

Acute cerebrovascular disease Saccular Aneurysm, Hunt-Hess 3, fisher grade 2: Application to Myra Levine's four conservation principles

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Abstract

Introduction: Cerebrovascular diseases or stroke is a disease suffered by various age group with recorded greater incidence among women than men. Its complications and effects leave minor and even debilitating impact on patient's health and recovery.

Purpose: This study described and explored a single yet complex type of stroke and its implications to patients, healthcare providers and support systems.

Methods: This research is through a single case study approach. Data were collected upon the approval of the research ethics committee. Data samples were recruited based on the inclusion criteria. Data were presented and analyzed in the perspectives of Myra Levine's Conservation Principles.

Results: Its correlation to the conservation principles is examined in terms of promotion of adaptation, maintenance of wholeness and vital roles of nurses and other allied health providers in caring and rehabilitating stroke patients. Nurses are holistic carers of patients with stroke. Nurses best practices in caring patients with stroke at the bed side is commendable.

Conclusion: In conclusion, as time is essential to brain, time is of greater priority in its bundle of care. Expertise of multi-disciplinary care providers must be desired and achieved, even in local settings, to ensure quality healthcare delivery. It is highly recommended to consider improving clinical pathways for nurses in delivering specialized care.

Keywords: Cerebrovascular disease; Stroke; Intracerebral haemorrhage; Ruptured aneurysm; Conservation.

Introduction

In setting the prevalence of stroke internationally, review of related literatures and articles are conducted. According to [1], "the worldwide prevalence of cerebral aneurysms is estimated to be approximately 3.2%, with a mean age of 50, and an overall 1:1 gender ratio. This ratio changes significantly after age 50, with an increasing female predominance approaching 2:1, thought to be due to decreased circulating estrogen causing a reduction in collagen content of the vascular tissue. The rate of rupture causing SAH is about 10 per 100,000. This is higher in certain populations such as the Finnish and Japanese. However, this is not due to a higher prevalence of aneurysms in these populations. The overall mortality due to aneurysmal SAH is considered to be 0.4% to 0.6% of all-cause deaths, with an approximate 20% mortality and additional 30% to 40%

morbidity in patients with known rupture".

At present, there is no established database of cases of Cerebral Aneurysm here in our country. Recent studies conducted by [2], "etiologies of most cerebral aneurysms are acquired lesions, with an increased incidence in patients with certain therapeutically non-influenceable risk factors such as advanced age and familial history. Other influenceable risk factors are hypertension, atherosclerosis, traumatic brain injuries, smoking, substance abuse (alcohol, methamphetamine, cocaine) and certain embolic-forming infections like endocarditis. Certain genetic conditions are associated with higher prevalence. This includes, but is not limited to, autosomal dominant polycystic kidney disease, Ehlers-Danlos Syndrome, fibromuscular dysplasia, tuberous sclerosis, Arteriovenous Malformations (AVM), and coarctation of the aorta".

In study of [3], "women have 1.24x greater incidence than

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men. Mean age of 55 years old is also included in risk factors and about 20 % of individuals with one aneurysm will have multiple aneurysms. In terms of race, African Americans and Hispanics are in greater risks compare to Asians. Cases in low-to-middle income countries almost double that of high-income countries".

Here in our country, there are influential people devastated by SAH secondary to ruptured aneurysm, from early to middle adulthood, none from this age bracket can exclude from the fatality of this disease, hence, this case study is chosen from too many identified neurological diseases.

The disease process of cerebral aneurysm is a dynamic and multi-factorial in nature and most of the time incompletely understood. At present study of [4,5], "it remains unknown what the actual cause for the initial disruption of the elastic internal lamina in the arterial vessel wall is and whether or not this process occurs early or later throughout the patient's lifetime. However, the current knowledge on chronological aneurysm development suggests that the progression of aneurysms and remodeling of aneurysm tissue is a discontinuous but ongoing process and that cerebral aneurysm cannot be generally assumed to be stable lesions".

