities. They already have a pricing structure to begin providing services to customers.[61]

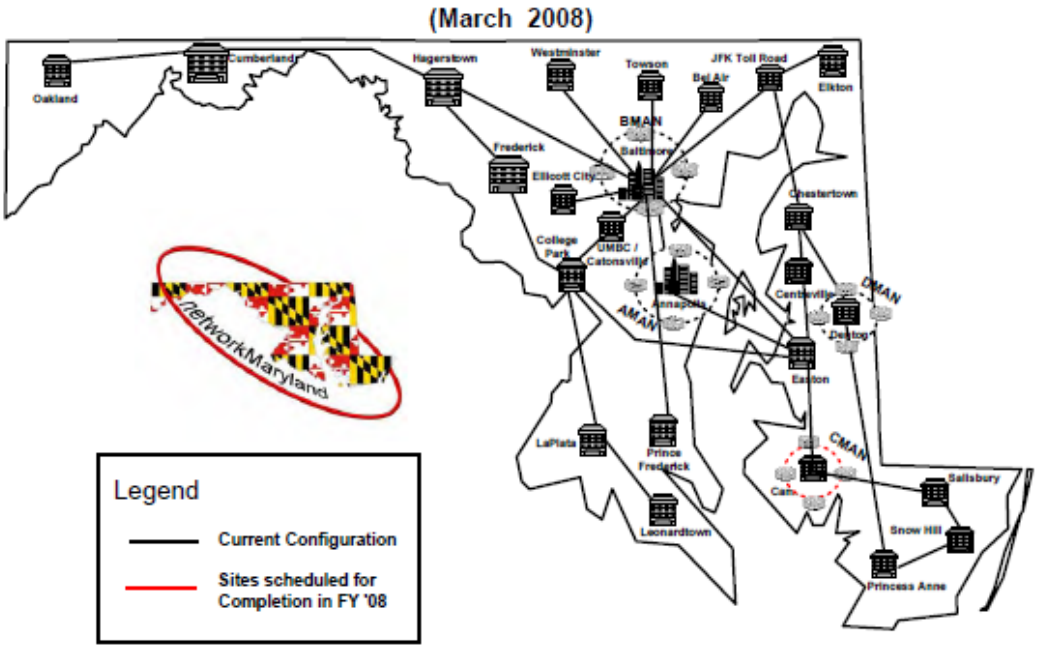

Figure 2. networkMaryland™ Design Overview

The Maryland Broadband Cooperative (MDBC) "is a public/private partnership to promote economic development through the deployment of technology supporting

[60] http://doit.maryland.gov/support/Pages/networkMaryland.aspx [accessed 02/25/09]
[61] networkMaryland Customer Information Package, April 2008, Version 7, http://doit.maryland.gov/support/Documents/nwmd_about/customerinformationpackage.pdf

infrastructures."[62] Their mission is related to driving economic development via universal, open access to broadband services in rural Maryland by building an advanced, world-class broadband network across the rural communities of Eastern, Southern and Western Maryland supported by its' members who provide "Last Mile" services.[62] It is funded by the Maryland Dept. of Business and Economic Development through the Maryland Rural Broadband Assistance Fund for the total amount of $9,839,383 from 2007-2010.[63] Access their interactive service map with completion dates for the entire state of Maryland here: http://www.mdbc.us/mdbc_map.html .

As with any network initiative, the final obstacle is often termed the "last mile" because it is the final connection between hospitals/healthcare institutions (both hub and spoke), radiology centers, community clinics, private physician offices, and state health departments which must be made for implementation of services. According to the MDBC, they have already connected the Lower Shore, Mid Shore, and Southern Maryland with a high-speed fiber optic network backbone and plan to have the Upper Shore and Western Maryland completed in the 2008-2009 timeline. As there are competing network initiatives in Maryland, pricing will be favorable and further boost the prospects of connecting the last mile. Redundancy will also assist with meeting federal goals of creating telehealth networks for use in natural disasters, terrorism, or other threats to national security. With such a network connected to the rural areas of Maryland, it will be straightforward to connect this backbone to the Internet2/LambdaRail as well as the hubs in central Maryland. Then a telehealth network infrastructure will be in place to fully support all of the current possibilities in telemedicine services in Maryland.

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[62] http://www.mdbc.us/ [accessed 02/25/09]
[63] T00F Dept. of Business and Economic Development PAYGO, Rural Broadband Assistance Fund (Statewide). http://mlis.state.md.us/2008RS/budget_docs/All/Operating/T00F_-_Dept_of_Business_and_Economic_Development_PAYGO.pdf

However, consensus regarding the need for a second redundant line is diminishing. Proponents suggest that technology has advanced to the point that reliance on the World Wide Web is adequate for telemedicine initiatives.

