

TEAMS IN HEALTHCARE; FIELD TRIAGE CEREBROVASCULAR ACCIDENTS

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ABSTRACT

Patient **safety** culture is a critical component of modern healthcare. The high-paced, unpredictable nature of the emergency department (ED) environment may impact adversely on it. Improvement in patient safety is one of the most critical issues facing 21st Century healthcare. **Triage** processes have evolved as one way to manage a growing patient volume that is beyond the ED's capacity to provide immediate care for all. Triage, derived from the French verb *trier*, meaning to sort or to choose, is the process by which patients are sorted or prioritized according to the type and **urgency** of their conditions. Time is a key factor in stroke treatment. Time is **critical** because a **stroke**, starves brain tissue minutes after the onset. When brain tissue dies, it is gone forever (Tang, H.; 2017).

Keywords: Safety – Triage – Urgency – Critical – Stroke

Standards of practice in emergency nursing and medicine suggest maximum acceptable wait times for care based on patient acuity level. Since acuity level is not necessarily static, patients in the waiting area need periodic reassessments to assure that their conditions do not warrant more immediate care. EDs should develop protocols to facilitate this process.

Despite widespread use for decision-making in prioritizing patient care, current triage methods are limited in reliability and accuracy. Nurses often conduct ED triage by using their clinical judgment and experience in the absence of written guidelines. Implicit criteria used by triage nurses to classify patients vary from hospital to hospital, shift to shift, and even nurse to nurse (Young, GP., Wagner, MB., Kellerman, AL, and Ellis, J., and Bouley, D., 1996). A national cross-sectional evaluation of hospital EDs found incorrect triage rates of 5.5%. High mis-triage rates are attributed to lack of standardization and validation of triage processes.

Staffing triage areas with experienced ED nurses or physicians, and incorporating written protocols can reduce errors. The Crowding Resources Task Force of the American College of Emergency Physicians developed recommendations for short-and long-term solutions for ED overcrowding. At the emergency department level, best practices to address overcrowding include: real-time monitoring of ED crowding metrics with the goal to identify problems before they get out of control; using written triage protocols; having flexible ED and triage staffing that allow for adjustment of staffing as needed; automating

processes where possible (e.g. using patient tracking software); and expanding fast-track and observation services (Crowding Resource Task Force, 2003).

Some cerebrovascular events are not diagnosed promptly, potentially resulting in death or disability from missed treatments. Misdiagnosis, in general, may account for 40,000-80,000 preventable deaths annually in U.S. hospitals and probably a comparable amount of disability. Physician reported errors and closed malpractice claims indicate that stroke is among the most common dangerous missed diagnosis (Newman-Toker, David E., 2009). One study found preventable deaths from stroke are attributed to diagnostic error over thirty times more often than deaths from myocardial infarction. A better understanding of factors that predispose to stroke misdiagnosis could help spur interventions to reduce them.

Receiving the correct treatment for stroke quickly can mean the difference between life and death or disability, but in most cases treatment must be provided to patients shortly after a stroke to be effective. The Rush TeleStroke Network, established in 2011, makes Rush University stroke specialists available around the clock for two-way consultation with physicians at community hospitals. The largest and most extensive telestroke network in the Chicago region, it has served more than 2,800 patients (Conners, M.D., James, 2019).

The mobile stroke team will respond to 911 calls reporting symptoms indicating stroke and can perform CT scans for patients promptly upon arrival. Radiologists will receive and analyze transmissions of these detailed brain images from the unit to determine which type of stroke the patient has experienced. Stroke neurologists will evaluate the patients remotely and decide what kind of treatment is indicated. The performance of other mobile stroke units in the United States has shown that the time from the onset of symptoms to treatment can be shortened in half, with the average patient being treated within thirty minutes.

BusinessDictionary defines team as a group of people with a full set of complementary skills required to complete a task, job, or project. Team members: operate with a high degree of interdependence; authority and responsibility for self-management; are accountable for the collective performance; and work toward a common goal and shared rewards. Teams incorporate two or more people who interact and influence each other, are mutually accountable for achieving common goals associated with organizational objectives, and perceive themselves as a social entity within an organization (McShane, S. L. & Von Glinow, M. A., 2010).

Teams offer the potential to achieve more than any person could achieve working alone; yet, particularly in teams that span professional boundaries, it is critical to capitalize on the variety of knowledge, skills, and abilities available.