Objectives of the Study

Cerebral aneurysm is a disease needing a specialized care and with time-bound approach due to its prognosis and outcome. At present, nurse specialization in the field of Stroke Nursing and other field of Neuroscience is absent, no organization nor regulating body to set competencies and limitations. Clinical nursing expertise is one of the considerations in provision of quality nursing care. Through trainings, workshops and clinical exposure, skills, knowledge and attitude can be forged and honed. This clinical case is conducted with the following objectives: 1) identify importance of clinical nurse specialist in provision of individualized and holistic care in stroke patients, 2) identify applicability of Myra Levine's Four Conservation Theory, 3) identify nurse initiated management that may improve patients' outcome.

Materials and Method

The research design and method used was qualitative, case study, applied, non-experimental and prospective.

The researcher obtained consent and permission to conduct research and perform clinical duty from Medical Center Chief, Head of Nursing Service Division and Training Specialist for Nurses of Tertiary Level Institution at Balanga City, Bataan where the researcher was currently employed. Permission was immediately granted with certain compromise on patients' data in compliance with the Data Privacy Act of 2018 (RA 10173) and agreement on disposal of collected data. Prior conduction of this case study, a consent form was made and given to patient and relative and explained the sole purpose

of the study.

Purposive non-probability sampling was utilized and data gathered from informant with good reliability percentage (patient and immediate relatives), performed detailed physical neurologic examination and reviewed pertinent work-ups upon admission at Emergency Department and during confinement at Neuroscience Unit under Neurocritical Care Service. The study was conducted in 7-day period from admission to transfer in a facility with capability of Neurosurgical operation for aneurysm (April 27- May 4, 2019). All gathered data were treated with utmost confidentiality and privacy as discussed. The questionnaire was stored in an envelope and disposed properly through shredding.

Results and Discussion

To present this case clearly, results were made in chronological order from day 0 to 7 and subcategorized into the following: targeted and detailed history taking, pertinent neurologic and general examination, summary of patient's course in the ward, review of pertinent work-ups, implemented medical and nursing management.

Day 0- Admission at Emergency Department up to Transfer to Neuroscience Unit

I. Targeted and Detailed History Taking

a. History of present illness and complaint: Patient L.A.D.C is a 47-year old female resided at Mariveles Bataan, plain housewife, came in due to complaints of sudden onset of throbbing/crushing and thunderclap headache associated with blurring of vision and followed by loss of consciousness, time of ictus is around 8 am on April 27,2019.

b. History of Past Medical Illness: Relatives claimed that patient have history of hypertension with poor compliance to prescribed unrecalled maintenance medications. Denied history of diabetes mellitus and previous stroke.

c. Familial History: Relative claimed that her father died with stroke like symptoms, (unidentified classification) in 1991.

d. Social History: Relatives denied smoking, alcoholic beverages drinking and substance abuse.

II. Pertinent Neurologic and General Assessment

The researcher was able to attend the patient at ED together with on-duty Neuroscience Nurse and presentation of symptoms are as follows:

Neurology

- Glasgow Coma Scale (GCS) Score of Nine (9) (BEO- 3, BVR-1, BMR- 5).
- National Institute of Health Stroke Scale (NIHSS)- Sixteen (16) Moderate to Severe Stroke.

- WFNS SAH Scale Score (World Federation of Neurological Surgeons)- Four (4).
- Agitated.
- Awake to drowsy state with persistent facial grimace.
- Preferential gaze to the left but crosses midline during oculoccephalic maneuver.
- Pupils Size-2-3 mm SRTL.
- (+) Right central facial palsy.
- (+) Nuchal rigidity.
- (+) Kernig's Signs.
- (+) Jolt accentuation of headache as evidence of facial grimacing.
- Able to move extremities left more than the right.
- (+) Babinski- Right.

Cardiovascular

- Fast heart rate with normal rhythm upon auscultation.
- No murmur.

Respiratory

- Fast breathing rate with normal rhythm breathing pattern.
- Minimal rales during auscultation.

Other system

- Unremarkable.