Telemedicine Financing and Reimbursement:

Medicare: The federal government regulates Medicare and has passed three important acts: Balanced Budget Act of 1997, Benefits Improvements and Protection Act of 2000 (part of Consolidated Appropriations Act of 2001) and Medicare Improvements for Patients and Providers Act of 2008. As a result, Medicare now reimburses a healthcare provider who delivers specified services via interactive audio-video telecommunications between patient and provider in specified settings. With the exception of federal telemedicine demonstration programs, rural HPSAs or counties not classified as a metropolitan statistical area (MSA) will be paid equal to the professional service if it were performed without telemedicine.[64] Although "store and forward" or asynchronous forms of telemedicine are only covered under federal telemedicine demonstration programs in Alaska or Hawaii, the Centers for Medicare and Medicaid (CMS) does recognize that "a service may be considered to be a physician's service where the physician either examines the patient in person or is able to visualize some aspect of the patient's condition without the interposition of a third person's judgment."[64] As a result, interpreting electrocardiography (ECG), electroencephalography (EEG), or diabetic retinopathy telescreening can be considered general services that are billable through Medicare but are not considered telemedicine even though they may be electronically transferred. Current federal legislation, the Medicare Telehealth Enhancement Act of 2009, presents continual change to telemedicine laws.

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[64] Medicare Benefit Policy Manual, Chapter 15 – Covered Medical and Other Health Services, http://www.cms.hhs.gov/Manuals/downloads/bp102c15.pdf [accessed 02/12/09]

Medicaid: Medicaid is an important federal-state partnership for providing medical care to low-income Americans. Although there are general requirements to receive federal funding, states have flexibility in choosing what services it will reimburse. Telemedicine is not recognized as a service under the Federal Medicaid statute, but at least 27 states (20 with law/legislation) in 2003[65] had begun reimbursing for services that would be defined as telemedicine under Medicare. These services must satisfy federal requirements for efficiency, economy, and quality of care.[66]

States have flexibility in how much and to whom they reimburse for telemedicine services. The Telemedicine Reimbursement Report offers some insight into the Medicaid reimbursement practices of various states and their respective laws/statutes.[65] Specifically, states can reimburse for these services and identify them with modifier codes, but it is not required. This makes tracking the use of telemedicine services through Medicaid difficult. Finally, Medicaid is required to abide by the Medicare Conditions of Participation, which requires set intervals that a physician must physically visit a long-term care facility.[66]

Maryland currently does not reimburse for telemedicine services through Medicaid (May 2009). See Appendix 1 for a table from the University of Maryland School of Medicine, Office of Policy and Planning that compiled research into Medicaid reimbursement laws/legislation in 2006 as part of the Telemedicine-Use and Reimbursement Study.[59]

Private Payers: Medicare and Medicaid are the second and third largest payers of health care in the United States with 13% and 12% respectively compared to 12% and 9% respectively

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[65]Center for Telemedicine Law, Telemedicine Reimbursement Report Office for the Advancement for Telehealth, HRSA, October 2003.
[66] Medicaid Telemedicine Overview, http://www.cms.hhs.gov/Telemedicine/ [accessed 02/17/09]

for Maryland.[67] However, private payers as a group covered 58% of the American people and 65% of Marylanders.[67] Like Medicaid, private payers are not federally mandated to provide reimbursement for telemedicine. Seven states in 2003 had legislation or other forms of policy regarding private payer reimbursement of telemedicine.[65] However, surveys show that many more states have private payers that are reimbursing telemedicine. To characterize the scope and depth of private payer telemedicine reimbursement, the American Telemedicine Association and AMD Telemedicine surveyed 72 telemedicine programs which billed for telemedicine. Over 100 private payers reimbursed for telemedicine through 38 programs across 25 states.[65] A follow up study also showed that 65 of the 116 contacted telemedicine programs with potentially billable services responded. Thirty-six programs (55%, two programs stopped billing) stated they did receive private payer telemedicine reimbursement and 81% stated their reimbursement fees were the same as equivalent non-telemedicine services (17% could not respond, one program said there was slight variation).[68] Fifty-six percent stated they do not receive reimbursement from HMOs, 31% stated they did, and 11% did not know.[68] Fifty-eight percent of the programs do not bill a facility fee, 17% do bill, and 19% stated inconsistent facility fee billing practices.[68] No private payers are reimbursing in Maryland.

Legal Barriers:

The medical-legal aspects of telemedicine represent a significant barrier to its widespread implementation. The issues remain with three distinct issues: licensing, credentialing, and

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[67] Urban Institute and Kaiser Commission on Medicaid and the Uninsured estimates based on the Census Bureau's March 2007 and 2008 Current Population Survey (CPS: Annual Social and Economic Supplements). http://www.statehealthfacts.org/

[68] Whitten Pamela, Buis Laurie. Private Payer Reimbursement for Telemedicine Services in the United States. Dept. of Telecommunication, Michigan State University

malpractice. Most importantly, the medical-legal issues need to be addressed at the national level.

Currently, each state is responsible to police the practice of medicine by issuing licenses to qualified medical professionals to practice the art and science of medicine based upon stringent requirements. However, standards for practicing medicine are relatively uniform across the country. For example, stroke standards for clinical care are the same in New Mexico as in Maine. Once given a valid license, the medical professional has the legal right to practice medicine in the particular state that issued it. Thus, telemedicine use across state boundaries is impossible without securing multiple state licenses, interstate licenses or federal licenses to practice medicine. Although some states have created a special purpose telemedicine license, this fad is phasing out.