The Social-Economic Approach to Management (SEAM) is a change management approach that has been tremendously successful in helping organizations thrive, improve the lives of workers, and improve economic returns. Its success is partly rooted in the fact that it is one of the most closely studied change management approaches (Conbere & Heorhiadi, 2011). The body of knowledge is expanded through ISEOR (Socio-Economic Institute for Firms and Organizations), the institute which houses SEAM. ISEOR maintains an

extensive database that comes from SEAM interventions, and contributes to an ongoing field of study through conferences, articles, and books.

The Socio-Economic Approach to Management has its roots in the 1970s as a change management program in France. A group of researchers including Henry Savall looked at the classical theories of organizations established by Frederick Taylor, Henri Fayol, and Max Weber, and sought to integrate this learning with the human relations team (Savall, 2010). The goal was to recognize and integrate the human factor, which according to SEAM is carried out by a team of consultants, who are referred to as intervener-researchers, reflecting their role as both a consultant in the change process and continuing the research work of ISEOR. Like other change management programs there is a defined process and an extensive set of tools, but the underlying assumptions and values in the SEAM process are quite different when compared to other change management programs.

Key to SEAM is the concept of hidden costs (Savall, Zardet, & Bonnet, 2008), those economic inefficiencies that come from what SEAM researchers define as dysfunctions. These dysfunctions can be defined as places where the organization or its members do not work as well or productively as possible. SEAM classifies dysfunctions into six categories: working conditions, work organization, time management, communication-coordination-cooperation, integrated training, and strategic implementation.

Another key to SEAM, where it seems to differ from other change management programs, is the focus on developing human potential. SEAM chooses the term “actors” to describe employees as a reflection of the value that. “By focusing on people, management can develop new income through reducing hidden costs and performance” (Conbere & Heorhiadi, 2011).

SEAM is grounded in a type of action research, with intervener-researchers both participating in change projects and being responsible for the on-going addition to knowledge about change management through ISEOR’s SEAM database and other academic contributions. SEAM has proven to be highly profitable in the companies where it has been implemented. Because of the ongoing additions to the database, SEAM intervener-researchers can demonstrate the effect of their interventions across a variety of industries in many international settings. The SEAM data base has been developed for 33 years, with over 1,000,000 hours of research work making it an incredibly well studied form of change management (Savall, 2008). Today, SEAM intervener-researchers can look at companies as diverse as bakeries and town councils and make a fair prediction prior to the intervention of what the percentage of hidden costs are in the organization.

Stroke, including intracranial hemorrhage, affects about 800,000 annually in the United States, costing over \$40 billion. Another 200,000-500,000 suffer a transient ischemic attack (TIA), a harbinger of impending stroke. Stroke is a leading cause of serious disability and death in the United States and worldwide. Early treatment improves outcomes and lowers recurrent stroke risk by as much as 80%, so timely diagnosis is probably important. A systematic review estimated that about 9% of all strokes are not recognized at first medical contact.

A stroke occurs when the blood supply to part of your brain is interrupted or reduced, preventing brain tissue from getting oxygen and

nutrients. Brain cells begin to die in minutes. A stroke is a medical emergency, and prompt treatment is crucial. Early action can reduce brain damage and other complications. There are two (2) main causes of stroke; a blocked artery (ischemic stroke) or leaking or bursting of a blood vessel (hemorrhagic stroke). Some people may have only temporary disruption of blood flow to the brain, known as a transient ischemic attack (TIA), that doesn't cause lasting symptoms.

An ischemic stroke is the most common type of stroke. It happens when the brain's blood vessels become narrowed or blocked, causing severely reduced blood flow (ischemia). Blocked or narrowed blood vessels are caused by fatty deposits that build up in blood vessels or by blood clots or other debris that travel through your bloodstream and lodge in the blood vessels in your brain.

Hemorrhagic stroke occurs when a blood vessel in your brain leaks or ruptures. Brain hemorrhages can result from many conditions that affect your blood vessels.

A transient ischemic attack (TIA) - sometimes known as a mini-stroke; is a temporary period of symptoms similar to those you'd have in a stroke. A TIA doesn't cause permanent damage. They're caused by a temporary decrease in blood supply to part of your brain, which may last as little as five (5) minutes. Like an ischemic stroke, a TIA occurs when a clot or debris reduces or blocks blood flow to part of your nervous system.