Vital Signs

- Blood Pressure- 170/90mmHg.
- Heart Rate- 105 beats per minute in a normal rhythm.
- Respiratory Rate- 30 breathes per minute in a normal pattern.
- Temperature- 37 degrees celcius.
- Oxygen Saturation- 92-97% via finger probe pulse oximeter.

III. Review and Summary of Pertinent Work-ups

Cranial CT scan

- Shows hyper-densities located at left temporal-parietal region and diffused along sulci and interhemispheric falx.
- Dilatation of bilateral temporal horn, suggestive of beginning obstructive hydrocephalus.
- Minimal subfalcine herniation.
- No massive infarction or space occupying lesion.

12 Lead Electrocardiogram

- No ischemic changes.
- Sinus Tachycardia.

Chest X-ray

- No hazy infiltrates.
- Cardiomegaly.
- Endotracheal tube in place.

Blood Chemistries and Electrolytes

- No deranged value.

Coagulopathies

- PT, PTT and INR- Normal results.

Cardiac Work-ups

- Troponin I and CKMB- Negative, not more than normal range.

Arterial Blood Gas Determination

- Fully compensated respiratory acidosis with more adequate oxygenation at 100% FiO₂, AC Mode.

IV. Implemented Medical and Nursing Care Management

Medical and nursing management implemented on this case are standardized, internationally accepted and evidenced-based practice.

- Activated Brain Attack Protocol- a multidisciplinary approach in treating stroke patients.
- Performed brief clinical and neurologic assessment.
- Performed targeted history taking to establish time of ictus or last seen normal, past medical history, social history and other medical complaints.
- Implemented Nursing Bundle of Care for CVD Patients.
- Assessed and intervened for Airway, Breathing and circulation problem (Secured airway, assisted ETT insertion).
- Placed head of bed at 30 degrees angle and maintain patient's head on anatomical neutral position.
- Administered oxygen support to maintain SPO₂ of >94%.
- Established double IV peripheral line using IV cannula gauge 18.
- Initiated IVF using PNSS at a rate ordered by the physician.
- Maintained of target parameters set by the physician.
- Monitored VS every 15 minutes during the first hour.
- Expedited all diagnostic procedures ordered by physician (accompanied patient to Imaging Department).
- Fall risk assessment and precautions at all time observed.
- Implemented Clinical Pathway for Cerebrovascular Disease, Hemorrhage.
- Initiated double peripheral IV lines, 1 access on Saline lock and 1 access hooked at PNSS 1L running at 125 ml per hour regulation until further orders.

• Hooked patient to mechanical ventilator with following parameters:

- Volume AC Mode.
- FiO₂ 100%.
- Vt- 480ml (computed at ~ 60 kg body weight x 8ml).
- BUR- 24 bpm for 20 minutes then decrease to 18 thereafter.
- PEEP -5 cmH₂O.
- PF- 40.
- Requested ABG determination 1-hour post hooking to MV.
- Obtained CBG (142 mg/dL).

• Administered the following medications:

- Mannitol 20% 150mL IV Bolus on stat basis then every 4 hours.
- Tranexamic Acid 500 mg IV every 8 hours for 6 doses then discontinue.
- Load Phenytoin 1000 mg SIVP, infuse at a rate not exceeding 50mg/minute using IV volumetric infusion set with 50 mL PNSS then maintain at 100mg IV every 8 hours.
- Nimodipine 60mg tab every 4 hours.
- Fentanyl 25mcg IV every 8 hours RTC for now.

- **Started Midazolam Drip:**

50 mgs in 50mL PNSS to run initially at 1 mg/hr then titrate to target RASS -2 (Mild Sedation) for 24 hours then reassess.

- **Nicardipine 1 mg IV push now then start Nicardipine Drip as follows:**

- 20 mg Nicardipine + 80 mL PNSS to run initially at 1 mg per hour then titrate by +/- 1 mg per hour every 10 minutes to maintain target SBP 13-15mmHg.
- Lactulose 30mL per Orem once daily, hold for BM more than thrice daily.
- Diazepam 5mg IV as needed for active seizures, maximum dose of 20 mg per day.
- No D5 Containing IVF.