Maryland law does not require an out-of-state physician to have a Maryland license to consult with a Maryland physician if the Maryland physician is actually treating the patient [Health Occupations 14-302(2)]. Also, a physician who resides in another state or jurisdiction adjoining Maryland whose practice extends into this state but who does not have an office in this state does not need a license if the same privileges are extended to physicians of Maryland by the adjoining state or jurisdiction [Health Occupations 14-302(4)]. In practice, this means physicians in the District of Columbia do not need a Maryland license to practice in Maryland. There is also an exception from full Maryland licensure requirement for an "eminent physician" from outside the state…Some standards still apply. (Health Occupations 14-319)."[59]

Options include a national licensure system, a multi-state compact-- similar to the mechanisms in place for RNs--, or establishing a regional licensure system through negotiations

with neighboring jurisdictions. Specifically, by partnering with adjacent state legislatures and medical boards to create inter-institutional credentialing agreements might mitigate certain of the medico-legal issues. Another solution that allows for interstate licensing would be implementation of a national system, which must be addressed at the national level. Maryland's role should be educating and advocating for this national system. Opponents argue that states have historically been and have done a good job at policing the practice of medicine and this solution might be slow to be realized. Options should be explored in further depth.

Credentialing of medical professionals is a second area that may create barriers to telemedicine implementation. Credentialing takes place by hospitals, healthcare insurance plans, and medical boards who use guidance from The Joint Commission, the National Committee for Quality Assurance (NCQA), and the Centers for Medicare and Medicaid. The purpose of medical credentialing is to verify the education, training, experience, and other background details pertaining to medical professionals for the practice of medicine. The Joint Commission released revised hospital credentialing standards in January 2004 that addressed telemedicine issues in their Comprehensive Accreditation Manual for Hospitals. Specifically, the report indicates that licensed practitioners who are responsible for the care, treatment, and services of the patient via telemedicine link are subject to the credentialing and privileging processes of the originating site.[69] Alternatively, the state could develop a credentialing process for the purpose of telemedicine if it would be accepted by the Centers for Medicare and Medicaid Services.

Unfortunately, the Centers for Medicare and Medicaid require medical staff to be credentialed at both the originating and distant sites in order to receive Medicare reimbursement. This is an ineffective use of resources, as it duplicates credentialing that already has occurred by

[69] Medical Staff chapter of JCAHO's 2004 Comprehensive Accreditation Manual for Hospitals.

the larger medical institution. Additionally, many of the community based hospitals lack adequate expertise to credential specialists. Centers for Medicare and Medicaid regulations must be reinterpreted to change current practice. Maryland-based stakeholders could be influential in articulating the need for regulation reinterpretation and greater efficiency.

A final barrier is medical malpractice. There is no case law to establish precedents for malpractice related to telemedicine. Establishing what constitutes the patient-physician relationship is critical to addressing this issue. In medical malpractice suits, the plaintiff is often required, as a prerequisite for medical liability, to convince the court that the defendant practiced medicine as part of a patient-physician relationship. The question revolves around the issue of whether or not the medical professional using telemedicine is engaged in the patient-physician relationship or is consulting the other medical professional solely. Fleischer and Dechene discuss the legal nuances concerning this issue in their book, Telemedicine and E-health Law, yet legal ambiguity remains concerning this issue. No case law currently exists.

Although telemedicine brings into question the definition of a relationship, research indicates that telemedicine may reduce the likelihood of medical malpractice in some cases[70]. Specifically, litigation more commonly results from failure to document appropriately why tPA was withheld rather than adverse outcomes from tPA administration. Telemedicine increases the utilization of tPA. The telemedicine system also may have a feature that automatically documents tPA orders. Thus, telemedicine may both raise and solve issues associated with malpractice.

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[70] American Heart Association. 2009.

Addressing the Barriers in Maryland

The California Telehealth Network, New England Telehealth Consortium, Arizona Telemedicine Program, and New Mexico Telehealth Commission are all approaches to establish leadership with a coordinating entity for telemedicine at the state level. Maryland has piloted and advanced telemedicine services in several medical specialties, and Maryland scientists have developed telemedicine technology, systems, and devices. Yet, in order to collaborate and standardize our telemedicine care and overcome the specific barriers mentioned above, there is a need in Maryland for a telemedicine network infrastructure and consortium. These organizing entities may assist in developing appropriate policies and procedures for addressing the technical and legal barriers to telemedicine, while developing a comprehensive coordinated telemedicine system of care.

Of particular importance is assurance that efforts related to the Health Information Exchange are in parallel with the any telemedicine endeavors. The Maryland Health Care Commission (MHCC) and the Health Services Cost Review Commission (HSCRC) are working toward the development of a long-term, sustainable plan for supporting the effective, efficient, and secure exchange of health information across the spectrum of health care stakeholders. The Commissions are supporting the work of the Task Force to Study Electronic Health Records, established by legislation enacted by the Maryland General Assembly during its 2005 session. Over the next two years, the Task Force will study the current use, and potential expansion of, electronic health records across the state. Its 26 members include representatives of the Maryland Senate and the House of Delegates, the Office of the Attorney General, the Johns Hopkins and the University of Maryland Schools of Medicine, and the federal Veterans Administration, as

well as twenty members appointed by the Governor to represent a broad range of provider and consumer interests, as specified in the enabling legislation.