Many factors can increase your stroke risk. Potential treatable stroke risk factors include:

- Being overweight or obese
- Physical inactivity
- Heavy or binge drinking
- Use of illegal drugs such as cocaine and methamphetamine

Medical risk factors include:

- High blood pressure
- Cigarette smoking or secondhand smoke exposure
- High cholesterol
- Diabetes
- Obstructive sleep apnea
- Cardiovascular disease, including heart failure, heart defects, heart infection or abnormal heart rhythm, such as atrial fibrillation
- Personal or family history of stroke, heart attack or transient ischemic attack

Other factor associated with a higher risk of stroke include:

- Age- people age fifty-five (55) or older have a higher risk of stroke than do younger people.
- Race- African Americans have a higher risk of stroke than do people of other races.
- Sex- Men have a higher risk of stroke than women. Women are usually older when they have strokes, and they're more likely to die of strokes than are men.
- Hormones- Use of birth control pills or hormone therapies that include estrogen increases risk (Mayo Clinic, 2020).

A stroke can sometimes cause temporary or permanent disabilities, depending on how long the brain lacks blood flow and which part was affected.

Complications may include:

- Paralysis or loss of muscle movement. A person may become paralyzed on one side of their face or body, or lose control of certain muscles, such as those on one side of their face or one arm.
- Difficulty talking or swallowing. A stroke might affect control of the muscles in a person's mouth and throat, making it difficult to talk clearly, swallow or eat. They may also have difficulty with language, including speaking or understanding speech, reading, or writing.
- Memory loss or thinking difficulties. Many people who have had strokes experience some memory loss. Others may have difficulty thinking, reasoning, making judgements, and understanding concepts.
- Emotional problems. People who have had strokes may have more difficulty controlling their emotions, or they may develop depression.
- Pain. Pain, numbness or other unusual sensations may occur in the parts of the body affected by stroke. For example, if a stroke causes a person to lose feeling in their arm, they may develop an uncomfortable tingling sensation in that arm.
- Changes in behavior and self-care ability. People who have had strokes may become more withdrawn. They may need help with grooming and daily chores.

Missed opportunities to diagnose a cerebrovascular incident symptoms include missed stroke. Missed TIA (transient ischemic attack), and missed sentinel headaches from intracranial aneurysms. Preventable harm may result from missed opportunities for acute treatment or management to avert a second, more serious stroke or complications of the initial stroke. Missed TIA and minor stroke (infarction without significant disability) or sentinel headache are often harbingers of major stroke within days or weeks without prompt intervention. Small studies suggest outcomes are worse with a missed stroke diagnosis. Initial misdiagnosis in mild subarachnoid hemorrhage conveys a three-fold greater odds of death or severe disability at one year. Mortality may be up to eight-fold greater for patients with misdiagnosed cerebellar infarctions (Tarnutzer, A.A., et al, 2011).

Not all strokes are obvious clinically. Presenting symptoms that are non-specific (e.g., dizziness, mild headache without mental status change, or transient numbness) are more likely to be misdiagnosed. Traditional stroke symptoms such as hemiplegia (paralysis of one side of the body), are rarely missed, but "non-traditional" stroke symptoms increase the odds of misdiagnosis. Less is known about demographic and healthcare system determinants of stroke misdiagnosis. Younger patients, women, minorities, and those triaged to lower acuity care or seen in non-teaching hospitals may be at higher risk.

One study strongly suggests misdiagnosis can be measured using administrative data. Stroke misdiagnosis appear to be associated preferentially with dizziness and headache presentations. This study provides some immediate suggestions to Emergency Department physicians who are evaluating patients with these symptoms; be more attuned to the possibility of stroke in younger, female, and non-white patients. Though 'simple', indiscriminate use of neuroimaging will not prove an effective strategy to detect stroke in these

patients. Instead, clinicians should leverage well-studied bedside methods to identify dizziness and headache patients at high risk for stroke.

General policy recommendations for hospitals and other healthcare stakeholders are less clear, pending further substantive research on methods to measure misdiagnosis and strategies to reduce them in the emergency department. Funding agencies should support studies to develop and refine revisit analyses as a means to measure the burden of misdiagnosis in the emergency department, along with a systematic study of disparities in misdiagnosis based on sex, age, and race and/or ethnicity.

Without robust measurement methods, it will be nearly impossible to assess the impact of interventions. Although many general solutions to help reduce misdiagnosis have been developed, none have yet been properly studied for their impact on patient outcomes. Problem specific solutions may hold more promise than general ones, and model-based economic analyses could help guide evidence-based policy development for misdiagnosis problems causing the greatest harms (Newman-Toker, D. E. et al, 2009).

