Implementation of Stroke Protocols in the Pediatric Practice Setting

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Written Project – DN823

July 27, 2021

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A large amount of work and research has been completed by many teams to show the impact of stroke and the increased incidence of stroke diagnosis within the pediatric population. Childhood stroke can be linked to many poor outcomes including: seizures, psychiatric disorders, behavioral difficulties, paresis, and an overall quality of life impact that is poor (Jacomb et al., 2016). It is critical that the Doctor of Nursing Practice (DNP) prepared nurse works to advocate for as well as recognize the impact their role can make in collaborating with the multidisciplinary team and unite efforts associated with early diagnosis, intervention, evaluation, and ongoing improvement modalities to promote systems thinking, impact organizational culture, and incorporate change related to evidence-based practice.

The need for guidelines and care delivery expectations is critical to care for the pediatric stroke patient. Offering specialized stroke care allows for patients to receive antiplatelet and anticoagulant therapies and treatments that are more regiment and consistent along with preventative treatment modalities. The need for guidelines and care delivery expectations is critical to care for the pediatric stroke patient. Cerebrovascular disease (stroke) is one of the ten leading causes of death in children and young adults ages 1 to 24 years of age (Kupferman et al., 2021). Lower rates of recurrence are reflective in the use of standardized treatment protocols and institutional pediatric stroke programs (deVeber et al., 2019). Timing for change and implementation of standardized practice is now.

Project Purpose

Implementing pediatric stroke protocols has led to improved safety, efficiency, quality, and has decreased disparity. The protocols have been built in the electronic medical record (EMR) allowing for standardized process and documentation alignment. Electronic health records (EHR’s)

have emerged among health information technology as meaningful use as they have shown to improve the efficiency and quality of healthcare, as well as health disparities in population health (Kruse et al., 2018). The ability to leverage data captured in the EMR to demonstrate timing of care, radiology testing and results, timing of diagnosis and treatment regimen initiation, along with patient outcomes are all components that the EMR build now allows for data to be pulled from. Additionally, admissions, transfers to higher level of care, and patient movement is clearly identified. Education and focused training have improved safety in the emergency department as the team is now more confident and competent through the utilization of the stroke protocols to identify stroke and follow a standardized process that is more efficient and overall effective. The ability to recognize stroke in pediatrics is life saving and life changing.

Significance and Background of Pediatric Stroke

Through prompt diagnosis and expedited testing, consults, and treatment plan implementation the level of disparity has decreased. The efficiency of the team has significantly improved as well as the interdisciplinary collaboration and communication leveraging the coordination of care. The opportunity to utilize advanced technology and specific radiological exams have allowed for decreased radiologic exposure time, prompter tests, expedited results, and earlier diagnosis. In the realm of pediatrics there remains a lot to be educated on in terms of technology's performance in its expanding role in the pediatric setting and care teams must be wary of extrapolating evidence regarding adult modalities to their use in children (Su et al., 2018).

The ability to utilize the EMR to extract health information that help to advance and improve patient care delivery is critical in today's healthcare environment. There is so much technology along with access to patient information for both the care team as well as the patient that it is imperative to capitalize on the available resources. For healthcare organizations the use of

technology allows for the benchmarking as a comparison to how well care delivery, use of technology, and patient outcomes are for their teams as compared to other like organizations. Networking capabilities offer information sharing, educational and training resources, as well as workflows, processes, policies, and protocols that are accessible and so useful. There is critical need to expand the use of pediatric stroke protocols across pediatric institutions to improve patient outcomes and care delivery. There are public health approaches along with public policy targeted at improving population health through prevention and intervention. Adverse childhood events have become instrumental in stimulating and explosion of transformative research into childhood adversity and leading to innovative practices (Lacey & Minnis, 2020). The challenge has become focused on the continuation of improvement opportunities, identifying and incorporating best practice, and implementing models of care that can significantly improve and inform practice and policy.

Project Relationship to DNP Essentials

The project is aligned with the DNP essentials in regards to reviewing and focusing on organizational quality improvement initiatives along with systems thinking approaches. The use of analytics and data aid in information gathering and enhance technological opportunities. The ability to connect with the interprofessional team with a focus and approach on improving patient care outcomes along with treatment plans within an organization help change the scope of treatment and hospitalization. Utilizing leadership attributes as well as evidence-based practice approaches, enables one's ability to partner with key-stakeholders leading to project success with implementation and ongoing plans for sustainability. The ability to incorporate the professional components associated with the DNP essentials with the project has led to tremendous improvement in outcomes and care of the pediatric stroke patient.

Practice Setting and Patient Population

The practice setting is a 260-bed acute care pediatric hospital. Within the practice setting the emergency department teams, incorporating the intensivist team, and the pediatric critical care nursing team will be critical to the project. The radiology department will be an area of focus along with the emergency department and intensive care unit. The patient population that will be cared for are ages from newborn to 21 years of age. The focus will be on those patients whose initial encounter is based on altered mental status, changes in behavior, sluggishness, slurred speech, delayed response times, seizure, and changes in personality or any other stroke related diagnosis.

Through the use of rapid diagnostic evaluation, arterial ischemic stroke can be classified into perinatal ischemic stroke and childhood ischemic stroke (Bhatia & Pruthi, 2016). The use of magnetic resonance imaging (MRI), which offers high sensitivity and specificity within the first hour of symptom onset allows for the potential to differentiate ischemic from hemorrhagic and impact treatment plans (Bhatia & Pruthi, 2016). The project will begin with protocol development and implementation through teaching and education within the multidisciplinary teams. The patients who meet the criteria previously mentioned will make up the patient population for the project work.

The organization, as a practice setting can stand to increase revenue as well as improve quality of care delivery associated with pediatric stroke. Stroke is related to high case fatality and hospital readmission rates as well as direct and indirect medical costs of $33 billion in 2011, this will drive demographics as well as follow-up that is indicated (Thompson & Stafford, 2017). Based on this it is important that we being to offer improved care and change outcomes for this vulnerable patient population.

Practice Setting Alignment with Project Intent

This project aligns with the organizational commitment to excellence in all that we do through the creation of a family-centered care environment with compassionate care from the heart. The organization's mission is to provide high-quality comprehensive healthcare services to children, regardless of their ability to pay, and to continuously improve the health and well-being of children. Through introducing and incorporating stroke protocols we can improve patient care outcomes, quality of life, and care delivery to this very critical patient population.

The implementation of pediatric stroke protocols within the organizational setting was based on the initial premise of needing a standardized care practice in place so that the pediatric stoke patient would not have to be transferred to a higher level-of-care facility, rather treated and admitted within our own practice setting. This ignited many discussions as well as led to truly identifying the organizational gaps associated with providing pediatric stroke care. There have been several elements that have surfaced as the process improvement initiative began creating challenges. The key factor associated with the implementation of the protocol is the gap of having no standardized care practice in place within the organization as well as across disciplines. Based on this, complex interventions along with comprehensive stakeholder analysis to provide stroke care has been identified as an immediate need (Krieger et al., 2019).

Current practice related to pediatric stroke is not standardized, consistent, or reliable within the organization's setting. Focused observation and data tracking to acquire current process data was utilized (Appendix H). Many pediatric stroke physicians recently have begun to consider endovascular therapy for acute stroke in children, with most changing their practice related to increased preparedness and details from data collection (Wilson et al., 2019). These efforts are helping to bring attention to pediatric stroke and the shift from adult-focused care delivery in rare instances to a more pediatric-focused workflow. The project intent is to create a standardized

process, implement policy to support practice, and treat stroke as a pediatric emergency. Work completed so far has focused on education of the emergency department staff (Appendix E), acquiring participant and provider consent to participate in the project (Appendix C & D), ongoing discussion and collaboration with key-stakeholders, and protocol build within the current electronic medical record. There is ongoing discussion with the neurologist and their commitment along with expectations related to the project and ongoing organizational process improvement opportunity. Actively engaging the key-stakeholders, focusing on protocol creation, along with policy development has escalated the establishment of a care-model.

Pediatric stroke does present similarly to adult stroke; however, it is critical that emergency department physicians recognize patients with seizure or altered mental status as possibly having a stroke. Strokes in children are medical emergencies and require rapid diagnosis, treatment, escalation of care, and initiation of treatment (Baldovsky & Okada, 2020). Through the implementation of pediatric stroke protocols, the providers will have a workflow to utilize so that we are able to admit the patient safely and care for them appropriately. The teams are excited for the completion of education and collaboration and the movement we are starting to see in alignment with implementation and go live within the next several weeks.

Key Stakeholders

As a project leader it is certainly imperative to form a collegial and cohesive team. The team's commitment to the project does enable successful outcomes. There are several key-stakeholders associated with my project and their involvement and support has been phenomenal. There is increasing reliance on teams to achieve complex work in organizations often times through creative approaches (Lee & Farh, 2019). One of our pediatric intensive care physicians is very passionate about the project and has been instrumental in helping gain the physician's buy-in and

support. She had completed her fellowship at another pediatric organization and the implementation of stroke protocols was her passion and project at that organization before joining us. She has provided advocacy and education to myself and our teams in regards to the critical importance of standardized practice as well as need for pediatric stroke protocols. She is certainly an expert and is even guiding the neurologists in current practice expectations and advances in treatment along with diagnosis of pediatric stroke.

The emergency department leadership team are two additional key members of my team. The nursing director as well as the medical director are extremely supportive of the project and have been integral to the incorporation of workflows, have helped with ensuring education is completed, staff participation, and helped with the protocol build, policy work, and advocacy for the project with the larger team. Additionally, members of the informatics team have helped with a build in the medical record of the protocols and workflow. Nursing education has been supportive and assisted with training and staff evaluations. The executive leadership team have been included in updates, key-stakeholder's meetings, engaged with any barriers or individual issues. There has been great push back from the neurology team and concern from them in regards to their workload and ability to support the protocols. Based on this, the Chief Medical Officer (CMO) has been phenomenal in connecting with them and setting specific expectations as well as requiring their participation. Coaching interventions are common practice in many organizations where a leader refers to a targeted intervention involving a formal one-on-one relationship and works to improve the leader's effectiveness to impact outcomes (Maynard et al., 2020). There are other team members who were a part of meetings and planning.

The radiology team as well as the medical director have been helpful in regards to the testing protocols and supportive of an immediate quick test that is indicated for diagnosis of stroke.

The ongoing efforts of the entire team are instrumental for caring for the pediatric stroke patient and as the tools, education, and collaboration continue to expand the patient outcomes have successfully improved. Through the implementation of pediatric stroke protocols, faster treatment in children will lead to faster recoveries, decreased recurrent stroke, decreased healthcare costs and earlier recognition and treatment will lead to improved patient outcomes (Shack et al., 2017). This is reliant on the entire care team to work collaboratively and support the project.

Project Benefits to Practice Setting

The implementation of pediatric stroke protocols coincides with the organization's mission in regards to providing excellent, safe, and efficient care to all children. Additionally, it aligns with several of the organizations strategic initiatives including supporting the growth of the neurology division and service line commitment to treatment and care of pediatric stroke patients, it will allow for the patients to remain in the facility for care and treatment, and it enables keeping our patients close to home which is a vital part of the organization's mission. The pediatric stroke protocol also unites a multidisciplinary team and adds to sustainability of ongoing healthcare needs of the pediatric stroke patient. The ability to offer standardized care for the pediatric patient suffering from stroke allows for rehabilitation services to get involved as well as several other disciplines including occupational therapy, physical therapy, child life, speech pathology, and many other teams. The ability to admit and treat this patient population serves as a financial incentive as well as adding great value as the organization continues to expand the care it provides. The opportunity to continually evaluate and improve care quality and safety is of high priority. There is evidence that the efficacy behind standardization of care delivery, practice, and measurement that is required to accelerate scientific rigor and evidence-based practice initiatives is of high importance (Herbst et al., 2020).

We are currently working to develop a neuroscience center and this patient population will certainly be a part of this dynamic as well. There is a commitment to improve patient experience through the care continuum along with family-centered care delivery (PR Newswire, 2020). Overall, the organization focuses on services that are indicated for the children who live in the Central Valley in California. We offer care regardless of the ability to pay and we have the highest percentage of children with Medi-Cal in the state. Children who experience stroke no matter their social status, financial backing, or ethnicity will be cared for by a team of experts and safe, efficient, and effective care will be delivered with positive patient outcomes. One of the biggest challenges associated with care is the affordability with financial strain to the healthcare budget, which then impacts the cost pressure on the patient (Orange County Business Journal, 2020). The focus on decreasing costs, managing treatment through standardized care delivery, and maintaining consistent methodology helps decrease costs for the organization as well as for the patient. This aligns with the mission, vision, and goals of the organization and leads to the ability to offer excellence in overall pediatric care delivery.