A Maryland Telemedicine Consortium could be considered. Its purpose would be to promote the statewide use of telemedicine as a prime utilization of HIT to increase access, improve quality, and reduce costs of Maryland's healthcare system, as well as serve as a unified and decisive voice for Maryland's businesses, hospitals, physicians, universities, and government agencies that hold value in telemedicine and can better apply for and compete for federal funding as part of ARRA and other future stimulus funding. [71, 72]

Strategies and Considerations for Success

The Office of Chronic Disease Prevention contracted to conduct an assessment of the technology and infrastructure currently implemented for telestroke care in other states. Specifically, interviews were conducted of existing telestroke programs in nine states to gain understanding of their scope, administration, costs, and financing (Georgia, New York, Massachusetts, Michigan, Kentucky, Texas, Virginia, Sothern California and Western Pennsylvania), as well as five telestroke vendors to gain understanding of technology needs, capabilities and costs. (REACHCall, BF Technologies, InTouch, Polycom, and Specialists on Call). The report is available within the Appendix.

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[71] Maryland State Advisory Council on Heart Disease and Stroke 2007 Annual Report. Department of Health and Mental Hygiene, Family Health Administration, 2007.
[72] Health Information Technology. American Recovery and Reinvestment Act (Recovery Act) Implementation Plan. Office of the National Coordinator for Health Information Technology. http://www.hhs.gov/recovery/reports/plans/onc_hit.pdf

The leading recommendation was to hire a consultant with expertise in implementing telestroke programs to determine how to best implement a telestroke program in Maryland. The consultant could lead the technical, legal, and financial issues to be considered. Additionally, there are four main options for technology: 1) purchasing some kind of proprietary "cart" system; 2) leasing the InTouch robots; 3) contracting with Specialists on Call to provide the stroke call and required technology; or 4) engaging a collaborative effort with information specialists representing stakeholders in Maryland to develop a "cart" system utilizing "off the shelf technology". Of these three, the cart option seems best suited to Maryland. The assessment also indicated an estimated start-up cost of $1 million. Several business models were identified for a telemedicine system, including Hub absorbs all costs, Hubs and Spokes pay for own technology and hubs charge for consults, Grants/Philanthropy, and Reimbursement for telestroke consults, including private payers, Medicare and Medicaid.

Conclusion

Telemedicine is an innovative tool that can address rising healthcare costs and lack of access to the medically underserved. The opportunity exists to meet the growing demand for affordable and accessible healthcare. Telemedicine can and should play an important role in revitalizing our healthcare system. ARRA funding may provide the stimulus to promote broadband networks, HIT/HIE, and telemedicine to spur economic development and technology related Maryland job growth. Were these grants not available, telemedicine would still be primed for implementation by industry, academia, and government. By judiciously adopting incremental telemedicine services, targeted solutions can address hospital, physician, patient, and

community needs. Stakeholders will appreciate telemedicine's unique advantages and collaborate to "Build a Telemedicine System of Care in Maryland."

To promote a telemedicine system of healthcare, a Maryland Telemedicine Network could be considered to facilitate the identification of solutions to the barriers described. With the assistance of stakeholders, the Department could lead the consideration of barriers, such as network infrastructure, reimbursement, and medical-legal issues. Additionally, discussions could seek to establish telemedicine standards and guidelines, as well as provide oversight and regulation for the Maryland Telemedicine Network. Finally, DMHM may ensure collaboration between the Maryland Health Care Commission and the Health Services Cost Review Commission, and other state entities related to the health information exchange.

Appendices

Appendix 1: Heart Disease and Stroke Burden Report

MARYLAND HEART DISEASE AND STROKE PREVENTION PROGRAM

The Maryland Heart Disease and Stroke Prevention Program, along with other state and local partners, will use the report findings to guide the implementation of statewide strategies found in the Maryland Heart Disease and Stroke Prevention and Control Plan. This Report, in conjunction with the Plan, is a requirement of the cooperative CDC funding agreement of the Maryland Heart Disease and Stroke Prevention Program. Based on the Social-ecological Model, the essential strategies of the program are to use education, policy and systems changes to increase heart disease and stroke prevention with emphasis on six program priority areas:

1. Addressing control of high blood pressure and high blood cholesterol in adults and older adults

2. Increasing knowledge of signs and symptoms for heart disease and stroke and the importance of calling 9-1-1

3. Improving emergency response

4. Improving quality of heart disease and stroke care

5. Eliminating health disparities

6. Focusing on the health care and worksite settings

Additional required activities of the cooperative agreement are to develop the foundation for a comprehensive cardiovascular disease prevention program through:

1. Partnership development

2. Definition of the burden of heart disease and stroke

3. Development of a State Plan

4. Pilot testing interventions

The Governor's Council on Heart Disease and Stroke serves as the advisory group for the grant providing strategic planning leadership and partnering in the production and evaluation of the Plan. Additional information is available through the Office of Chronic Disease Prevention web site: http://fha.maryland.gov/cdp/ .