The failure to recognize an ischemic stroke in the emergency department is a missed opportunity for acute intervention and for prompt treatment with secondary prevention therapy. Current guidelines recommend intravenous recombinant tissue-type plasminogen activator in select patients, and recent data have shown that patients with large vessel occlusion may benefit from early recanalization with stent-retrieval devices. In addition, patients with missed strokes may not be monitored appropriately for neurological progression of stroke syndromes or stroke-related complications. Swift diagnosis is critical to offer treatments and achieve the best long-term outcomes. Despite this, a sub-set of acute ischemic strokes go unrecognized in the emergency department (Arch M.D., MPH, Allison R; et al, 2019).

The clinical and radiographic patterns of stroke patients with a missed diagnosis have not been well characterized. One institution previously linked misdiagnosed strokes to non-traditional symptoms, such as nausea / vomiting, altered mental status, dizziness, and a patient fall. These symptoms are more common in posterior circulation strokes, and with young patients where posterior circulation strokes may be more frequently misdiagnosed.

Despite stroke center certification, a significant proportion of ischemic strokes are initially misdiagnosed and this leads to missed opportunities for intervention and improved outcomes. Atypical symptoms associated with brain stem and cerebellar posterior circulation strokes lead to misdiagnoses. Symptoms such as acute nausea / vomiting, dizziness, and difficulty walking should be triggers to consider ischemic stroke in the emergency department, particularly when paired with a history of hypertension or a currently elevated blood pressure.

Over half of the 53.4 million annual inpatient admissions in the United States begin in the emergency department (ED), yet more than five (5) times as many ED visits are treated and released from the ED as are admitted to the same hospital. ED visits have outpaced population growth since at least 1993, but the trend has not been uniform across conditions or patient characteristics (Skinner, H.G., et al; 2006-2011).

The ED is a healthcare setting where patients receive care for a variety of circumstances, including life-threatening emergencies, acute illness and

injury, and complications associated with chronic conditions. EDs also provide care for non-urgent situations, serving as an alternative to primary care. The diversity of clinical reasons for presenting to the ED; and their associated urgency-results in variation in the mix of ED visits based on factors such as geographic locations and community socioeconomic characteristics. ED utilization may also vary over time because of rapid changes in the health care system, insurance coverage, and access to care, although evidence has been mixed.

The Healthcare Cost and Utilization Project (HCUP) Statistical Brief presents information on ED visits between 2006 and 2014. Population-based ED visit rates in 2006 and 2014 are provided by patient characteristics, whether the ED visit resulted in admission to the same hospital or resulted in the patient being treated and released, and the type of first listed diagnosis for the ED visit.

- Findings from this study showed that overall, the number of ED visits in the United States increased 14.8 percent from 2006 to 2014.
- Comparing 2006 and 2014, the percentage of ED visits increased among the following patient subgroups: those aged 45-64 year, those with low income, and those residing in large central metropolitan areas.
- The population rate of ED visits in the United States was 432 visits over 1,000 population in 2014.
- The rate of ED visits was highest for patients aged 65 years and older, but the rate increased the most between 2006 and 2014 for patients aged 45-64 years of age.
- The ED visit rates was higher for females than males in both 2006 and 2014.
- The rate of ED visits for patients living in low-income areas increased from 2006 to 2014 but showed little change for patients in higher-income areas.
- Comparing 2006 and 2014, the ED visit rate increased in large central metropolitan areas and in medium and small metropolitan areas, whereas the rate decreased in suburban areas. ED visit rates were the lowest in the West region.
- In 2006, private insurance was the most frequent payer for ED visits in the United States, but by 2014 Medicaid was the most frequent payer for ED visits.
- The overall ED visit rate for injuries decreased from 2006 to 2014, whereas the rate for medical, mental health / substance abuse, and maternal / neonatal visits increased.
- The rate of ED visits resulting in an inpatient admission increased from 2006 to 2014 for mental health / substance abuse and maternal / neonatal visits.
- The rate of treat-and-release ED visits for injuries decreased from 2006 to 2014, whereas the rate for medical, mental health / substance abuse, and maternal / neonatal treat-and-release ED visits increased (Moore, B. J., PhD; et al, 2017).

Improvement in patient safety is one of the most critical issues facing 21st Century health care. Patient safety is the result of collective efforts seeking to avoid medical errors or preventable adverse events (AE's), and hence safeguard the patients from harm. Patient safety is difficult to achieve

in emergency health care due to the particular combination of patients with complex high acuity conditions, a working environment, which is difficult to control, and multidisciplinary teamwork involving frequent handovers with the potential for communication failures.