- **Maintained on the following target parameters:**

- SBP 130-150 mmHg.
- Serum Na 145-155 mEq/l.
- CBG 140-180 mg/ dL.
- Keep normothermic.
- Maintain euvolemic state.
- O2 Saturation >96%.
- Performed CBG Monitoring every 6 hours pre feeding.
- Assisted NGT insertion and started tube feeding with 1600kcal/day LSLF divided by into 6 equal feedings.
- Assisted insertion of IFC aseptically then connected to urine bag.
- Monitored NVS and Vs every 1 hour.
- Monitored I and O every 1 hour then obtain 4 hours fluid balance.
- Admitted to Neuroscience Unit under Neurocritical Care Subdivision.
- Communicated definitive plan of management.
- Stabilize patient's condition.
- Aggressive blood pressure control to prevent rebleeding or rupturing of unsecured aneurysm.
- Pain management with opioids analgesics.
- Early weaning to Mechanical Ventilator.
- Empiric treatment of infection followed by culture guided treatment.
- Prevention of vasospasm.
- Once neurologically stable, transfer to institution with capability to perform CT Angiogram and Aneurysm Clipping or Coiling.

Day 1 of Confinement at Neuroscience Unit

I. Summary of Patient's Course in the Ward

Significant improvement on neurologic status is observed on Day 1 of NSU confinement. Patient is now fully awake and consistently follows simple to complex commands with GCS Score of (E4, V4, M6). Complained of moderate headache on a pain scale score of 7-8 on a scale of 10 in a recurrent pattern. Vital signs are within target parameters and assessment of other systems are unremarkable.

II. Review Pertinent of work-ups

- SGOT and SGPT- within normal limit.

- Lipid Profile- hyperlipidemic.

III. Implemented Medical and Nursing Care Management

- Verified and performed detailed history taking.
- Implemented Nursing Bundle-of-Care Protocol for CVD (Stroke Alphabet).

Airway

- Elevated HOB at 30 degrees angle.
- Maintained hyperextension of patient's head.
- Suctioned endotracheal and oropharyngeal secretions frequently as needed.

Breathing

- Maintain oxygen saturation at >94%.
- Circulation.
- Hook to continuous cardiac monitoring specifically for the first 24-72 hours post stroke.

Disability

- Perform manual motor testing every 1 hour for the first 24 hours post stroke.
- Aid on patient's self-care and ADL's.

Exposure and Precaution

- Perform head-to-toe assessment.
- Implement fall risk assessment and tagging for high-risk patient's classification.

Fever Control

- Take patient's temperature every 1 hour or as needed.
- Give Paracetamol 300mg IV or Paracetamol 500 mg tab every 4-6 hours for temperature > 37.5 degrees Celsius.

Glucose Control

- Maintain CBG level at 140-180 mg/dl. Treat for CBG less than 80mg/dl with D50 50ml SIVP.

Hypotension and Hypertension Prevention

- Promote adequate cerebral blood flow to maximize reperfusion.

Intake and Output Monitoring

- Maintain euvolemic state to ensure adequate circulating blood volume.

- **Carried out the following physician's order:**

- Started weaning by decreasing of Flo2 by 10% every 2 hours until 40% is reached.
- Started Ipratropium + Salbutamol Neb nebulization every 8 hours.
- Started N-acetylcysteine 600mg tab, dissolved in ½ glass of water, twice daily.
- Started Amlodipine 10 mgs tab once daily.
- Continued pain medications.
- Continued titration of Nicardipine drip as ordered.
- Continued IV hydration with PNSS 1L at 100ml/hour until further orders.

- Scheduled for Cranial CT Angiogram.
- Requested for repeat Creatinine, Serum Na, K, iCa and Mg.

Day 2 -3 of Confinement at Neuroscience Unit

I. Summary of Patient's Course in the Ward

Patient's neurologic status is consistently improved upon observation post sedation and able to tolerate weaning plan, successful extubation was done on Day 3 of confinement. Adequate pain control is observed and claimed with decreasing trend of throbbing headache. No documented seizure event at this point in time. 48 hours recorded vital signs were maintained on target parameters.