APPENDIX A: DATA SOURCES

DATA SOURCE	DESCRIPTION
MD Behavioral Risk Factor Surveillance System (BRFSS)	The Maryland BRFSS is an ongoing telephone surveillance program designed to collect data on the behaviors and conditions that place Marylanders at risk for chronic diseases, injuries, and preventable infectious diseases. The typical sample size each year is 4,400 households with an adult respondent 18 years of age or older. The data in this report are based on the weighted data. The weighting method involved adjustments of the sample proportions of selected demographic characteristics so that they equal the sample proportions in the population and also adjustments of the sample surveyed so that it represents the State population. Refer to www.marylandbrfss.org for more information on Maryland BRFSS. National BRFSS data can be downloaded from www.cdc.gov/brfss
MD Health Services Cost Review Commission	The Maryland Health Services Cost Review Commission created a significant data infrastructure that includes a uniform accounting and reporting system and extensive data collection on, and analysis of, every aspect of hospital operations. To fulfill its broad disclosure responsibilities, it distributes annual reports on hospital operations and makes all such Commission files accessible to the public. Refer to http://www.hscrc.state.md.us/index.cfm for more information on Maryland Health Services Cost Review Commission

MD Vital Statistics Administration	The Maryland Vital Statistics Administration is charged with registering all births, deaths, and fetal deaths occurring in the State of Maryland; issuing certified copies of birth, death, and marriage certificates and providing divorce verifications; compiling and analyzing vital statistics data; preparing annual estimates of the population of Maryland by political subdivision, age, race, and sex; preparing mandated vital statistics and population reports; and supplying vital statistics and population data to users in the public and private sectors. Refer to http://www.vsa.state.md.us/ for more information on Maryland Vital Statistics Administration.

APPENDIX B: DEFINITIONS

Cardiovascular disease and stroke encompass multiple health conditions and risk factors.

The following terms are commonly referred to in this Burden Report. Definitions are from the American Heart Association and the American Stroke Association and can be found at www.americanheart.org and www.strokeassociation.org . For a complete list of ICD codes used to define specific data sets see Appendix C.

Angina (Angina Pectoris): Medical term for chest pain or discomfort due to coronary heart

disease. Angina is a symptom of a condition called myocardial ischemia. It occurs when the heart muscle (mycocardium) doesn't get as much blood (hence as much oxygen) as it needs for a given level of work. Insufficient blood supply is called ischemia. Stable angina (or chronic stable angina) refers to "predictable" chest discomfort such as that associated with physical exertion or mental or emotional stress. Rest and/or nitroglycerin usually relieve stable angina. Unstable angina refers to unexpected chest pain and usually occurs at rest. It is typically mores ever and prolonged and is due to a reduced blood flow to the heart caused by the narrowing of the coronary arteries in atherosclerosis. **Unstable angina is an acute coronary syndrome and should be treated as an emergency.**

Blood Pressure: The force or pressure exerted by the heart against the walls of the arteries. When the arterioles (smaller arteries) constrict (narrow), the blood must flow through a smaller "pipe" and the pressure rises. High blood pressure can result, adding to the workload of the heart and arteries. Optimal blood pressure is less than 120/80 mm Hg. High blood pressure, or **hypertension**, is a condition in which blood pressure levels are above the normal range. Blood pressures of 120-139 / 80-89 mm Hg are considered prehypertension. Blood pressure is considered high it if is 140/90 mm Hg or higher. High blood pressure increases the risk for heart attack, angina, stroke, kidney failure and peripheral artery disease (PAD). High blood pressure may also increase the risk of developing fatty deposit in arteries (atherosclerosis). The risk of heart failure also increases due to the increased workload that high blood pressure places on the heart.

Cardiovascular (Disease): Pertaining to the heart and blood vessels. ("Cardio" means heart; "vascular" means blood vessels.) The circulatory system of the heart and blood vessels is the cardiovascular system.

Cerebrovascular Disease (Stroke): Stroke is a disease that affects the arteries leading to and within the brain. A stroke occurs when a blood vessel that carriers oxygen and nutrients to the

brain is either blocked by a clot or bursts. When that happens, part of the brain cannot get the blood (oxygen) it needs, so it starts to die. Stroke can be caused by either a clot obstructing the flow of blood to the brain (called an ischemic stroke) or by a blood vessel rupturing and preventing blood flow to the brain (called a hemorrhagic stroke).

Cholesterol: A soft, waxy substance found among the lipids (fats) in the bloodstream and in all the body's cells. It's an important part of a healthy body because it's used to form cell membranes, some hormones and is needed for other functions. Cholesterol and other fats can't dissolve in the blood. They have to be transported to and from the cells by special carriers called lipoproteins. There are several kinds but the most important are low-density lipoprotein (LDL or "bad") and high-density lipoprotein (HDL or "good").

Cholesterol Classifications: Total blood cholesterol is the most common measurement of blood cholesterol. Cholesterol is measured in milligrams per deciliter (mg/dL) of blood. Total cholesterol is composed of high-density lipoprotein (HDL or "good") cholesterol, low-density lipoprotein (LDL or "bad") cholesterol and very-low density lipoprotein (VLDL), which carries triglycerides. Triglycerides, a common type of blood fat, can also affect cardiac arrest. Blood cholesterol and triglycerides are classified by levels that relate to the risk of heart disease. The numbers are interpreted based on all risk factors including age, family history, smoking status, blood pressure, physical activity level, weight and diabetes status.

Congestive Heart Failure (Heart Failure): Because not all patients with heart failure have problems with excess fluids, such as in the lungs or extremities, the term "heart failure" is preferred over "congestive heart failure." Heart failure is the inability of the heart to pump out all the blood that returns to it. This results in blood backing up in the veins that lead to the heart and sometimes in fluid accumulating in various parts of the body.