Practice Site Needs Assessment

The significance of early diagnosis and intervention remain the key elements associated with building a strategy to care for the pediatric stroke population. Worked collaboratively within a team focusing on stroke in children aids in the development and needed incorporation of a Pediatric Stroke Outcome Measure (Leistner et al., 2019). Stroke research is relevant and needed so that process improvement from the first patient encounter to discharge of a patient suffering from stroke can become a component within the care delivery environment. The organizational setting, patient outcomes as well as initial presentation of patients are crucial elements for gaining momentum and support project intent and needed stakeholder involvement. Understanding how to promptly

diagnose and treat stroke can lead to improved management, the ability to target rehab strategies, and improve outcomes (Leistner et al., 2019).

Literature Review

A relevant review was conducted, focusing on parameters inclusive of the last five to seven years for a search on related topics and articles affiliated with several key words. The words included the following: pediatric stroke, pediatrics, stroke, protocols, stroke protocols, stroke guidelines, nursing theory related to stroke, caring theory, and pediatric stroke protocols to name a few. The databases that were searched included: PubMed, Medline, Wolters Kluwer, Elsevier, PMC, Sage Journals, Oxford Academic, Scielo.org, Wiley, Dove Press, and EBSCO. The need for interprofessional education and collaboration is crucial. The enhancements and advancements in treatments is linked to improved outcomes relative to the development and implementation of pediatric stroke protocols clearly identifying methodology relative to diagnostic testing, medications for treatments, and prompt diagnosis.

Relevant Evidence

Dedicated inpatient stroke units with interprofessional practice teams who place the child and family as the center of the care plan have resulting reductions in mortality, have shown decreases in disabilities, and enduring along with improved patient outcomes (MacKenzie et al., 2017). An interdisciplinary team focused on a pediatric stroke protocol with an ED pediatrician activating a stroke alert has captured 40% of pediatric patients with stroke (Ladner et al., 2015). Safety and efficacy of endovascular therapy as well as intravenous thrombolysis in children with Acute Ischemic Stroke (AIS) has led to decreased recurrence (Pacheco et al., 2018). The occurrence of AIS in the pediatric population is extremely rare and delays in the treatment will lead to morbidity and mortality (Lahlam & Nelson, 2017). There is evidence that surgical revascularization

and clinical follow-up in patients with sickle cell disease, who have a higher risk of developing strokes has led to lower rates of ischemic insults (Aguilar-Salinas et al., 2019). Children that have been screened and then scanned have resulted in the early detection of stroke in every 2 per 1000 patients (Kupferman et al., 2021).

Evidence-based practice research offers several positive components that enhance project improvement work. The utilization of gray literature can provide specific details, hone in on geography, is relatable for small audiences, and can impact systematic reviews through viable reports or recent surveys. Most research is defined as a systematic inquiry that uses disciplined methods to solve a problem (Grainger, 2020). This type of research is consistent with evidence-based practice.

Levels of Evidence

Levels of evidence for the project focused on Level I, II, and II primarily. There was evidence pulled from other practice sites relating to Level I evidence that included the use of pediatric stroke protocols currently. Level II evidence came from controlled trials and research-based project scopes that met criteria related to stroke protocols. The Level III evidence proved most reliable and was critical as it was pulled from case-controlled systematic research.

Literature Synthesis

Within ongoing DNP-project related work, some gray literature has been uncovered relative to pediatric stroke. Much of this literature relies on personal experience and exposure to the topic. There are reports from the state census reports that was utilized early on in the project work to synthesize the patient population and demographic information associated with the pediatric patient population impacted by stroke. Additionally, information in regards to treatment regimens, testing, and protocols from other pediatric organizations has proven to

be extremely helpful, useful, and informational. The availability of these resources as well as access to the information has been vital for ongoing project work and buy-in of key-stakeholders. Gray literature's prevalence in nursing journals is steady and findings have led to informed teaching amongst researchers serving the nursing community. The ability to have a comprehensive review of work completed as well as project focused specifics with reference to research, gray literature, and evidence-based practice is imperative to process improvement. The ability to open scope to include an understanding, characteristics, challenges, and features associated to data, research, and literature is vital to project work (Miah et al., 2021).

The stages of research related to health and disease and the interventions that attribute to the improvement of health. With the utilization of translational science and research looking at improving health in a specific patient population is dependent on data and findings that enable others to rationalize the impact and make process changes or improvements based on relevant evidence. When considering the implementation of pediatric stroke protocols, existing protocols and workflows utilized at other pediatric organizations that have proven successful in achieving improved patient outcomes, prompter diagnosis, and established treatment plans that have been proven effective. Reflecting on the science, including research gaps as well as promising research offers leaders conceptual areas indicated for collaboration and empirical support for process improvement initiatives (Sunderji et al., 2020).

In regards to pediatric stroke it has been imperative to recognize and validate the impact stroke has on the pediatric patient population. Bringing forward the opportunity to implement workflows and protocols to standardize treatment, expedite testing, improve timing associated with diagnosis, and incorporate treatment plans that have proven to be successful aligns evidence-based practice with translational science and research. In a very short period

of time, many areas of science have transitioned to data-dependent methods enabling the development of networked systems technologies along with methodologies associated with analysis (Vellido, 2020). This is extremely important in building stroke protocols in the electronic medical record as well as utilizing rapid radiological testing that is focused and fine-tuned magnetic resonance imaging (MRI) and computerized tomography scan (CAT scans) that led to prompt diagnosis and treatment plan initiation.

Ongoing innovation and advances in healthcare and practice are reliant on research, analysis, data, and commitment from the team to implement process and incorporate practice change. The healthcare industry has become reliant on technology and driven by technological innovation to address clinical needs (Coentro et al., 2019). When considering process improvement, evidenced-based practice changes, and research-based studies within the practice setting are vital. There were over five hundred plus articles relative to pediatric stroke that emerged upon literature review. Many articles focused on system-based approaches as well as evidence-based practice (Appendix K).

Theoretical Foundation for the Project

Theory that guides practice creates a path for clinicians to focus on and is highly indicated when recommending the institution of new guidelines or care protocols amongst an interdisciplinary team. Through creating and sustaining a caring culture a team can create a viable and sustainable treatment environment (Wei et al., 2019). The rationale related to the utilization of this theory to support the development of stroke protocols and implementing them into practice for the pediatric population stems from caring for the patient first and wanting to ensure that high quality care is delivered. This will lead to improved patient outcomes, increased patient and family satisfaction, staff satisfaction, and an overall positive impact for the

organization. A change theory is implicated in order to be successful and institute a new model or process that can be adopted into practice. Lewin's three-step change management theory can be utilized to transform care at the bedside (Wojciechowski et al., 2016). Utilizing a lean system methodology based on Lewin's fundamental principle for change, leaders can focus on accountability, communication, transparency, and employee engagement (Wojciechowski et al., 2016).

Watson's Theory of Human Caring (Watson, 2021) is based on a scientific approach intended to transform patient care from a treatment-centered approach to a holistic approach of the mind, body and spirit (Wei et al., 2019). Through the development of pediatric stroke protocols, building education, and the incorporation of protocols into practice promotes interprofessional collaboration and a designed intervention model to implement and sustain positive patient outcomes related to care of pediatric stroke patients. There are a multitude of patient-centered factors from age, genetic background, medical conditions, and many other risk factors that if identified and managed will lead to improved treatment of the pediatric stroke patient (Lee et al., 2017). Collaboration is an essential component in delivering quality care and in leading continuous quality improvement projects, which is the premise of the project. Hospitals are complex adaptive systems that in order to maintain and survive, organizations must respond to an ongoing changing environment (Wojciechowski et al., 2016). Quality improvement projects stem from Lewin's change model and the guiding principles of unfreezing, changing and moving, and refreezing enable empowering the team to recognize needed change, encourage recommendations and implementation of needed change, and focus efforts on sustaining the change while adapting and influencing the culture for acceptance and relevance.

It is challenging to attempt to estimate the exact value of creating a healthcare culture focused on caring, however many healthcare organizations can benefit from it through improved patient experiences and satisfied employees (Wei et al., 2019). Through the use of Watson's theory caring interventions to promote nursing behaviors towards patient outcomes and colleagues is an approach and foundation theory that the incorporation of stroke protocols will be built upon. The patient is the priority, focus, and primary factor and it is up to us, healthcare providers to ensure high quality care delivery with excellent outcomes and safe, effective care delivery. Through this study and work, it is clear that delays in diagnosis derives from a clinician's difficulty in recognizing presenting signs and symptoms. There is still a large amount of work, research, and practice initiatives related to the treatment of pediatric stroke. Early diagnosis and treatment are critical and must be implemented in all pediatric healthcare organizations.

Change Theory Associated with the Project

Kurt Lewin's change theory focuses on individuals influenced by challenges that forces aim or focus on a direction to cause change to happen (Lewin, 1997). Determining a needed change, gaining key-stakeholder support, creating the need for change, and managing concerns enables leaders to make change occur. The model that supported my work was the knowledge-to-action (KTA) process framework. This model is based on building knowledge and then knowledge integration. There are phases associated with this model that contributed to standardizing and planning the implementation of pediatric stroke protocols. The first phase consists of identifying the problem you are trying to address and beginning the process of searching for and researching the issue. Based on the information uncovered, the next step is in adapting the knowledge acquired to formulate content. One must then focus on identifying barriers. The next phase is selecting, adapting, and implementing interventions along with

monitoring the use of implanted knowledge. Evaluation of the outcomes associated to the knowledge and project is the next phase and leads to the final phase which is sustainability of the knowledge and practice change.

This model has worked well with educating the emergency department, radiology department, and the pediatric intensive care teams on stroke recognition in children. The protocol was introduced to them along with the policy to guide practice and support patient care delivery. This model is grounded in action theory, therefore allows adaptability across multiple settings, which was vital for the project work and multiple teams that stroke protocol implementation impacts. The four key principles linked to enhancing organizational KTA strategy include the following: aligning knowledge production and action, fostering connections among key-stakeholders, understanding and working with key contextual factors, and considering the diverse stages of care associated with stroke (Cameron et al., 2017). The ability to break down the processes associated with the outlined phases within the KTA process framework allowed for streamlined timelines and processes leading to successful outcomes.

Utilizing an evidence-based practice model has guided the implementation of the DNP focused project. The KTA process framework as highlighted above is quite descriptive and offers a phase-by-phase approach. The KTA model is utilized in medical and public health fields as a method to translate activities for policy, while capitalizing on practitioners, researchers, and research related information to drive practice and to identify gaps in current along with future practice (Santos & Santos, 2019). The ability to utilize data and proven practice methodology that has been widely accepted, refined, and re-purposed to support care gaps are critical to improving care and patient outcomes. The concept of evidence-informed,

mediated practice is a form of impact within the educational-based and practice-focused environment like healthcare is indicated to improve professional practice and provide ongoing insight related to care standards (Malin, 2020).

Project Description and Outcomes Summary

The project plan was to implement pediatric stroke protocols in the pediatric hospital setting. The focus of the setting is the practice environment of clinical care delivery including the emergency department (ED) and the pediatric intensive care unit (PICU). The project involved the entire multidisciplinary team and was reliant on the support of key-stakeholders. The ED Director of Nursing, ED Certified Nurse Educator, ED Provider, PICU Intensivist, PICU Director of Nursing, PICU Certified Nurse Educator, Assistant Chief Nursing Officer (ACNO), Chief Nursing Officer (CNO), Chief Medical Officer (CMO), Neurology Medical Director, Medical Director for Neurosurgery, Trauma RN Coordinator (ED), Medical Director of Radiology, and the Director of Radiology all actively participated and were engaged. There was ongoing collaboration and data collection. Opportunities to collaborate with other pediatric organizations within the Children's Hospital Association (CHA) was utilized as well as organizational connections and list serves for projecting, planning, and in conjunction with supporting ongoing efforts. Through gathering data, the ability to identify gaps, barriers, and needed interventions surfaced. Collaboration with the safety and quality colleagues was incorporated and the data collected was compared and justified. Ongoing collaborative meetings discussing the critical need for stroke protocols as there were no guidelines in place revealed opportunities to standardize practice across all disciplines. The PICU Intensivist and the ACNO took the lead working collaboratively to schedule meetings inclusive of several of the key-stakeholders mentioned in a variety of different forums. Ongoing research and list serve communication was continuous and fluid throughout the project.