Health professionals in the emergency department (ED) work in high pressure conditions, with multiple interruptions and time constraints. Major medical interventions may be initiated with limited historical and diagnostic data. Hence, there is increased possibility for errors and untoward patient outcomes. While there may have been many approaches to improving patients' safety, establishing a culture of safety is considered a core strategy.

Across the world, EDs face cumulative challenges due to rising patient numbers and increasing admission of elderly patients with multiple comorbidities. The ED is a challenging workplace due to the high demand and turnover of patients, lack of control over workload, and difficulties with communication. Thus it is vulnerable to patient safety risks. It has been documented that 8.5% of the patient-identified issues are safety related.

Emergency departments' personnel are subjected to a wide range of stressors, including time pressure, workload, inadequate staff, and deficiency of teamwork. Acute stress may impair performance of ED workers and risk patient safety. System failures, stressed and fatigued care providers and medication errors, communication problems, lack of professional skills, and problems with medical equipment have been found to be the most frequent reasons for errors in the ED (Alshyyab, Muhammad Ahmed, et al; 2018). Thus the challenge faced by ED management is to understand the complexity of patients' safety, the factors that influence it, and strategies that may be used to build a more positive work culture and climate and thus improve patient safety.

The primary focus of this review was to build a conceptual framework for patient safety culture in the ED. This review found that the majority of studies identified a positive attitude among ED workers to patient safety culture. The dimensions rated as having the highest impact were teamwork, supervisor / manager expectations, and actions promoting safety, while those with the lowest impact were staffing, management support for patient safety and the frequency of error reporting. The main negative impact was identified for dimensions beyond the ED and included human factors and resources, managerial factors such as leadership, lack of hospital management support for patient safety, organizational and environmental factors such as work conditions, reporting a blame free culture, and lack of ongoing and continuous learning.

Across healthcare, there is an increasing reliance on teams from a variety of specialties; nursing, physician specialties, physical therapy, and social work, to care for patients. At the same time, medical error is estimated to be "the third most common cause of death in the U.S." (Makary M.A., D.; 2016). The shift to providing care in teams is well founded given the potential for improved performance that comes with teamwork, but as demonstrated by these grave statistics, teamwork does not come without challenges. Consequently, there is a critical need for health care professionals, particularly those in leadership roles, to consider strategies for improving team-based approaches to providing quality patient care.

Teams offer the promise to improve clinical care because they can aggregate, modify, combine, and apply a greater amount and variety of knowledge in order to make decisions, solve problems, generate ideas, and execute tasks more effectively and efficiently than any individual working alone. Given this potential, a multidisciplinary team of health care professionals could ideally work together to determine diagnoses, develop care plans, conduct procedures, provide appropriate follow-up, and generally provide quality care for patients.

Yet, we know that, overall, teams are fraught with failures to utilize their diverse set of knowledge, skills, and abilities and to perform as well as they could. The potentially harmful consequences for patients cannot be ignored; such as incomplete communication and failing to use available expertise, increases the risk of medical error and decreases quality of care.

The need for all medical and health professionals' trainees to understand how to work across disciplinary boundaries is noteworthy, given that the stakes are high and that working together effectively requires more than simply ensuring that team members are smart people. Team members, especially those in leadership positions or with higher status, should actively invite input to ensure that team members voice all of their information. They should also be role models in expressing appreciation for diverse knowledge from all sources to ensure that team members' input; regardless of who the team member is, will be considered and used in the team's work. Such teams will be well suited to capitalize on their expertise, avoid errors, and provide effective patient care (Mayo MS, Anna T., et al, 2016).

Emergency Department (ED) attendances in the UK have increased significantly during the past five (5) years. Crowding describes overwhelmed EDs unable to operate effectively; one consequence is that suboptimal care is delivered to patients, because longer waiting times delay diagnosis and treatment. This can lead to significant negative outcomes including a reduced quality of care and increases in length of stay, serious incidents and mortality. Workforce challenges, including difficulty in recruiting and retaining the nursing and medical workforce also occur. Crowding contributes to clinically significant delay in diagnosis, recognition of acute deterioration and the commencement of treatment; patients with time-critical conditions are particularly vulnerable (Redfern, Emma, et al, 2018).

The adult ED at Bristol Royal Infirmary is situated in an inner city centre setting, with an annual attendance of over 70,000 new patients. If there is no immediate capacity for patients arriving by ambulance, then after an initial assessment, the patient is moved to the corridor outside the ED, on a trolley, and ongoing care is provided by a 'queue nurse', who may be unfamiliar with the ED environment and associated clinical quality standards.