Coronary Heart Disease (CHD): Disease of the heart caused by atherosclerotic narrowing of the coronary arteries likely to produce chest pain (angina pectoris) or heart attack.

Heart Attack (Myocardial Infarction): Death of our damage to part of the heart muscle due to an insufficient blood supply. Heart attacks occur when one of the coronary arteries that supply blood to the heart muscle is blocked. Blockage is usually caused from a buildup of plaque (deposit of fat-like substances) due to atherosclerosis. If a plaque deposit tears or ruptures, a blood clot may form and block the artery, causing a heart attack. Heart attack is also called a coronary thrombosis or coronary occlusion.

APPENDIX C: DISEASE DIAGNOSIS

The following International Statistical Classification of Diseases and Related Health Problems (ICD) Codes were used to define the data sets analyzed within the report.

Cardiovascular Disease	Age	Data source	Definition
Mortality from coronary heart disease	All	Vital statistics	Underlying cause ICD-10-CM codes I11, I20-I25
Mortality from congestive heart failure	All	Vital statistics	Underlying cause ICD-10-CM code I50.0
Mortality from cerebrovascular disease (stroke)	All	Vital statistics	Underlying cause ICD-10-CM codes I60-I69
Hospitalization for acute myocardial infarction	All	Hospital discharge	Primary diagnosis ICD-9-CM code 410
Hospitalization for congestive heart failure	All	Hospital discharge	Primary diagnosis ICD-9-CM code 428.0
Hospitalization for cerebrovascular accident (stroke)	All	Hospital discharge	Primary diagnosis ICD-9-CM codes 430-434 and 436-438
Prevalence of high blood cholesterol awareness among adults aged ≥18 years	≥18 years	BRFSS	Respondents who report having been told by a doctor of having high blood cholesterol within the previous 5 years
Prevalence of high blood pressure awareness among adults aged ≥18 years	≥18 years	BRFSS	Respondents who report having been told by a doctor, nurse or other health professional of having high blood pressure
Prevalence of diabetes among adults aged ≥18 years	≥18 years	BRFSS	Respondents who report having been told by a doctor of having diabetes
Physical Activity, Nutrition and Tobacco Use			
Fruit and vegetable consumption among adults aged ≥ 18 years	≥18 years	BRFSS	Respondents who report eating fruits and vegetables ≥ 5 times/day or <1 and 0 time/day
Prevalence of overweight among adults aged ≥ 18 years	≥18 years	BRFSS	Respondents who have a body mass index (BMI) ≥ 25.0 -29.99kg/m2 calculated from self-reported weight and height
Obesity prevalence among adults aged ≥ 18 years	≥18 years	BRFSS	Respondents who have a body mass index (BMI) ≥ 30.0 kg/m2 calculated from self-reported weight and height

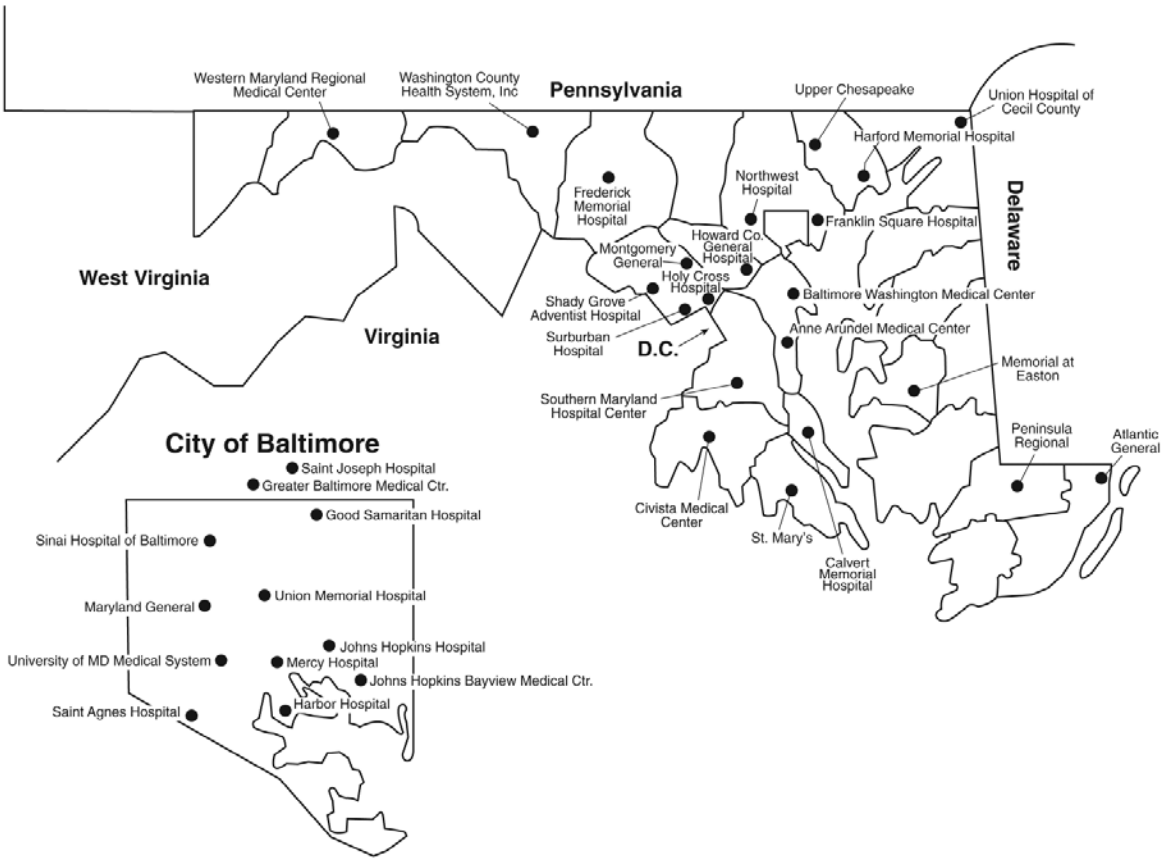
Recommended physical activity among adults aged ≥ 18 years	≥18 years	BRFSS	Respondents who report not having any leisure time physical activity for ≥ 30 minutes or running or walking for exercise during the last 30 days.
Cigarette smoking among adults aged ≥ 18 years	≥18 years	BRFSS	Respondents who report having smoked 100 cigarettes in their lifetime and are current smokers on every day or some days or former smoker (stopped smoking now)