The continued gathering of research, information, and existing protocols led to the development of a protocol and tool for implementation to guide the project plan. The key-stakeholders identified added input and reviewed the tool created as well as took part in the final decision-making. Consent from all team members prior to full implementation of the project was achieved. Measuring the utilization of the protocols minimally two times a month by pulling data from the Epic electronic medical record (EMR) and through the utilization of a survey to identify user aptitude and utilization of the proposed protocol tool was achieved. Ongoing monitoring and record keeping ensued. Ongoing meetings and touch points throughout the project with key stakeholders and organizational leadership took place. The need for streamlined childhood stroke protocols in an effort to minimize delays in diagnosis and offer clear standards for treatment was clearly identified and created (Mirksy et al., 2017).

Project Timeline

Project management is a technique that enables establishing, coordinating, planning, and scheduling tasks to achieve project success (Illies & Stachowski, 2020). Incorporated in project management are timelines and targeted goals for achievement to reach project completion. The project timeline for the work associated with pediatric stroke stayed on course for the most part. There were a few challenges, primarily associated with key-stakeholders within the neurology team that did cause about a two-week delay. Delays in project work can result in a project becoming derailed or even aborted, however assembling the team to review the timeline along with deliverables can aid in resetting and re-establishing momentum (Baum & Swig, 2017). The implementation of pediatric stroke protocols was implemented without the support from the neurology team; however, it was supported in its entirety by the Chief Medical Officer (CMO), the Director of Emergency Medicine, and the Director of the Pediatric Intensive Care unit. These

providers have worked collaboratively and recognize the importance as well as the gaps in care in caring for the pediatric stroke patient.

The project focused on education for the emergency department frontline staff related to assessment and early recognition of pediatric stroke. A pre-education survey (Appendix F) was completed and a presentation (Appendix L) was delivered to the team. Consent to participate (Appendix B) in the project work was also completed as a first step. The providers were pulled into to help create a standard protocol and policy (Appendix A & B) to align with practice and care delivery. Many key-stakeholders reviewed the protocol and policy giving insight, feedback, and final approval. The identified physician leaders have been the direct care providers for this patient population and have accepted all accountability. If needed neurologic intervention is identified there is escalation of care to a higher-level of care facility that offers advanced neurosurgical intervention. The challenges associated with the neurologists pushed out the timeline slightly as it was imperative to continue to connect with leadership to identify expectations of that team. Ongoing observations and data collection remained on track and interpretation of the data within the project was vital and reliant to further investigate the challenges, limitations, opportunities, trends, and outcomes relative to the project work (Kolling et al., 2021). The project was successfully completed inclusive of a post-education survey (Appendix F) as well as a summative survey (Appendix G) having been completed. Follow-up with the Neurologists who are now actively involved has occurred as well as ongoing focus for the sustainability of the project is ongoing with continued patient tracking and report out to involved care teams as indicated.

Project Budget

The project budget incorporated on-shift working hours for staff and providers along with the informatics team and leadership. There was no real allotment of dollars specific to the project

work as it was completed during working hours and by staff who would be otherwise caring for the same identified patients. Labor costs therefore were absorbed within the operating daily budget of each home unit along with additional operating costs such as electric, equipment utilization, and materials used for the care of the patients. Much of the project budget was fixed and had no impact on the project. Variable expenses stemmed from a few hours of work linked to the data analyst team pulling information and running reports to support the data elements of the project. Time was tracked and approved by leadership. The outcome of the project has proven to be financially beneficial for the organization and care teams, therefore much of the expenses identified were approved and had minimal impact.

Project Implementation

The implementation of pediatric stroke protocols within the organizational setting was reliant on process change and the culture of the organization, which made it imperative to capture support and buy-in for project success and program longevity (Bedgood, 2018). The focus early on was to pull together key-stakeholders and engage as well as align strategy associated with the "why" behind the work. Focusing on stroke recognition, testing, treatment regimens, and overall care delivery expectations led to an increased visibility of gaps in current process along with the critical need to standardize care in this patient population. The main challenge was with the Neurologists, and the project highlighted the lack of innovation, forward-thinking, and recognition of needed change from this provider group. The Neurologist were defensive, obstructive, and unwilling to participate or take on any accountability early on in the project. Without their early participation and acceptance of the need for stroke protocols the CMO encouraged the project work to continue and bypass the Neurologists.

Without neurology's involvement, there was a strong provider knowledge-base and expertise in stroke recognition, testing, and treatment regimens among the emergency department providers, radiologists, and the pediatric intensivists that emerged. They have partnered with me and have partnered with me and have strongly advocated for the needed standardized protocol, practice, and policy implementation. These stakeholders are critical contributors in the implementation of complex health interventions and aid in the careful design of the components that enable tailored management of the project (Krieger et al., 2019). One fortunate component associated with the project work is that many pediatric patients suffering from stroke typically require no surgical intervention, but rather a cocktail of intravenous (IV) medications and close monitoring to safe guard from stroke occurring as well as minimizing impact. The physician teams previously mentioned were highly capable, trained, skilled, and knowledgeable in pediatric stroke care and led the implementation and successful outcomes of the project work. The efficient collection and communication of patient information and impact of stroke has led to the potential for greatly improving the safety, quality, and overall care delivery to this patient population (Pittman et al., 2021). The ability to demonstrate through data, patient safety alerts, and higher-level of care activations has led to overall support and recognition of the need for pediatric stroke protocols as well as increased awareness and advocacy for this patient population.

IRB Approval

The success of the project relied upon the university's approval of the IRB project (Appendix J) and the facility approval of the project (Appendix I). Ongoing faculty as well as facility mentors have aided in project success as well as motivation along the way. Additionally, the required CITI-training was completed as well (Appendix I).

Instruments for Data Collection

The data collection methods that were utilized throughout the project include the following: interviews, surveys, observation, reports, and documentation. Collecting data is a process of gathering and analyzing information that is specific to a problem to offer solutions and evaluate results. The information gathered from the various sources have offered insight into the impact of the project associated with the staff's role, provider roles, patient impact, and overall care impact. Upon implementation of the project, several months were spent collecting data along with documentation review. The ability to acquire a large amount of data prior to the project start-up proved helpful. The goal with data collection is to capture quality evidence to answer questions, influence change, and support informed decisions.

With the implementation of pediatric stroke protocols, the goal was to achieve a standardized practice that leads to early recognition of stroke, prompt diagnostics, diagnosis, and treatment initiation. To increase efficiency and quality of many operations such as this, many organizations investigate through process management and process optimization (De pourcq et al., 2019). This type of work is reliant on data to drive process change and impact performance. With significant advancement in technology there are so many opportunities to leverage data to impact care delivery during this time. With project work, the results and details associated with the impact of the implemented change or improvement are vital and rely upon engaging key-stakeholders and staff. Health care organizations and their systems are using data to improve patient experience, lower costs, improve clinical experience, and better outcomes (Smith et al., 2021). Continuous improvement methodology stems from knowledge gained at the site of care and biomedical data drives scientific inquiry, problem solving, and decision-making. The importance of data collection is to improve health, safety, quality, and overall care delivery was critical to the project success.

Data Analysis and Interpretation

There are several tools and protocols worth exploring and researching to potentially implement or use as a strategy for creating a set protocol for implementing related to pediatric stroke. In recent research the following were identified: patient eligibility flashcard; stroke assessment cared; door-to-diagnostic exam; dosing and treatment protocols; patient tracker; and so forth. There are many CHA organizations who have implemented protocols that can be utilized as a resource or reference as the project plan progressed. The creation of a survey was incorporated as well to determine staff satisfaction, usage, and feedback relative to utilizing the protocol. This proved vital and added value for project sustainability. There is a stroke scale that was considered along with cutting edge diagnostic capability, and treatment options. Work was being completed with the informatics team and the Epic team to build a protocol in the EMR as well as creating reports that can be ran based on patient diagnosis, treatment, and order sets. This data was pulled by quality and safety teams and will be utilized to support ongoing stroke treatment. The primary analysis of the data aimed at representing a favorable patient outcome defined by the implementation of a well-received and defined stroke protocol. There was a well-defined start date, ongoing tracking and trending date mid-course, and a definitive end date for final data collection and patient participation. The final analysis of data was completed and allowed for ample time for data collection as well as full project implementation to occur.

Stroke is a major cause of mortality and morbidity in children globally (Mirsky et al., 2017). Centers that focus on streamlining childhood stroke protocols inclusive of imaging minimize delays in diagnosis and are able to identify stroke syndromes more rapidly leading to improved patient outcomes (Mirsky et al., 2017). Prior to the project implementation the organization encountered 60 to 80 patients a year (2015-2019) diagnosed with pediatric stroke. Of these patients, 100% were transferred out to higher level-of-care facilities. Over the course of 2020, the timing for radiological

testing was greater than 2 hours with neurology consults occurring only 25% of the time and never within the 30 minutes expected time frame for response. With the implementation of pediatric stroke protocols in 2021, over the course of just 3 months (April – June), the timing of assessment, provider consult, and radiological testing is now completed under 2 hours. The average response time for the emergency department (ED) provider is 7 minutes, the average radiological test is under 60 minutes, and the pediatric intensivist arrive in under 30 minutes to consult and determine treatment plan. Over the months of April 2021 thru June 2021 there were a total of 9 patient encounters with a diagnosis of stroke. Of these patients, 50% were transferred to a higher level-of-care facility for surgical intervention and 50% were admitted and remained within our facility for treatment.

Prior to stroke education 99% of the emergency department staff surveyed stated that stroke is not easily distinguishable in the pediatric population. There was 37% of those staff members who were unfamiliar with any standardized process for treating stroke, 31% of staff felt that education was not reliable, 84% of staff felt as though community resources were not available, and 22% of those staff members were not comfortable managing the pediatric stroke patient. The post-education survey (Appendix F) resulted in 100% of the surveyed staff stating that stroke is easily distinguishable and now what to look for now, there are now familiar with a standardized process and work flow, they felt that education was delivered appropriately, and that there are community resources available. They all reported at 100% being comfortable with managing the pediatric stroke patient. The importance of a collaborative and interdisciplinary team approach is self-evident and there is opportunity to further examine all roles and the significance when creating a protocol and standardized workflow.

The summative survey (Appendix G) results were extremely positive with 83% of staff strongly agreeing and 17% agreeing that the new pediatric stroke protocol and policy is easy to understand and follow. There were 82% of staff who strongly agreed that the protocol offers a clear care delivery plan with an additional 18% in agreement. There were 84% of staff who strongly agreed with 16% agreeing that the use of the algorithm helped to identify stroke and 100% of the staff surveyed strongly agreed that the protocol and algorithm has now made stroke recognition easier. The overwhelming positive response in addition to the ability to admit and treat pediatric stroke patients has been achieved through the utilization of the pediatric stroke policy and protocol.

Project Evaluation

The summative assessment is the review of outcomes associated with the project, whereas formative evaluation is conducted during the creation of the project or throughout the implementation of the project. The ability to evaluate the relationship between neurological outcomes following pediatric stroke diagnosis as well as behavioral and health outcomes was imperative to the project (Cooper et al., 2018). The concept of introducing the concept of pediatric stroke protocols occurred through meetings with key-stakeholders and through education with the emergency department staff. There was a pre-education survey (Appendix F) conducted as well as a post-education survey (Appendix F) to capture the understanding associated with the implementation of the stroke protocols along with the policy and process expectations that coincided with it. Throughout the implementation phase staff were supported, time stamps were captured along the journey of care, and impacted patients were followed closely along with data collection and analysis occurring so that the project work could be continually evaluated, enhanced, revised, and redirected if indicated.

To improve long- and short-term outcomes in pediatric stroke, extrapolation of the experience suggested that the formation of an acute stroke team with multidisciplinary representation and written protocols is vital to delivering emergent pediatric stroke care (McKinney et al., 2018). The summative evaluation (Appendix G) was utilized upon the completion of the project and included a review of the overall percentage of pediatric patients screened for as well as treated for stroke. The survey was completed and results were shared for complete transparency and open-honest feedback. The analysis of data helped identify the percentage of patients who were diagnosed with stroke or treated for altered mental status and data was compiled to create an executive summary. The frequency of stroke and other neurological emergencies in children verifies the critical need for implementing as well as maintaining a pediatric stroke protocol (Wharton et al., 2020).