This study found that in retrospective reviews of clinical incidents reported during times of crowding that variation in practice and omissions in basic elements of care were common contributory factors to incidents. Human factors also play a role in the delivery of substandard care during periods of crowding. Checklists, when introduced appropriately, can

improve standardization and reliability in the delivery of care, resulting in improved patient outcomes.

The aim was to improve patient safety in the ED. Since the introduction of the checklist, no clinical incidents relating to failure to recognize deteriorating patients or delay in care delivery had been reported. This correlates with the implementation of the checklist and its hourly intervention requirement. Checklists have been adopted in several specialties to improve the standardization and reliability of care and patient outcomes. The implementation of our ED safety checklist was associated with improvements in key ED clinical performance indicators. There was improved management of time-critical conditions which included mean increase of over five (5) % in CT scanning within an hour for patients with a suspected stroke.

This study demonstrated that a simple checklist aimed at identifying the deteriorating patient in a busy ED can be successfully implemented and used effectively by staff unfamiliar with the intense and demanding work of the ED.

Emergency Triage, Treat, and Transport (ET3) is a voluntary, five-year payment model that will provide greater flexibility to ambulance care teams to address emergency health care needs of Medicare beneficiaries following a 911 call. Under the ET3 model, the Center for Medicare and Medicaid Services (CMS) will pay participating ambulance suppliers and providers to 1) transport an individual to a hospital emergency department (ED) or other destination covered under the regulations, 2) transport to an alternative destination (such as a primary care doctor's office or an urgent care clinic), or 3) provide treatment in place with a qualified health care practitioner, either on the scene or connected using telehealth (CMS.gov, 2019).

This model will allow beneficiaries to access the most appropriate emergency services at the right time and place. The model will also encourage local government, their designees, or other entities that operate or have authority over one or more 911 dispatches to promote successful model implementation by establishing a medical triage line for low-acuity 911 calls. As a result, the ET3 aims to improve quality and lower costs by reducing avoidable transports to the ED and unnecessary hospitalizations following those transports.

Currently, Medicare regulations only allow payment for emergency ground ambulance services when individuals are transported to hospitals, critical access hospitals, skilled nursing facilities, and dialysis centers. Most beneficiaries who call 911 with a medical emergency are therefore transported to one of these facilities, and most often to a hospital ED, even when a lower-acuity destination may more appropriately meet an individual's needs.

With the support of local governments, their designees, or other entities that operate or have authority over one or more 911 dispatches, ambulance suppliers and providers will triage people seeking emergency care based on their presenting needs. The model aims to ensure Medicare Fee-For-Service beneficiaries receive the most appropriate care, at the right time, and in the right place. The model may help make EMS systems more efficient and will provide beneficiaries broader access to the care they need. Beneficiaries who receive treatment from alternative destinations may also save on out-of-pocket costs. AN individual can always choose to be brought to an ED if he/she prefers.

The ET3 Model aims to reduce expenditures and preserve or enhance quality of care by:

- Providing person-centered care. Such that beneficiaries receive the appropriate level of care delivered safely at the right time and place while having greater control of their healthcare through the availability of more options.
- Encouraging appropriate utilization of services to meet health care needs effectively
- Increasing efficiency in the EMS system to more readily respond to and focus on high-acuity cases, such as heart attacks and strokes.

The key participant of the ET3 model will be Medicare-enrolled ambulance service suppliers and hospital-owned ambulance providers. In addition, to advance regional alignment, local governments, their designees, or other entities that operate or have authority over one or more 911 dispatches in geographic areas where ambulance suppliers and providers have been selected to participate in the model will have an opportunity to access cooperative agreement funding.

Any individual who calls 911 and is connected to a dispatch system that has incorporated a medical triage line under the model, would be screened for eligibility for medical triage services prior to ambulance initiation. Upon arrival on scene, participating ambulance suppliers and providers may triage Medicare beneficiaries' to one of the model's interventions upon ambulance dispatch following a 911 call. As part of a multi-payer alignment strategy, the Innovation Center will encourage ET3 model participants to partner with additional payers, including state Medicaid agencies, to provide similar interventions to all people in their geographic areas.

Receiving the correct treatment for stroke quickly can mean the difference between life and death, or disability, but it in most cases treatment must be provided to patients shortly after a stroke to be effective. The Rush TeleStroke Network, established in 2011, makes Rush stroke specialists available around the clock for two-way consultation with physicians at community hospitals. The largest and most extensive telestroke network in the Chicago region, it has served more than 2,800 patients (Connors MD, James; 2019).