Appendix 2

04/02/2008

Maryland Institute for Emergency Medical Services Systems

Primary Stroke Centers



Appendix 3

Summary of Current Physician Shortages by Region & Specialty For 2007

Specialty	2007				
	Capital	Central	Eastern	Southern	Western
Primary Care*:					
Medical Spec:					
Allergy					
Cardiology					
Dermatology					
Endocrinology					
Gastroenterology					
Hem/Onc					
Infectious Disease					
Nephrology					
Neurology					
Psychiatry					
Pulmonary Med					
Rheumatology					
Hospital Based:					
Anesthesiology					
Diag Radiology					
Emergency Medicine					
Neonatology					
Pathology					
Phys.Med					
Rad. Oncology					
Surgical Spec.					
Gen. Surgery					
Neurosurgery					
OB/GYN					
Ophthalmology					
Orthopedic Surg					
Otolaryngology					
Plastic					
Thoracic Surg					
Urology					
Vascular Surg					
Total	8	5	18	25	20
% of Shortages	26.7%	16.7%	60.0%	83.3%	66.7%

Legend:

Adequate Physician Supply

Borderline Physician Supply

Physician Shortage

Appendix 4

Table 1. State Medicaid Programs - Reimbursement for Telemedicine

	State	Interactive	Store and Forward	Reimburse Hub site (consulting)	Reimburse Spoke site (originating)	Other
1.	Alabama					Pilot project to transmit vital signs from patient's homes to medical personnel.
2.	Alaska	X	X	X	X	
3.	Arizona	X	X	X	X	Non-emergency transportation to and from the spoke site
4.	Arkansas*	X		X	X	
5.	California*	X		X	X	Medical and mental health
6.	Colorado*	X	X			
7.	Georgia*	X		X	X	
8.	Hawaii	X	X			
9.	Illinois*	X	Limited	X	X	
10.	Indiana	X		X	X	
11.	Iowa*	X		X	X	
12.	Kansas*	X		X	No	
13.	Kentucky*	X				
14.	Louisiana*	X	No	X	X	
15.	Maine*	X				
16.	Michigan	X				Only in the upper peninsula, other regions to do not reimburse through Medicaid
17.	Minnesota*	X	X	X	X	
18.	Missouri	X	No			
19.	Montana*	X		X	X	
20.	Nebraska*	X	X	X	X	Available to patients who cannot access comparable service within 30 miles of their home
21.	Nevada	X				
22.	New York	X	X	No	No	
23.	North Carolina*	X	No	75%	25%	
24.	North Dakota*	X	No	X	Only if a medical service is provided	
25.	Oklahoma*	X	X	X	X	
26.	Oregon	X		X	X	
27.	South Carolina	X	No	X	X	
28.	South Dakota*	X	X limited to "near real-time" such as email, phone and fax.	X	X	
29.	Tennessee	X				
30.	Texas*	X	X (imaging services)	X	X	
31.	Utah*	X		X (mental health covered)	X (mental health excluded)	
32.	Virginia	X		X	X	
33.	Washington	X				
34.	West Virginia*	X		X	X	
35.	Wisconsin	X				
36.	Wyoming	X				

Medicaid reimbursement enacted by law or legislation.
Source: Office of Policy and Planning, University of Maryland School of Medicine, December, 2006
Note: An empty cell does not necessarily mean the item is not reimbursable, although that assumption is highly likely, it may also be that the published reports did not state one way or another if these items were eligible for reimbursement.

Appendix 5

Maryland Acute Telestroke Initiative: Observations and Recommendations

Conducted by: Stephanie Aldrich, Health Policy Consulting

05/11/2009

Overview of project

- Interviewed existing telestroke programs in nine states to gain understanding of their scope, administration, costs, and financing (Georgia, New York, Massachusetts, Michigan, Kentucky, Texas, Virginia, Southern California and Western Pennsylvania).
- Interviewed five telestroke vendors to gain understanding of technology needs, capabilities and costs. (REACHCall, BF Technologies, InTouch, Polycom, and Specialists on Call).