Project Implications

The implementation of pediatric stroke protocols has impacted care delivery as well as patient outcomes align with staff satisfaction. Having a standardized workflow for physicians and frontline staff to follow as a path to guide care for the suspected pediatric stroke patient is significant and has shown process improvement and impact. The protocol has allowed for early recognition as well as expedited radiological testing, and prompter diagnosis so that the correct treatment can be initiated. Pediatric stroke is rare; however, it does occur and the volume of pediatric strokes are increasing year over year. A pediatric accelerated time-to-treatment, time-to-diagnosis in children with stroke along with increased MRI for initial imaging has led to more timely access to diagnosis and stroke management (Shack et al., 2017).

The awareness of pediatric stroke within the public health spectrum is highly indicated and the advocacy by many children’s hospitals are aiding in this effort. Stroke recognition in children is

often delayed and the need for fast-track management and interventional therapy has become a new normal (Tabone et al., 2018). Childhood stroke constitutes a topic of clinical importance amongst pediatricians and providers in pediatric organizations. A multi-model approach with elaborate training, educational publications in professional journals that can be referenced, along with web-based offerings that could reach a broader range of providers are being achieved (Bonfert et al., 2018). A highly indicated approach includes childhood stroke awareness campaigns that will contribute to optimizing care for children suffering from stroke.

Through clinical prevention at the systems level, this effort will lead to decreased serious harm, diminished negative impact to the patient along with improved outcomes as well as ongoing care needs that will coincide with earlier diagnosis and efficient treatment. One system level change as a direct result of the protocol is enhanced MRI's focusing on brain imaging as well as cervical arterial abnormality allowing for a shorter series of radiologic tests and prompter diagnosis (Baltensperger et al., 2019). The impact stroke has on the patient and their family can result in significant health outcomes that impact quality of life and life expectancy. Through the use of a protocol a multi-system approach and impact can be incorporated into direct care delivery.

Project Sustainability

It is vital to share experience, outcomes, along with the overall project plan with key stakeholders now with completion of the project. The emergence of quality care is a driving force within many organizations focusing on healthcare delivery and requires innovation and project management techniques to improve outcomes (Dobin & Lazar, 2020). Throughout the implementation of pediatric stroke protocols, it was imperative to keep stakeholders engaged and updated. The support of leadership and staff in relation to the project success and sustainability is critical. The many implications associated with stroke protocols from a thorough assessment,

escalation to a provider, timely diagnosis through radiological studies, and treatment led to the ability to gather significant data and shed light on gaps in processes and opportunities for improvement. Sharing the information acquired from directly interviewing the frontline staff, gathering details associated with pre- and post- stroke education surveys as well as the summative evaluation proved pertinent to revealing the impact of the project along with the improvements that have surfaced in relation to the care delivery for the pediatric stroke patient.

Standardizing a process along with the impact and influence associated with disseminating the outcomes and efforts will enhance trust and willingness to participate (Cunningham-Erves et al., 2020). Having recently had the opportunity to sit down with the CMO, Medical Director of Neurology, a Neurologist, and a Pediatric Intensivist was certainly challenging and invigorating in that the Neurology team who had been a barrier throughout the project work was now willing to sit down with the team, allowing for the opportunity to review the project impact along with the outcomes with them. Sharing some of these components were quite successful with the Neurology team, as they are actually are now actively engaging, expanding their networking with collegial pediatric hospitals that we partner with and that are pediatric stroke centers, and are willing to consult in the emergency department when indicated. The ability to expand the care we provide as well as advance within our own hospital has been a tremendous outcome. There is ongoing need for continuing education along with advancing the protocol, policy, and work completed to inpatient teams in the Acute Care and Critical Care units. Creating a comprehensive framework along with dissemination of outcomes help to facilitate the development of future policies, guidelines, and multifaceted care models (Bassler et al., 2016). The outcomes for our patients have vastly improved and the diagnosis of stroke is being recognized early upon assessment within minutes of the patient encounter and timely access to testing and treatment is a priority. A

sustainable process and care delivery model has been established and will be sustainable with key-stakeholders ongoing support and active participation.

Dissemination of Information

The plan to disseminate the overall impact that the creation and implementation of pediatric stroke protocols along with associated patient outcomes has created is now the focal point as the project is finalized. The frontline staff, clinical leaders, providers, and executive leaders who have supported and actively engaged throughout the project will be informed through several venues on project outcomes, their impact, and the need for sustainability. Many have participated in multiple and ongoing meetings, forums, discussions, surveys, case reviews, and data reviews. Key-stakeholders have recognized the gaps along with opportunities to improve pediatric stroke care across the continuum and have become knowledgeable advocates promoting needed changes to improve care. These leaders have inspired others to work toward change in practice to achieve positive outcomes and factor on influence verses power (Radvany, 2021).

There were changes in practice oversight that led to modifications in the policy as well as the protocols that will be incorporated in communication and information sharing. However, the overall implementation of pediatric stroke protocols has led to increased data collection revealing a decrease in the time to diagnosis and care management (Baldovsky & Okada, 2020). The exposure the project has received throughout the organization along with the benefits our pediatric patients are gaining is aiding the progress and commitment to the project. Increased awareness of pediatric stroke is a key element and the related work has led to an established care standard that has been long over-do and critically indicated to achieve successful outcomes that impact the life of a child and their family. Project implementation has been completed and data along with results are being

compiled to present to the Executive Team and the interdisciplinary teams who have led change and enhanced pediatric stroke care within the organization and the community.

The dissemination of the information will be achieved through email communication, presentations, and organizational forums. The ability to utilize the data along with proven practice methodology to improve patient care and outcomes has become a key concept. Evidence-informed practice change was the main impact associated with the implementation of stroke protocols and with the educational-based along with practice-focused setting, this approach has proven to improve professional practice and provide ongoing insight related to care standards (Malin, 2020).

Executive Summary

Throughout the implementation of pediatric stroke protocols there has been reliance on leveraging leadership skills. Being an effective leader was instrumental in achieving successful implementation of the project. The foundation of the project work was based on trust, integrity, relationship building, problem-solving, accessibility transparency, and dependability along with strong communication and collaboration. Key-stakeholders including the executive leadership team and providers, was imperative to discern the impact to the patients and the organization that not having standardized stroke protocols was having.

Having the ability to admit 50% of pediatric stroke patients is a vast improvement with the remaining 50% going to a higher level-of-care for surgical intervention that we are unable to facilitate at this time. High work demands and minimal ability to control often times involves combining a leadership role with being a clinician (Kersemaekers et al., 2020). Revealing data and statistical information in an articulate, well-planned approach served to build trust and integrity as well as gain support and engagement. The transparency with the emergency department relative to the increased volume of stroke patients along with delays in diagnosis and

diagnostic testing gained knowledge, problem-solving, and participation in the project. Relying on continuous collaboration and communication has been vital along the course of the project. The project has led to enhanced relationships with several of the pediatric Intensivists as well as the emergency department leadership team and medical director. The collegiality that has evolved within the interdisciplinary team has been extraordinary and has resulted in successful outcomes for our patients and their families.

The ability to gain support and a commitment to create a protocol (Appendix A), build a policy (Appendix B), complete the education modules (Appendix L), participate in surveys (Appendix F & G), establish set processes, and allow for observation along the way has been remarkable. Effective leadership is reliant on being skilled and knowledgeable along with guiding principles based on improving healthcare delivery (Abraham et al., 2021). The frontline staff, clinical leaders, providers, and executive leaders have been nothing but supportive and engaged throughout the project. They have participated in many forums, discussions, surveys, case reviews, and data reviews. Key-stakeholders have recognized the gaps along with opportunities to improve pediatric stroke care across the continuum and have become strong and highly knowledgeable advocates. These leaders have inspired others to work toward change in practice to achieve positive outcomes and factor on influence verses power (Radvany, 2021).

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Appendix A

Pediatric Stroke Protocol Policy

Policy/Procedure Number	To be assigned by Policy Librarian
Policy/Procedure Name	Emergency Management of Pediatric Stroke
Type of Policy/Procedure	Provision of care- Nursing
Date Approved	TBD
Date Due for Review	TBD
Policy/Procedure Description	Outlines the management of pediatric strokes
Supersedes	Re-titling with # change or merger (if not, delete line)

Purpose Statement

Outlines the management of the patient with **actual** or suspected stroke to promote effective treatment, ensure adequate cerebral perfusion, decrease/inhibit cerebral edema, prevent shifts in brain tissue from one compartment to another, and prevent secondary insults to the brain.

Policy

The goal of this policy is to outline the assessment, interventions and definitive care as determined by the method causing the ischemic injury.

Inclusion Criteria:

- Age greater than 30 days
- Focal Neurological deficit OR unexplained alteration in mental status

Exclusion Criteria:

- Sickle Cell Disease
- Suspected Meningitis/encephalitis
- Pregnant female
- Past history of brain tumor

Clinical History at risk for stroke including but not limited to: (50% of patients have no risk factor)

- Vasculitis: Kawasaki Disease, Lupus, Moya Pregame Syndrome
- Brain Tumor: Secondary Hemorrhage, s/p radiation
- Metabolic: Mitochondrial encephalopathy with lactic acidosis and stoke like episodes, organic acidemias
- Infection: Meningitis, encephalitis, varicella, mastoiditis/otitis media, tuberculosis, coccidiomycosis
- Hematologic/Coagulopathy: Sickle cell disease, dehydration, DIC, Disordered coagulation, severe anemia, polycythemia, thrombocytosis, acquired/inherited coagulopathy.
    - Acquired coagulopathy: nephrotic syndrome, medications ie: ocp, anabolic steroids

Cardiac: Cardiac surgery, arrhythmia, congenital heart defects

Qualified/Applicable Personnel

Emergency and PICU Nurses who have demonstrated competency with a qualified preceptor in the care of patients with acute brain injury.

Definitions

Hemorrhagic Stroke:

A stroke caused by a rupture in a weakened blood vessel that bleeds into the surrounding brain. The blood accumulates and compresses the surrounding brain tissue. Two types of weakened blood vessels usually cause hemorrhagic strokes, aneurysms and arteriovenous malformations (AVMs)

Ischemic or thrombotic stroke:

A stoke caused by blockage of an artery (or, in rare instances, a vein). An ischemic stroke occurs when a blood vessel that supplies the brain becomes blocked or "clogged" and impairs blood flow to part of the brain. The brain cells and tissues begin to die within minutes from lack of oxygen and nutrients.