The mobile stroke team will respond to 911 calls reposting symptoms indicating stroke and can perform CT (computerized tomography) scans of the patients promptly upon arrival. Radiologists will receive and analyze transmissions of these detailed brain images from the unit to determine which type of stroke the patient has experienced. Stroke neurologists will evaluate the patients remotely and decide what kind of treatment is indicated.

The performance of other mobile stroke units in the United States has shown that the time from onset of symptoms to treatment can be shortened in half, with the average patient being treated within thirty (30) minutes. The inclusion of telemedicine technology on board the new mobile unit will allow Rush stroke specialist to not only analyze CT scans, but to also to interview patients from afar, and to prescribe the appropriate treatment on the spot. "The stroke team will be seeing the patient, making decisions, and treating them in the field. It's really advancing acute stroke care," Connors says.

Through a program known as ETHAN (Emergency Telehealth and Navigation), the city of Houston Fire Department Emergency Medical Services program uses video and other technology to allow emergency physicians to conduct real-time assessments of patients in the field to determine if they require transport to the emergency department or could be better served elsewhere. For those not requiring emergency care, the program can facilitate the scheduling of and transportation to an appointment at a partner clinic that can serve as a medical home (Alqusairi MD, D., et al; 2015).

Through another local partner, the program conducts follow up monitoring and connects patients to community-based resources that address social serviced and other health-related needs. In its first 9 (nine) months of operation, ETHAN has seen steadily rising use; significantly reduced unnecessary ambulance transports and emergency department visits (and other associated costs); connected a meaningful number on non-emergent patients to primary care medical homes; and freed up significant time for ambulance crews to deal with true emergencies.

Many people who call emergency medical services (EMS) are suffering from relatively minor problems. Yet often these individuals end up being transported by ambulance too- and treated in the emergency department (ED), even though their medical problems could be handled more quickly, effectively, and efficiently in the primary care setting. Treating these patients in the ED unnecessarily drives up costs and contributes to overcrowding and long waits.

Roughly thirty (30) to forty (40) percent of the 700 to 800 calls to 911 in Houston each day do not involve true emergencies, including many calls from individuals suffering minor headaches or lacerations, spider bites, toothaches, simple colds, joint pain, insomnia, and other minor ailments that can be treated effectively and efficiently in the primary care setting. In many instances, patients call 911 because they know they need some type of medical care but do not know how else to access the health care system.

As in most around the country (US), Houston Fire Department EMS providers have historically transported all patients who want treatment to the nearest ED, including those suffering from primary-care-related issues. Overall, patients with primary care-related issues account for an estimated forty (40) percent of all ED visits in the city.

Transporting and providing care to non-emergent patients through the ED drives up overall health care costs and contributes to ED and EMS bottlenecks. Using EMS and ED providers to treat patients who could be treated more effectively and efficiently elsewhere takes up scarce resources that could be better deployed treating patients with true emergencies. In Houston, EMS personnel periodically report instances where they cannot respond to true emergencies in their area because they are dealing with non-emergent patients; as a result, an ambulance farther away must respond, driving up wait times for patients who need immediate attention.

Through ETHAN, the Houston Fire Department EMS uses video and other technology to allow emergency physicians to conduct real-time assessments of patients in the field to determine if they require transport to the ED or could be better served elsewhere. For those requiring ED care, the program facilitates the scheduling of and transportation to an appointment at a partner clinic able to serve as a medical home. Through a partner organization,

ETHAN also conducts follow-up monitoring and connects patients to community-based resources that can address social services and other health-related needs.

Compared with urban and suburban dwellers, individuals living in rural areas have fewer health care resources and less access to preventive services and are more likely to be poor, have chronic health conditions, and be in fair or poor health. Individuals of low socioeconomic status living in urban areas have similar barriers to access. Disparities are even greater for certain racial and ethnic groups, such as Hispanic Populations (Gray MS, S., & Kowalski, N.; 2014).

Individuals living in rural areas, especially poor rural areas, have access to fewer health care resources. Although twenty (20) percent of the U.S. populations lives in rural areas, only nine (9) percent of physicians practice in rural settings. Individuals in rural areas typically must travel longer distances for care, experience long waiting times at clinics, or are unable to obtain the necessary health care they need in a timely manner.

Individuals living in rural areas are more likely to be poor; poor or near-poor individuals are more likely to have chronic health conditions and to experience periods of time during which they are uninsured. Individuals studied as part of a government funded study of the problems faced by urban populations, were found to be roughly twice as likely as their non-urban peers to suffer serious conditions, including arthritis, asthma, depression, diabetes, hypertension, and stroke. Poverty, lack of health insurance, inadequate access to preventative care, and language / cultural barriers are associated with poor health outcomes (Gray MS, S., & Kowalski, N.; 2014).