Key Observations/Recommendations

- **Hire a consultant with expertise in implementing telestroke programs to determine how to best implement a telestroke program in Maryland.**
- **Total costs.** Looking across the programs interviewed, it looks like it'll most likely cost somewhere around $1 million to set up the program, not including any consulting fees you incur (see above). Ongoing costs are highly dependent on the technology purchased. For

example, if Maryland purchases the InTouch robots, ongoing costs will be high because the robots are leased, not purchased. Ongoing costs based on other technologies could vary from around $100,000 to $500,000 per year. (Assumes 2 hubs and a total of 20 spokes)

- **Technology options.** There are three main options:

  1. Purchase some kind of "cart" system
  2. Lease the InTouch robots
  3. Contract with Specialists on Call to provide the stroke call and required technology.

  Of these three, the cart option seems best suited to Maryland. Hopkins/UMD can provide the necessary stroke consultations, so Specialists on Call would not be a good fit; and the InTouch robot system seems unnecessarily expensive and requires leasing, so ongoing costs continue to be high for this option. However, because the leasing costs include 24/7 tech support, InTouch does reduce (even, potentially eliminate) the need for IT support on the spoke side. The cart option also offers the potential for being able to leverage existing technology in MD hospitals for at least some of the component parts.

- **Stroke-specific systems.** Most of the programs contacted are currently specific to stroke, but most also intend and are able to use the technology purchased for other types of TM consults.

- **Business models in use**

  - *Hub absorbs all costs*. They put technology in place in spokes; no costs to spokes (KY, GA, MI); revenues from transfers make the program solvent (KY, GA); increased revenue from improved reputation for the hospital as a result of the program more than pays for program (MI).

- *Hubs and Spokes pay for own technology and hubs charge for consults***.** (Mass General; UPMC is similar for spoke hospital outside the university system)
- *Grants/Philanthropy.* VA and USCD have been funded by grants to date; are exploring various business models for the future. NY encouraged spokes to use state funds allocated to rural hospitals to put technology in place originally. Michigan's program was made possible by the start-up investment of Trinity Health, a catholic health system, which views the program as consistent with its corporate mission.
- *Reimbursement for telestroke consults.*
    - Private payers. Only KY and UCSD said they were getting reimbursed by private payers. KY interview included a general statement about not having any difficulty getting reimbursed from Medicare or private payers. UCSD said "Blue Cross Blue Shield" reimbursed them. (Note that Blue Cross of California and California Blue Shield are separate companies in CA – Dr. Meyer did not know whether it was just one or both of these payers that reimburse for TM).
    - Medicare**.** Dr. Hess from GA explained that Medicare will pay for DRG 559 (acute ischemic stroke treated with tPA – about $12,000) only if patient is treated with tPA at the hospital that admits the patient. If the patient is treated at a spoke and then transferred to a hub, neither hospital gets paid by Medicare. CMS is apparently looking into this, collecting data from hospitals about how frequently this happens. Hess expects CMS to work out something like a split in payment for the patient – i.e., 20% of the payment going to the spoke and 80% to the hub when a patient is transferred. [Note: This "drip and ship" paradigm is popular in Maryland.]

        - Medicaid. Programs in GA, MA, and NY pay for TM; not in PA. No information on other states.

- **Key Challenges identified in program interviews**
    - *Medical/legal*
        - Malpractice. No issues/cases noted.
        - Consent
        - Anti-kickback
        - Credentialing
    - *ED staff turnover*
    - *IT issues*
    - *Putting a system in place will take time and effort*
    - *Buy-in from doctors*
- **Key Lessons identified from program interviews**
    - *Move beyond stroke*
    - *Engage your partners*
    - *Have a program "champion."*
    - *Technology issues*
        - *Make accessing imaging simple*

- *Costs.* Keep costs for spoke hospitals as low as possible and invest in technology that requires the least maintenance. Put the expensive technology at the hub where it can be supported and maintained.
- *Technology versatility.* Make sure the technology you invest in can be used for other purposes.
- *Web-based systems are simpler and cheaper*
- *Assessment of connectivity*. Want to be sure to have enough connectivity speed to ensure good quality audio and video (frame rate and resolution). Also need enough IT support to keep it working.
- *Equipment checks*. Check the communication between every spoke and the hub – "the system has to work when you need it"
- *Experienced IT staff.* To support the program in the hospital. Possibly also would have more training on the system for nursing and ER people – how to turn it on, how to position it (how not to use it as a coat rack), etc.
- *Evaluate all available systems before purchasing***.** If going to invest money, should really critically look at which system is the best.

- *Staffing.* Need a strong program management officer – hard to find one person who understands the clinical and technological issues – may take more than one person.
- *Put together an advisory board***.** An advisory board committee with people from JHU, UMD, and other hub and spoke folks to have them keep a finger on the pulse of the project. The stroke advisory board provides quality measures for stroke care, tries to link them with other programs (like "get with the guidelines"), tries to dovetail with JCAHO

certification criteria for primary stroke centers, etc. They meet quarterly. Such an advisory board would be uniquely positioned to play a role in ongoing quality improvement initiatives as well.

- Make telestroke part of a broader initiative to improve stroke care in the state.

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Hospital Based:					
Anesthesiology					
Diag Radiology					
Emergency Medicine					
Neonatology					
Pathology					
Phys.Med					
Rad. Oncology					
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Gen. Surgery					
Neurosurgery					
OB/GYN					
Ophthalmology					
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