Last known well:

The date and time prior to hospital arrival at which it was witnessed or reported that the patient was last known to be without the signs and symptoms of the current stroke or at his or her baseline state of health

PedNIHSS Pediatric national institutes of Health Stroke Scale:

A scale that quantifies stroke severity using a child specific version of the National Institutes of Health Stroke Score

TPA Tissue Plasminogen Activator:

An FDA-approved treatment for ischemic or thrombotic stroke, which is a stroke caused by a blood clot interrupting blood flow to a region of the brain

Procedure

1. Identify potential stroke patients based on presentation and clinical signs of deficits likely caused by an Acute Ischemic Stroke (AIS)
    a. **Infants/Young Children:**
        i. Focal weakness
        ii. Seizures
        iii. AMS

    b. **Older Children:**
        i. Hemiparesis and hemi facial weakness
        ii. Aphasia, Dysarthria

iii. Ataxia
iv. Visual filed deficits
v. Seizures, generalized or focal (but more common in younger kids)
vi. Headache with vomiting (most common symptom in hemorrhagic stroke)
vii. Coma (ICH, SAH, large MCA infarct, PRES, bilateral watershed infarcts)

2. Employ interventions to limit the potential damage of an AIS
3. Engage experts to support a more in-depth neurologic assessment of the potential for an AIS
4. Support the appropriate medical imaging exams
5. Determine type of stroke, hemorrhagic vs. Ischemic
6. Engage in therapies/interventions to support reperfusion of the region and decrease secondary injuries

Process

1. **Patient Initial neuro assessment**
   a. Level of Consciousness (i.e. Alert, lethargic, comatose)
   b. Speech (fluent, aphasic, dysarthria)
   c. Pupil reactivity. Pupils midline or deviated?
   d. Facial grimace equal or asymmetrical?
   e. Strength UE and LE (range 1-5)

2. **Stroke screening questions**
   a. Assess for focal neurological deficits
      i. Unilateral weakness or sensory change?
      ii. Vision loss or double vision?
      iii. Speech difficulty?
      iv. Dizziness or trouble walking?
      v. Difficulty swallowing? (For posterior AIS)
   b. Did the problem begin or get worse suddenly?
   c. Has the problem been present for less than 4.5 hours?
   d. When was the child last known well?
   e. When was last PO intake? (if sedation is needed for imaging)

   KEY POINT: Neurology will have been paged to support a PedNIHSS to determine likelihood of stroke

3. **Initiate and maintain neuroprotective measures**
   a. Normovolemia: 50th % to 15th % above the 95th% for age (reference table A)
   b. Normovolemia: isotonic fluid resuscitation as needed and maintenance fluids with Normal saline
   c. Normoglycemia: goal of 80-180 mg/dL
   d. Normothermia: temp <37.5 C
   e. Seizure control: if suspected manage with Keppra 20mg/kg
   f. Keep head of bed flat, ONLY if ICP elevation not suspected
   g. Normocapnia 40-45 only if ICP not of concern
   h. Avoid Hyponatremia (Goal Na > 140)

i. Vital signs every 15 min
j. Neuro Assessments every 15 min
k. Support airway breathing and circulation
l. Supplemental oxygen if sats are <96%

4. **Anticipate provider imitated Stoke order Set:**
    a. Support ABCs
    b. Place 2 PIVs
    c. Bloodwork stat:
        i. capillary blood gas with lactate
        ii. Glucose
        iii. INR
        iv. PT/PTT
        v. Type & Screen
        vi. Fibrinogen
        vii. CBC
        viii. CMP
        ix. urine drug screen
        x. Urine pregnancy (when applicable)
    d. NPO
    e. Head of bed **FLAT, ONLY** if there is no concern for increased ICP
    f. Normotension: target SPB between 50th- 15% above the 90 %tile for age (reference table A)
        i. Treat low BP with NS
        ii. Treat significant HTN with labetalol to lower BP by ~25% over 24 hrs

TABLE A: Systolic BP Parameter

Age	**50%ile (mmHg)**	**95%ile (mmHg)**	**15% above 95th% (mmHg)**
1-4 years	90	111	128
5 yrs	94	113	130
6-10 years	96	121	139
11-18 years	105	131	151
> 18 years	110	140	161

    g. Normovolemia: Isotonic fluid (i.e. Normal saline) at maintenance with bolus prn
    h. Normoglycemia: (Goal 70-200mg/dL)
        i. Age >2, use Normal Saline (NS) (unless hypoglycemic)
        ii. Age <2, use D_5NS
    i. Maintain **normal** O2, CO2, and pH
    j. Normothermia: treat temp >37 with **acetaminophen**
    k. Seizure control: treat any seizure with anti-epileptic medication STAT
    l. Vitals q15 min
    m. Neuro exam q15 min

n. MRI, stat hyper acute MRI Stroke with dedicated images. Radiology Control desk to call MRI tech stat and calls Radiologist for immediate read. If unable to get MRI due to need for sedation, page Anesthesia at ext. 39025 stat.
If we have time delays >60 min until we get MRI, consider CT head + CT Angio Head stat

KEY POINT: results of MRI dictate next steps in provider management, see **Addendum A,** Acute Ischemic Stroke workflow and **Addendum B**, TPA Candidate Treatment Workflow

Reportable Conditions

1. Report any abnormal vital signs and assessment findings immediately to the attending provider.
2. Immediately report to the attending provider any neuroprotective interventions that do not maintain the patient within the appropriate range as defined within policy and subsequently within the order set.

Education

Educate to the plan of care and anticipated interventions and treatments.

Documentation

All documentation will occur in the Electronic Medical Record

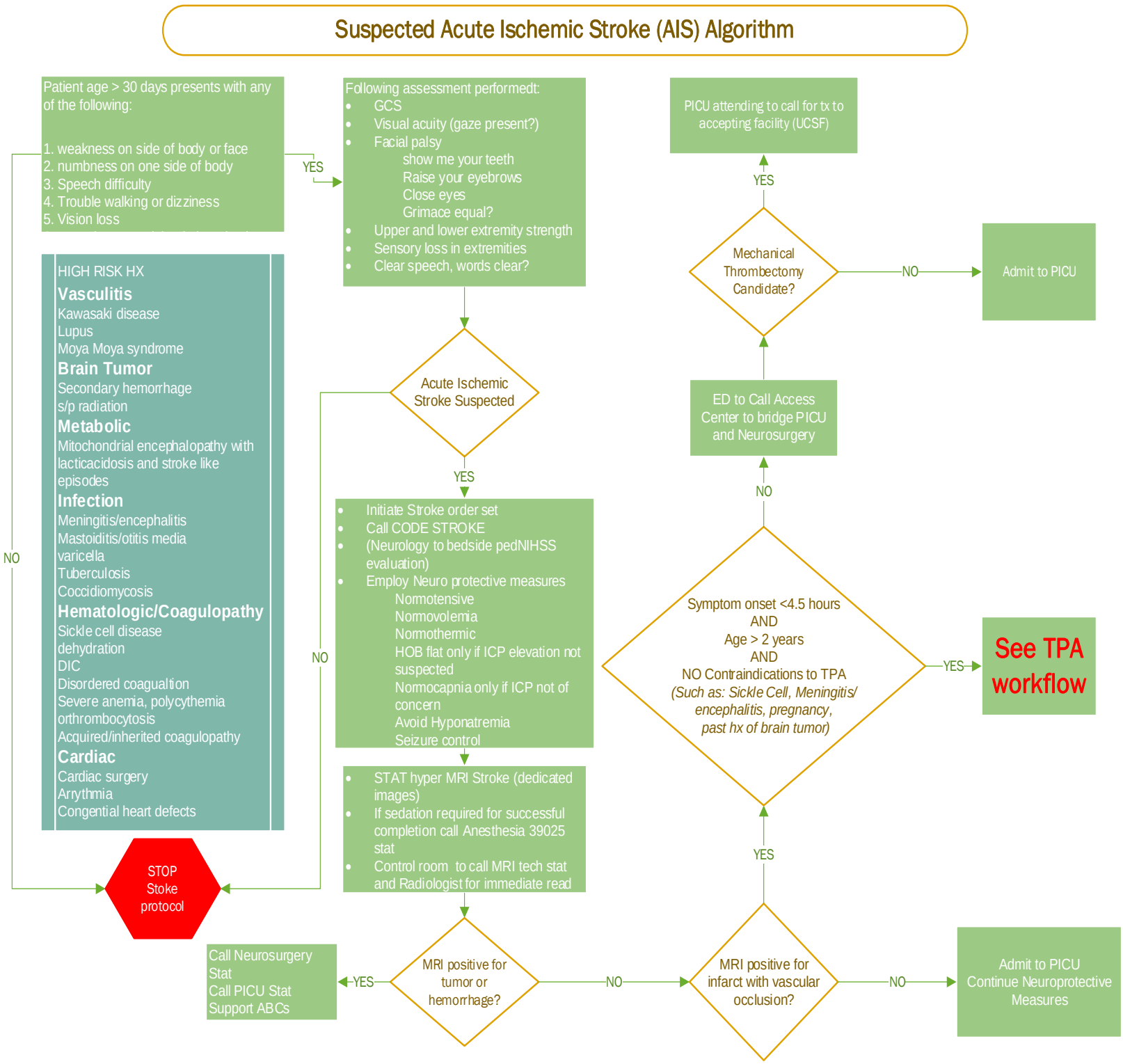
PLEASE do NOT remove any of the tables below. They are a part of ALL policies.

References/Regulations (applicable regulations, references within last 5 years when possible)	***In modified APA format*** (see example below), list specific citations that substantially support this document and its objective. This may include clinical references, textbooks, physician/nurse expert, standardized testing references and periodicals. Please put the most recent publication first, then add subsequent references in year of publication in descending order. **Example:** Curley, M., Razmus, I., Roberts, K., & Wypij, D., (2003). Predicting pressure ulcer risk in pediatric patients. The braden q scale. *Nursing Research,* 52, 22-31. **Regulations Examples**: California Code of Regulations, Title 22, Social Security, Division 5. Licensing and Certification of Health Facilities, Chapter 1. General Acute Care Hospitals, Article 3. Basic Services, §70213. Nursing Service Policies and Procedures.

	Joint Commission (2008). Provision of Care, treatment and services [Standard 12.110 of performance 3]. In Comprehensive accreditation manual for hospitals (pp. [insert page numbers]). Oak Brook Terrace, IL: The Joint Commission. Centers for Medicare & Medicaid Services Conditions of Participation, §482.23, Nursing Services. California Health & Safety Code, Division 2. Licensing Provisions, Chapter 2. Health Facilities, Article 3. Regulations, Section 1270.1(b).

Appendix B

Pediatric Stroke Algorithm Policy Continued Page 7



Appendix C

Recruitment Plan

Subject: Training Invitation

Dear Direct Care Providers,

My name is Vicky Tilton and I am a doctoral student at Purdue University Global. I am implementing my Doctor of Nursing Practice (DNP) Project on the Emergency Department and Intensive Care Units at Valley Children's Hospital. The title of my DNP Project is *Implementation of Pediatric Stroke Protocols*.

I would like to invite you to participate in the DNP Project. As a participant you will be required to give informed consent and attend an education session on pediatric stroke recognition and use of the proposed pediatric stroke protocol/policy. The education will occur during a December 2021 staff meeting (to be announced), starting at (TBD). It will be held in the conference rooms of each unit.

The DNP Project has been approved by both Valley Children's Hospital and Purdue University Global IRB.

I look forward to seeing you there.
Kind Regards,

Vicky Tilton, DNP Student

vickytilton@student.purdueglobal.edu

Appendix D

Purdue University Global

Consent for Participation

Implementation of Pediatric Stroke Protocols

CONCISE SUMMARY

You are being asked to be a participant in a quality improvement project about pediatric stroke protocol implementation conducted by DNP student Vicky Tilton with Purdue University Global at Valley Children's Healthcare. You have been asked to participate in the project because of your clinical role and expertise and may be eligible to participate. Your participation is voluntary and you can withdraw from the project at any time.

The purpose of this project is to improve patient care delivery and improve patient outcomes through the incorporation of pediatric stroke protocols.

If you agree to be in this project, you will be asked to do the following things:

- Provide feedback in regard to the education provided related to pediatric stroke protocol implementation, and incorporation and understanding of the stroke algorithm.

You are being asked to be a participant in a quality improvement project about pediatric stroke protocol implementation conducted by DNP student Vicky Tilton with Purdue University Global at Valley Children's Healthcare. You have been asked to participate in the project because of your clinical role and expertise and may be eligible to participate. We ask that you read this form and ask any questions you may have before agreeing to be in the project.

Your participation in this project is voluntary. Your decision whether or not to participate will not affect your current or future relations with Purdue University Global or at Valley Children's Healthcare. If you decide to participate, you are free to withdraw at any time without affecting that relationship.

The purpose of this project is to improve patient care delivery and improve patient outcomes through the incorporation of pediatric stroke protocols.

If you agree to be in this project, you will be asked to do the following things:

- Provide feedback in regard to the education provided related to pediatric stroke protocol implementation, and incorporation and understanding of the stroke algorithm.

Approximately 100 clinical care providers collectively may be involved in this quality improvement project with Purdue University Global at Valley Children's Healthcare.

The project involves no risk/discomforts and/or inconveniences to the participants. The benefits of participating in the project is the ability to provide care for the pediatric stroke patient using a stroke algorithm. This allows for increased partnerships with community providers and practices, as well as expand on opportunities for growth of services offered and consistency for the patient and family who may be cared for the organization and team for multiple years. You will have the ability to implement a protocol that impacts care and improves patient outcomes and can be shared with other CHA organizations and change the course for some of our patients.
No information about you, or provided by you during the project, will be disclosed to others without your written permission. When the results of the research are published or discussed in conferences, no information will be included that would reveal your identity.

Any information that is obtained in connection with this project and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. Results of the project will be kept on a flash drive with an encrypted password known only to the project manager. The flash drive will be kept in a locked cabinet accessed only by the project manager.

There is no monetary reimbursement for participation in the project.