Rural and urban access to health is a collaborative program that provides safety net services for the growing at-risk population, including Hispanic migrant workers and immigrants, in nine counties in central Indiana. Sponsored by eight hospitals (six in rural areas and two in rural / urban area) and St. Vincent Medical Group, the program employs field-based workers to coordinate and integrate care, provide outreach and education, and facilitate access to health care and prescription drugs. The program also trains individuals to serve as interpreters and translates educational materials to facilitate clients' health care knowledge and access.

The global telemedicine field is growing dramatically every year, with an increasing array of solutions to meet the needs of providers and patients alike. A study entitled "Global Telemedicine Market Outlook to 2018" noted that the telemedicine industry, which stood at \$14.2 billion in 2012, is expected to grow at a compound annual growth rate of 18.5 percent from 2012-2018. From a regulatory standpoint, this expansion will intensify as telemedicine initiatives align with the goals of the Federal Government and Accountable Care Organizations (ACOs) to reduce healthcare expenses and improve quality of care to patients (Subcommittee on Health and Technology, 2014).

Telemedicine provides patients with immediate access to cost-effective, efficient and speedy care. Whether used to manage chronic illnesses, monitor patient conditions in areas where specialty care is not available, or triage victims in an emergency situation, telemedicine applications provide significant advantages for patients and providers alike. Research shows that the field is poised for impressive expansion, and at the same time consumer trust in

telemedicine is gaining traction too. Given the anticipated growth, and the proliferation of telemedicine platform from which to choose, there are a number of factors that healthcare organizations must consider carefully when reviewing these solutions.

When physicians' forward medical records from their tablets or patient insurance data is accessed from a smartphone, this confidential information can be intercepted and compromised. A telemedicine system that incorporates security measures such as unique user passwords, encrypted data and secure patient records storage is key to preventing a data breach. The rise of Bring Your Own Device (BYOD) has increased these risks significantly, since physicians are using their own mobile devices for both work and personal purposes. In fact, Cisco's study cites that 9 in 10 Americans employed in the healthcare industry use their personal smartphones for work, and 40 (forty) percent of those mobile devices are not password protected.

Mobile communications proliferates in the medical field, yet realistically there is a large segment of healthcare providers that are not prepared to manage it properly for patient care. As physicians, it is incumbent upon them to be fully aware of these issues and focus on selecting technology that ensures protection of patient health information and patient privacy. In short, patient privacy requires security.

Another major challenge that telemedicine offerings must address is the perceived lack of personal connection with mobile interactions. Many offerings, perhaps, miss key ingredients that physicians require to provide effective care. How do health practitioners work within the virtual environment to ensure that their bedside manners remain warm and personal?

With the growth of the telemedicine industry, the opportunity is ripe for caregivers and providers to offer patients highly personalized quality care within a secure, reliable platform. The key is to find a solution that marries secure and scalable solutions; government-grade, locked-down security; innovative functionality that can scale and grow; and a patient-centered approach that delivers on the promise of technology without losing the human touch. In our increasingly connected world, it is imperative that the medical community remains at the forefront of change in order to continue to offer the highest quality care to new and existing patients.

Emergency triage has historically, and continues to be, a focus on the improvement and intervention of patients, particularly in emergent situation. There continues to be a great deal to learn and research regarding this methodology of care. The opportunities within this scope are vast. As I write this recap, I am looking at an article entitled, "Can Sudden Weather Changes Cause Strokes?" (Garg MD, Rajeev; 2018).

A collaborative study led by a neurologist at Rush University Medical Center in Chicago, IL; and an environmental scientist at the University of Illinois at Chicago, suggests that weather patterns that cause dramatic changes in barometric pressure may increase the incidence of a type of stroke known as spontaneous intracerebral hemorrhage, that is, the rupture of a blood vessel in the brain.

In conclusion, stroke is a leading cause of death and adult disability in the United States of America according to the American Heart Association / American Stroke Association. On average, someone suffers a stroke every forty

(40) seconds, someone dies of a stroke every four (4) minutes, and 795,000 people suffer a new or recurrent stroke each year (Press Release, Rush, 2019). Field triage, treatment and transport of stroke victims had clearly been identified and requires further investigation and implementation of an effective means of treatments for these critical patients during a critical, emergent, medical event in their lives.

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