You can choose whether to be in this project or not. If you volunteer to be in this project, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you don't want to answer and still remain in the project

The person implementing this project is Vicky Tilton, RN working. You may ask any questions you have now. If you have questions later, you may contact the project manager: Vicky Tilton Phone: 513.312.2399. The Purdue University Global DNP Faculty Mentor is Dr. Elizabeth Copeland who can be reached at 706-575-9515.

If you feel you have not been treated according to the descriptions in this form, or you have any questions about your rights as a project participant, you may contact the Institutional Review Board (IRB) at Purdue University Global through the following representative:

Dr. Susan Pettine, *IRB Chair*
Email: spettine@purdueglobal.edu

Remember: Your participation in this project is voluntary. Your decision whether or not to participate will not affect your current or future relations with Purdue University Global or Valley Children's Healthcare. If you decide to participate, you are free to withdraw at any time without affecting that relationship.

You will be given a copy of this form for your information and to keep for your records.

I have read (or someone has read to me) the above information. I have been given an opportunity to ask questions and my questions have been answered to my satisfaction. I agree to participate in this project. I have been given a copy of this form.

Signature	Date
Printed Name	
Signature of DNP Student	Date (must be same as subject's

Appendix E

Teaching Materials

Education Outline

1. Welcome & Introduction
2. Discuss DNP Project
3. Informed Consent
4. Pediatric Stroke
    a. Description
    b. Significance
    c. Treatment
5. Protocol Summary Tool
    a. Implementation
    b. Timing
    c. Reporting to Provider
6. Feedback Log
7. Questions & Answers
8. Conclusion

Handouts

1. Pediatric Stroke Policy/Protocol & Algorithm (Appendix A)
2. Informed Consent-Copy

Appendix F

Pre and Post Survey

1. Stroke is easy to diagnose in the pediatric patient population.
   - Yes
   - No

2. It is rare that children have strokes.
   - Yes
   - No

3. Many pediatric organizations follow standardized stroke protocols and algorithms for care delivery.
   - Yes
   - No

4. Valid and reliable protocols are available for pediatric stroke.
   - Yes
   - No

5. Resources are available in the community to treat pediatric stroke.
   - Yes
   - No

6. I am comfortable explaining and utilizing the pediatric stroke protocol and algorithm when caring for a patient experiencing neurological deficit or unexplained alterations in mental status.
   - Yes
   - No

Appendix G

Summative Project Evaluation Survey

Please indicate if you agree or disagree with the following statements.

1. The Pediatric Stroke Protocol was easy to understand, follow, and implement.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Comments

2. The pediatric stroke protocol offers a clearly defined plan for care delivery.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Comments

3. The pediatric stroke protocol and algorithm identified children at risk for stroke that I may not have identified without using the tool.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Comments

4. The protocol and algorithm made it easier to recognize pediatric stroke early.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Comments

5. Please provide any feedback that you believe will improve outcomes for pediatric patients experiencing a stroke.

Appendix H

Data Collection Tool

Age	Ethnicity	Gender	Admission Time	Initial Complaint/Concern	Presentation of Clinical Signs	Neurologic Deficits	Interventions	Neuro Consult Requested	Medical Imaging Exam	Therapy Initiated

- Data Items
  - Age
  - Ethnicity
  - Gender
  - Admission Time
  - Initial Complaint/Concern
  - Presentation of Clinical Signs
  - Neurological Deficits
  - Interventions
  - Neuro Consult Requested
  - Medical Imaging Exam
  - Therapy Initiated
  - Documentation of report to provider in medical record

Appendix I

Agency Approval Letter &

CITI Training

Valley Children's Healthcare
9300 Valley Children's Place
Madera, CA 93636
(559)353-3000
valleychildrens.org

May 5, 2020

Subject: Facility Approval Letter

To Whom It May Concern:

This letter will serve as my approval that Vicky Tilton may conduct hex DNP project at Valley Children's Healthcare. Vicky has informed me of the plan for the project as well the targeted population. We are excited to have this opportunity to work with her on project.

I support this effort and will provide any assistance necessary for the successful implementation of this project. If you have any questions please do not hesitate to call. I can be reached at 559-353-6609.

Senior Vice President, Clinic & Inpatient, Patient Experience & CNO, Administration — CFO
Valley Children's Healthcare
9300 Valley Children's Place
Madera, CA 9363

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 1 OF 2
COURSEWORK REQUIREMENTS*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** Vicky Tilton (ID: 8691043)
- **Institution Affiliation:** Purdue University Global (ID: 487)
- **Institution Email:** vtilton@valleychildrens.org
- **Institution Unit:** Nursing
- **Phone:** 559-353-5369

- **Curriculum Group:** Human Research
- **Course Learner Group:** Group 2.SOCIAL
- **Stage:** Stage 1 - Basic Course
- **Description:** This course is suitable for Investigators and staff conducting SOCIAL / HUMANISTIC / BEHAVIORAL RESEARCH with human subjects.

- **Record ID:** 34390559
- **Completion Date:** 03-Dec-2019
- **Expiration Date:** 02-Dec-2021
- **Minimum Passing:** 80
- **Reported Score*:** 100

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED	SCORE
Belmont Report and Its Principles (ID: 1127)	03-Dec-2019	3/3 (100%)
Students in Research (ID: 1321)	03-Dec-2019	5/5 (100%)
History and Ethical Principles - SBE (ID: 490)	03-Dec-2019	5/5 (100%)
Defining Research with Human Subjects - SBE (ID: 491)	03-Dec-2019	5/5 (100%)
The Federal Regulations - SBE (ID: 502)	03-Dec-2019	5/5 (100%)
Assessing Risk - SBE (ID: 503)	03-Dec-2019	5/5 (100%)
Informed Consent - SBE (ID: 504)	03-Dec-2019	5/5 (100%)
Privacy and Confidentiality - SBE (ID: 505)	03-Dec-2019	5/5 (100%)
Research with Prisoners - SBE (ID: 506)	03-Dec-2019	5/5 (100%)
Research with Children - SBE (ID: 507)	03-Dec-2019	5/5 (100%)
Research in Public Elementary and Secondary Schools - SBE (ID: 508)	03-Dec-2019	5/5 (100%)
International Research - SBE (ID: 509)	03-Dec-2019	5/5 (100%)
Internet-Based Research - SBE (ID: 510)	03-Dec-2019	5/5 (100%)
Research and HIPAA Privacy Protections (ID: 14)	03-Dec-2019	5/5 (100%)
Conflicts of Interest in Human Subjects Research (ID: 17464)	03-Dec-2019	5/5 (100%)
Kaplan University (ID: 763)	03-Dec-2019	No Quiz

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

Verify at: www.citiprogram.org/verify/?k1fb92775-b3b3-4d6f-8f94-f952785dbbdc-34390559

Collaborative Institutional Training Initiative (CITI Program)
Email: support@citiprogram.org
Phone: 888-529-5929
Web: https://www.citiprogram.org

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 2 OF 2
COURSEWORK TRANSCRIPT**

** NOTE: Scores on this Transcript Report reflect the most current quiz completions, including quizzes on optional (supplemental) elements of the course. See list below for details. See separate Requirements Report for the reported scores at the time all requirements for the course were met.

- **Name:** Vicky Tilton (ID: 8691043)
- **Institution Affiliation:** Purdue University Global (ID: 487)
- **Institution Email:** vtilton@valleychildrens.org
- **Institution Unit:** Nursing
- **Phone:** 559-353-5369

- **Curriculum Group:** Human Research
- **Course Learner Group:** Group 2.SOCIAL
- **Stage:** Stage 1 - Basic Course
- **Description:** This course is suitable for Investigators and staff conducting SOCIAL / HUMANISTIC / BEHAVIORAL RESEARCH with human subjects.

- **Record ID:** 34390559
- **Report Date:** 03-Dec-2019
- **Current Score**:** 100

REQUIRED, ELECTIVE, AND SUPPLEMENTAL MODULES	MOST RECENT	SCORE
Students in Research (ID: 1321)	03-Dec-2019	5/5 (100%)
Defining Research with Human Subjects - SBE (ID: 491)	03-Dec-2019	5/5 (100%)
The Federal Regulations - SBE (ID: 502)	03-Dec-2019	5/5 (100%)
Belmont Report and Its Principles (ID: 1127)	03-Dec-2019	3/3 (100%)
Assessing Risk - SBE (ID: 503)	03-Dec-2019	5/5 (100%)
Informed Consent - SBE (ID: 504)	03-Dec-2019	5/5 (100%)
Privacy and Confidentiality - SBE (ID: 505)	03-Dec-2019	5/5 (100%)
Research with Prisoners - SBE (ID: 506)	03-Dec-2019	5/5 (100%)
Research with Children - SBE (ID: 507)	03-Dec-2019	5/5 (100%)
Research in Public Elementary and Secondary Schools - SBE (ID: 508)	03-Dec-2019	5/5 (100%)
International Research - SBE (ID: 509)	03-Dec-2019	5/5 (100%)
Research and HIPAA Privacy Protections (ID: 14)	03-Dec-2019	5/5 (100%)
Internet-Based Research - SBE (ID: 510)	03-Dec-2019	5/5 (100%)
History and Ethical Principles - SBE (ID: 490)	03-Dec-2019	5/5 (100%)
Kaplan University (ID: 763)	03-Dec-2019	No Quiz
Conflicts of Interest in Human Subjects Research (ID: 17464)	03-Dec-2019	5/5 (100%)

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

Verify at: www.citiprogram.org/verify/?k1fb92775-b3b3-4d6f-8f94-f952785dbbdc-34390559

Collaborative Institutional Training Initiative (CITI Program)
Email: support@citiprogram.org
Phone: 888-529-5929
Web: https://www.citiprogram.org

Appendix J

IRB Approval Letter

Institutional Review Board
550 West Van Buren
Chicago, Illinois 60607

Expedited Review – Final Approval

December 9, 2020

Ms. Vicky Tilton
Purdue University Global
vickytilton@student.purdueglobal.edu

Re: Protocol #20-75 – "Implementation of Stroke Protocols in the Pediatric Practice Setting."

Dear Ms. Tilton:

Your proposed project was reviewed by the Purdue University Global Institutional Review Board (IRB) for the protection of human subjects under an Expedited Category. It was determined that your project activity meets the expedited criteria as defined by the DHHS Regulations for the Protection of Human Subjects (45 CFR 46), and is in compliance with this institution's Federal Wide Assurance 00010056.

Please notify the IRB immediately of any proposed changes that may affect the expedited status of your project. You should report any unanticipated problems involving risks to human subjects or others to the IRB.

If you have any questions or need additional information, please contact feel free to contact me at spettine@purdueglobal.edu. I wish you well with your project!

Sincerely,

Susan B. Pettine

Susan B. Pettine, Ph.D., CBM
IRB Chair
Purdue University Global

cc: Dr. Elizabeth Copeland
Dr. Amy Daly

Appendix K

Literature Synthesis

Occurrence/Incident	• Pediatric stroke has an incidence that is estimated between 0.6 and 13 cases per 100,000 children as identified by Jacomb, et al. (2018). Stroke in childhood has been linked to a multitude of poor outcom inclusive of behavioral difficulties, paresis, seizure, psychiatric disorders, and a poorer quality of life (Jacomb et al., 2018). There are many cognitive domain reductions and impaired intellectual functioni related to stroke.
Diagnosis/Treatment	• Clinical and radiological phenotyping in an effort to recognize common constellations of clinical symptoms along with vascular patterns on cerebral angiograms have led to more timely detection and diagnosis of vasculopathy and stroke as stated by Mackay and Steinlin (2018). The need for refined pediatric code stroke protocols along with predictive clinical decision support tools and the implementation of rapid MR is imperative to treatment regimen identification and improved outcomes (Mackay & Steinlin, 2018).
Evidence/Education	• Evidence for stroke protocols in the pediatric stroke population within the organization is clear. Curren process includes the utilization of other pediatric organizations for telemedicine neurology consult services; however, the impact is the inability to obtain timely feedback and gain appropriate direction f stroke treatment. • Education for the nurses and physicians within the organization is imperative and highly indicated in a effort to treat and care for this unique patient population. The ability to implement a stroke protocol th offers guidance for timely imaging and a solid pathway for treatment will improve patient outcomes an allow for the patients to remain at the organization for treatment and care delivery.
Vision/Team	• Creating a setting through a shared vision that can be adopted across several disciplines is critical. The multidisciplinary team values learning, evaluation and skill that enables clinical and managerial camps enable each other and lead to change. There are many opportunities to foster this effort from networki information sharing, shared goal setting, patience and persistence with practice change and implementation, and the ability to understand other's agendas along with obstacles and opportunity for making a change for the purpose of positive patient impact (Batras et al., 2014).

Appendix L

Nursing Education Power-point

Valley Children's HEALTHCARE

Pediatric Stroke

Objectives

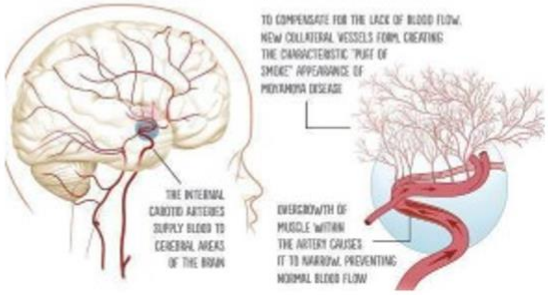
- Discuss stroke risk factors for the pediatric population.
- Identify 2 types of pediatric strokes.
- List the objective/subjective assessments required for stroke.
- Identify neuroprotective interventions.
- Navigate Epic charting for neuroassessment.

Risk Factors for Stroke, Clinical History:

*Including but not limited to:

- Cardiac: Cardiac surgery, Arrhythmias, Congenital Heart Defects
- Vasculitis: Kawasaki Disease, Lupus, Moyamoya Syndrome
- Brain Tumor: Secondary Hemorrhage, Status-post Radiation
- Metabolic: Mitochondrial Encephalopathy with lactic acidosis and stoke like episodes (MELAS Syndrome), Organic Acidemias
- Infection: Meningitis, Encephalitis, Varicella, Mastoiditis/Otitis Media, Tuberculosis, Coccidiomycosis
- Hematologic/ Coagulopathy: Sickle Cell Disease, Dehydration, DIC, Disordered Coagulation, Severe Anemia, Polycythemia, Thrombocytosis, Acquired/ Inherited Coagulopathy
  - Acquired Coagulopathy: Nephrotic Syndrome, Medications (ie: oral contraceptive pills, anabolic steroids)

Moyamoya Syndrome



MELAS SYNDROME
symptoms

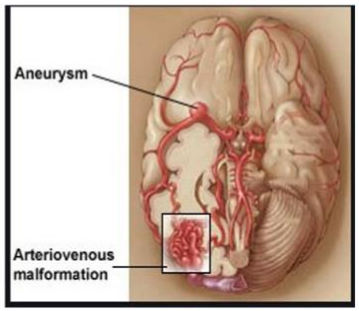
MELAS stands for:

- **M**itochondrial myopathy – weakness of muscles throughout the body
- **E**ncephalopathy – disease of the central nervous system
- **L**actic **A**cidosis – abnormal build-up of lactic acid, normally a waste product, in the body
- **S**troke – occurs when the blood supply to part of the brain is cut off by disease, and brain cells die.

Types of Stroke:

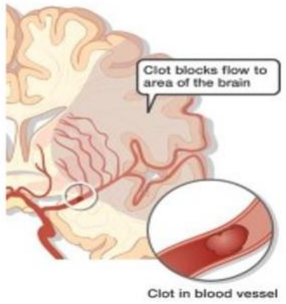
Hemorrhagic:

- A stroke caused by a rupture in a weakened blood vessel that bleeds into the surrounding brain. Blood accumulates and compresses brain tissue.
- Two types of weakened blood vessels:
  - Aneurysms
  - Arteriovenous Malformations (AVMs)



Ischemic/Thrombotic:

- A stroke caused by blockage of an artery, or in rare instances, a vein. Blood supply is blocked or "clogged", impairing blood flow to part of the brain. Brain cell and tissue death occur due to lack of oxygen and nutrients.



Assessment:

Last Known Well:

The date and time prior to hospital arrival at which it was witnessed or reported that the patient was last known to be without the signs and symptoms of the current stroke or at their baseline state of health.

Common presentations for suspected stroke:

- Infants and young children:
  - Focal weakness
  - Seizures
  - AMS
- Older children:
  - Hemiparesis and hemi -facial weakness
  - Aphasia, dysarthria
  - Ataxia
  - Visual field deficits
  - Seizures, generalized or focal (more common in younger children)
  - Headache with vomiting (most common symptom in hemorrhagic stroke)
  - Coma

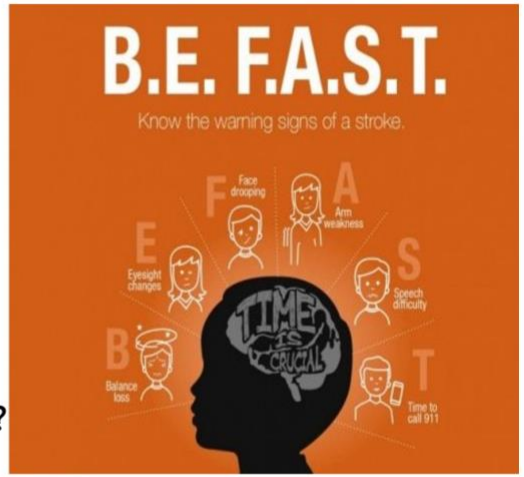
Neurological Assessment:

- Level of Consciousness
- Speech
- Pupil reactivity
- Facial grimace: equal or asymmetrical (chart under tremors?)
- Strength Upper Extremities
  - Compare bilaterally: Hand grasping, arm drifting


- Strength Lower Extremities:
  - Compare bilaterally: Foot flexion/extension assessing with resistance


Stroke Screening Questions:

- Assess for focal neurological deficits:
  - Unilateral weakness, sensory change?
  - Infants: favoring use of one side?
  - Vision loss, double vision?
  - Speech difficulty
  - Dizziness or trouble walking?
  - Difficulty swallowing ?
- Did the problem begin or get worse suddenly?
- Has the problem been present for less than 4.5 hours?
- When was the child last known well?
- When was last PO intake?



Interventions:

TIME IS OF THE ESSENCE

1. Employ interventions to limit potential damage.
2. Engage doctors to get a more in -depth neurologic assessment.
3. Support medical imaging exams.
4. Once type of stroke is diagnosed, engage in therapies/interventions to support reperfusion of the region and decrease secondary injuries.

Neuroprotective Interventions:

- Support airway, breathing circulation
- Keep B/P at the 95%ile referencing chart below.

TABLE A: Systolic BP Parameter

Age	50%ile (mmHg)	95%ile (mmHg)	15% above 95%% (mmHg)
1-4 years	90	111	128
5 yrs	94	113	130
6-10 years	96	121	139
11-18 years	105	131	151
> 18 years	110	140	161

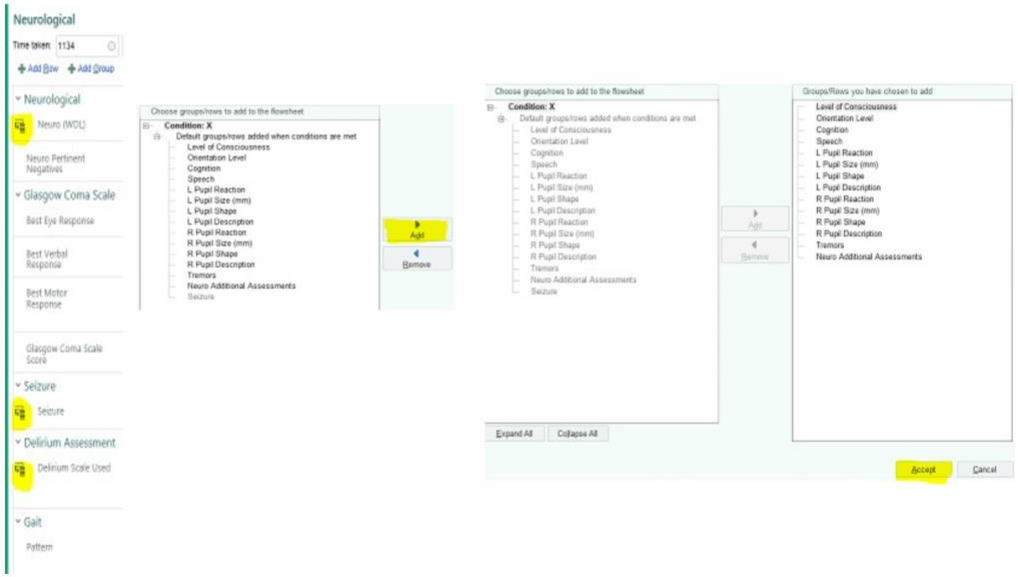
- Normovolemia: Isotonic fluid resuscitation as needed and maintenance fluids with Normal Saline
- NormoglycemiaGoal 80-180mg/dL
- Normothermiatemp <37.5C
- Seizure control: if suspected manage with Keppra 20mg/kg
- Keep head of bed flat, ONLY if ICP elevation is not suspected.
    - Rationale: keeping the bed flat improves brain perfusion in suspected stroke patients.
- NormocapniaETCO2 40-45, only if ICP elevation is not suspected.
- Avoid hyponatremia: Goal Na > 140
- Vital Signs every 15 minutes and Neuro Assessments every 15 min
- Supplemental O2 if saturations are <96%

Potential Orders to Implement:

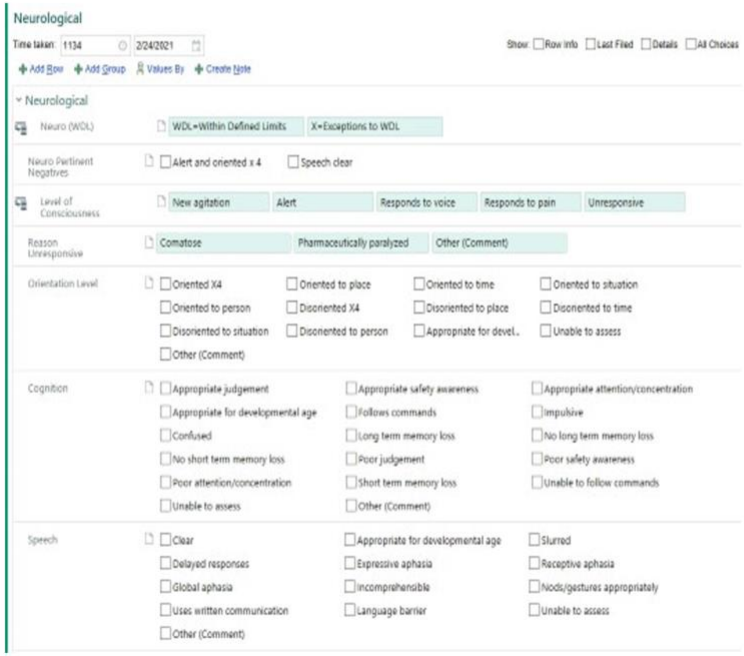
- Place 2 PIVs
- Blood work (cap blood gas, INR, PT/PTT, typer and screen, fibrinogen, CBC, CMP, urinalysis, urine preg when applicable
- NS bolus/ maintenance to maintain B/P at the 95%ile according to earlier referenced chart
- Expeditious MRI, CT
- Potential meds to control BP, fever, seizure

Epic Charting

Open all cascading rows for the Neurological Assessment, add everything available, and accept



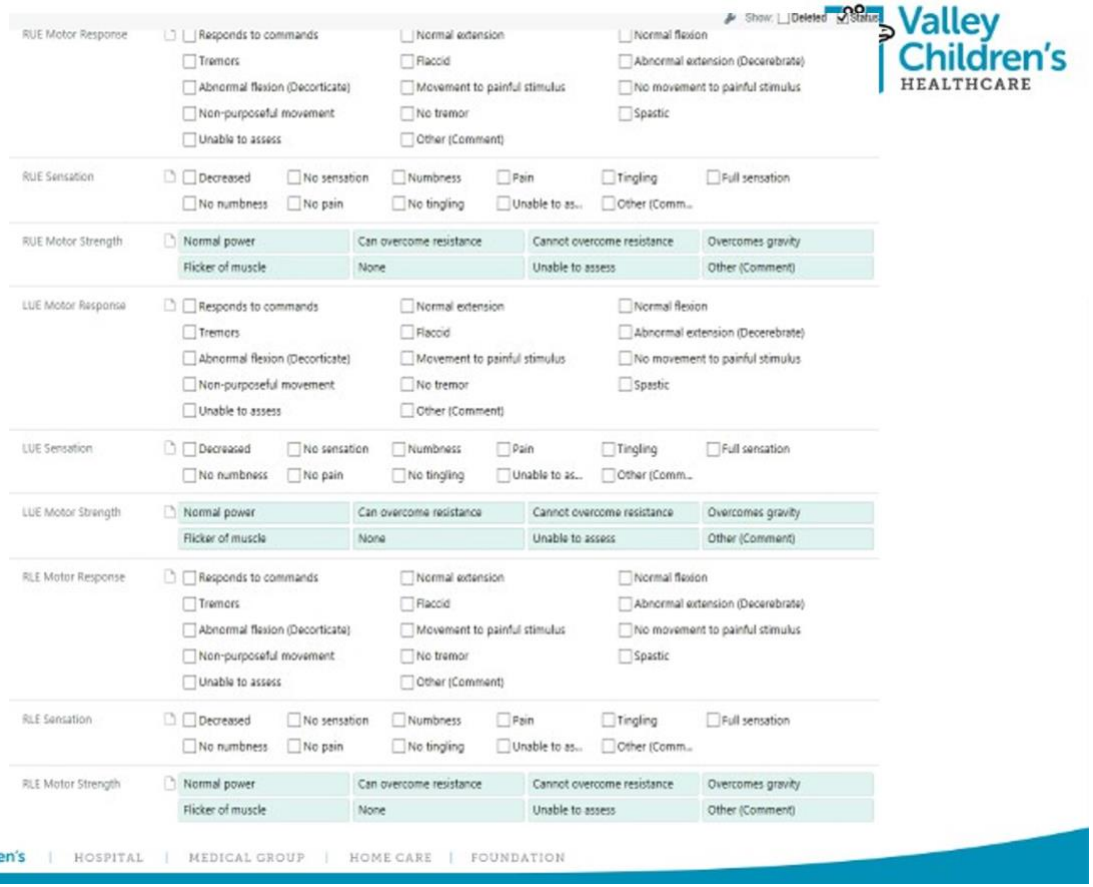
Epic provides everything needed for charting a full neurological assessment.

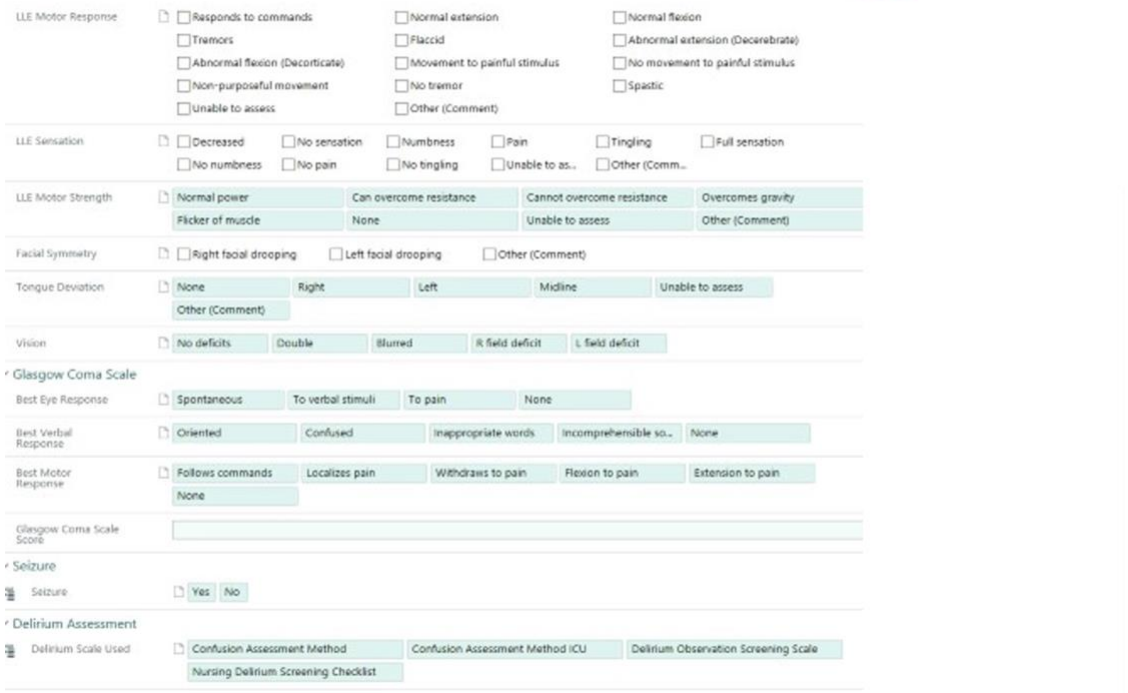



L Pupil Size (mm)
1 2 3 4 5 6 7 8 9 Other (Comment)
L Pupil Shape
Round Oval Other (Comment)
L Pupil Description
Pinpoint Keyhole Irregular Dilated Other (C...
R Pupil Reaction
Brisk Sluggish Nonreactive Unable to assess Other (Comment)
R Pupil Size (mm)
1 2 3 4 5 6 7 8 9 Other (Comment)

	•
	•
	•
	•

Flexion


Show: Deleted Status
Valley Children's HEALTHCARE
RUE Motor Response
Responds to commands
Normal extension
Normal flexion
Tremors
Flaccid
Abnormal extension (Decerebrate)
Abnormal flexion (Decorticate)
Movement to painful stimulus
No movement to painful stimulus
Non-purposeful movement
No tremor
Spastic
Unable to assess
Other (Comment)
RUE Sensation
Decreased
No sensation
Numbness
Pain
Tingling
Full sensation
No numbness
No pain
No tingling
Unable to as...
Other (Comm...
RUE Motor Strength
Normal power
Can overcome resistance
Cannot overcome resistance
Overcomes gravity
Flicker of muscle
None
Unable to assess
Other (Comment)
LUE Motor Response
LUE Sensation
LUE Motor Strength
RLE Motor Response
RLE Sensation
RLE Motor Strength
Valley Children's | HOSPITAL | MEDICAL GROUP | HOME CARE | FOUNDATION


LLE Motor Response
Responds to commands
Normal extension
Normal flexion
Tremors
Flaccid
Abnormal extension (Decerebrate)
Abnormal flexion (Decorticate)
Movement to painful stimulus
No movement to painful stimulus
Non-purposeful movement
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Spastic
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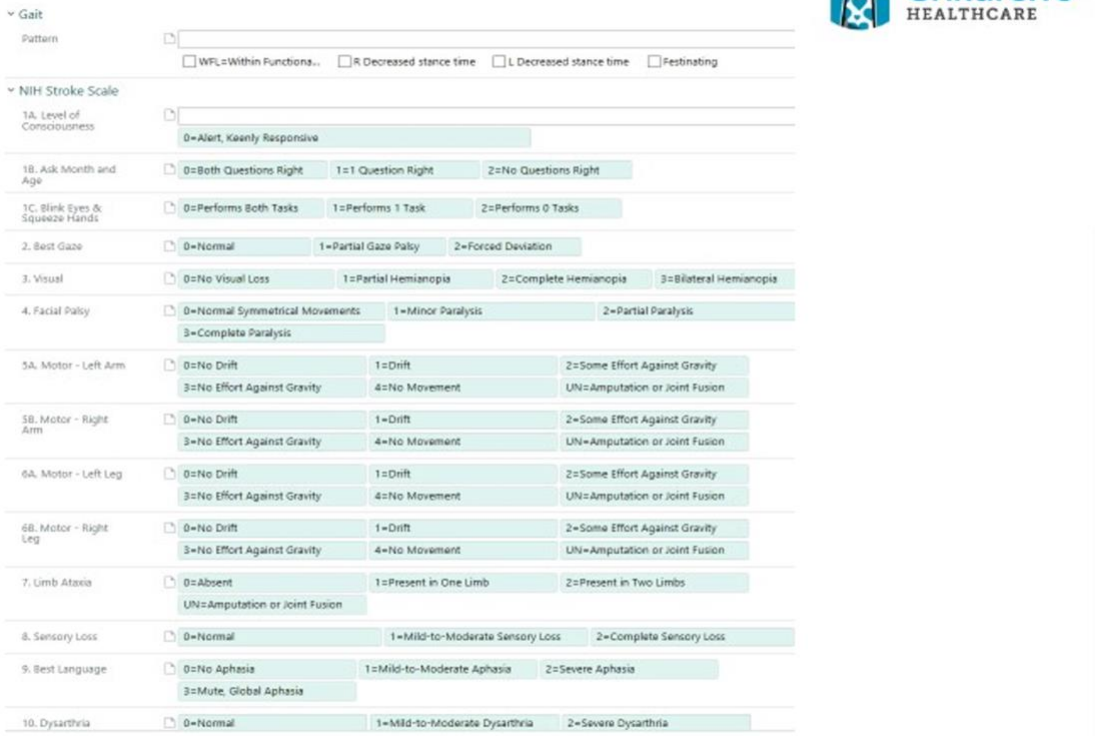
LLE Sensation
Decreased
No sensation
Numbness
Pain
Tingling
Full sensation
No numbness
No pain
No tingling
Unable to as...
Other (Comm...
LLE Motor Strength
Normal power
Can overcome resistance
Cannot overcome resistance
Overcomes gravity
Flicker of muscle
None
Unable to assess
Other (Comment)
Facial Symmetry
Right facial drooping
Left facial drooping
Other (Comment)
Tongue Deviation
None
Right
Left
Midline
Unable to assess
Other (Comment)
Vision
No deficits
Double
Blurred
R field deficit
L field deficit
Glasgow Coma Scale
Best Eye Response
Spontaneous
To verbal stimuli
To pain
None
Best Verbal Response
Oriented
Confused
Inappropriate words
Incomprehensible so...
None
Best Motor Response
Follows commands
Localizes pain
Withdraws to pain
Flexion to pain
Extension to pain
None
Glasgow Coma Scale Score
Seizure
Seizure
Yes
No
Delirium Assessment
Delirium Scale Used
Confusion Assessment Method
Confusion Assessment Method ICU
Delirium Observation Screening Scale
Nursing Delirium Screening Checklist



Gait

Pattern

☐ WFL=Within Functiona... ☐ R Decreased stance time ☐ L Decreased stance time ☐ Festinating

NIH Stroke Scale

1A. Level of Consciousness
0=Alert, Keenly Responsive

1B. Ask Month and Age
0=Both Questions Right | 1=1 Question Right | 2=No Questions Right

1C. Blink Eyes & Squeeze Hands
0=Performs Both Tasks | 1=Performs 1 Task | 2=Performs 0 Tasks

2. Best Gaze
0=Normal | 1=Partial Gaze Palsy | 2=Forced Deviation

3. Visual
0=No Visual Loss | 1=Partial Hemianopia | 2=Complete Hemianopia | 3=Bilateral Hemianopia

4. Facial Palsy
0=Normal Symmetrical Movements | 1=Minor Paralysis | 2=Partial Paralysis | 3=Complete Paralysis

5A. Motor - Left Arm
0=No Drift | 1=Drift | 2=Some Effort Against Gravity | 3=No Effort Against Gravity | 4=No Movement | UN=Amputation or Joint Fusion

5B. Motor - Right Arm
0=No Drift | 1=Drift | 2=Some Effort Against Gravity | 3=No Effort Against Gravity | 4=No Movement | UN=Amputation or Joint Fusion

6A. Motor - Left Leg
0=No Drift | 1=Drift | 2=Some Effort Against Gravity | 3=No Effort Against Gravity | 4=No Movement | UN=Amputation or Joint Fusion

6B. Motor - Right Leg
0=No Drift | 1=Drift | 2=Some Effort Against Gravity | 3=No Effort Against Gravity | 4=No Movement | UN=Amputation or Joint Fusion

7. Limb Ataxia
0=Absent | 1=Present in One Limb | 2=Present in Two Limbs | UN=Amputation or Joint Fusion

8. Sensory Loss
0=Normal | 1=Mild-to-Moderate Sensory Loss | 2=Complete Sensory Loss

9. Best Language
0=No Aphasia | 1=Mild-to-Moderate Aphasia | 2=Severe Aphasia | 3=Mute, Global Aphasia

10. Dysarthria
0=Normal | 1=Mild-to-Moderate Dysarthria | 2=Severe Dysarthria


11. Extinction and Inattention
0=No Abnormality
NIH Stroke Scale
Onset of Symptoms
Last Seen Well - Date
Last Seen Well - Time
Accept
Cancel