II. Review Pertinent of work-ups

- Repeat CBC with platelet count- within normal limits.
- Repeat Serum Electrolytes- K- 2.50 mmol/l, rest of the findings are within normal limits.

III. Implemented Medical and Nursing Care Management

- Continued nursing bundle-of-care protocol.
- Carried out the following orders.
- Started correction of serum K with Potassium Chloride Drip: 10 mEq in 90 ml PNSS to run for 1 hour for 6 cycles.
- Administered pre-extubation medications.
- Titrated Nicardipine Drip until hold.
- Started Losartan 100mg tab once daily in am.

Day 4-6 of Confinement at Neuroscience Unit

I. Summary of Patient's Course in the Ward

No significant neurologic deterioration was observed and patient's showed ability to sustain adequate oxygenation and expectorate oro-tracheal secretions. Increasing trend of moderate throbbing headache with pain scale score of 6-8 on a scale of 10 as severe headache. Facilitation of CT Angiogram was conducted and done.

II. Review Pertinent of work-ups

- Repeat Serum Potassium- 4.2 mmol/l.

III. Implemented Medical and Nursing Care Management

- Continued nursing bundle-of-care protocol.
- Carried out the following orders.
- Increased frequency and dosage of Fentanyl to 50 mcg every 6 hours.
- Requested repeat Creatinine post Angiogram.
- Maintained on set target parameters.

Day 7 of Confinement at Neuroscience Unit

Patient is neurologically and hemodynamically stable. Coordinated and facilitated transfer to institution with capability to perform operation of securing an aneurysm. Health teachings emphasized and advised follow up care.

Identified Nursing Problems and Intervention

1. Ineffective airway clearance (Page 44, 55)

Definition

Inability to provide clear secretions or obstructions possibly to be taken to maintain a clear airway.

Interventions

Airway stabilization is done upon admission at ED. Frequent suctioning and chest physiotherapy post nebulization.

2. Mechanical Ventilation Weaning Response: Adult

Definition

Respiratory and psycho-logical adjustment to progressive removal of mechanical ventilation.

Interventions

Facilitated weaning plan in collaboration with Respiratory Therapist. Spontaneous Breathing and Weaning trials are utilized.

3. Intracranial Adaptive Capacity, Decreased

Definition

This provides a mechanism on the intracranial fluid dynamic to normalize the compensated increasing intracranial volumes. This may result to a repeated disproportionate pressure in response to non and noxious stimuli.

Interventions

Cerebral edema management through administration of high dose hyperosmolar agents. Maintained head of bed at 30 degrees angle and head part on anatomical neutral position. ICP monitoring rendered and implemented precautionary measures for seizures.

4. Anxiety

Uneasy feeling and discomfort with feeling of anticipated anger manifested by feelings of apprehension.

Intervention

Pain medications were given on timely manner and maintained on sedation for 24 hours.

5. Pain, Acute

Definition

Unpleasant discomfort to a potential injury to a tissue (International Association for the Study of Pain); sudden or slow onset of any intensity.

Interventions

Maintained on opioid analgesics and frequently reassess level of pain.

6. Self-Care Deficit

Definition

Inability to perform ADL's

Interventions

Assisted in performing ADL's during confinement in ICU.

7. Risk for rebleeding

Definition

Re-ruptured of unsecured aneurysm due to internal and external factors.

Interventions

Reduce of physical stimuli to lessen risks of rebleeding prior

to the surgical operation or any invasive procedure to secure preventive rupture of aneurysm.

Follow Up Consult Post Aneurysm Clipping

Patient followed up on Neurology Clinic on Day 14 post aneurysm clipping. On thorough observation and assessment, almost no residual of stroke and showed an intact cognitive function. No seizure event was documented but with complaint of mild recurrent headache. Normal vital signs were taken. Patient was able to perform activities of daily living and with assistance.

Health Education for Patients and Significant Others

As a Stroke Nurse, one of its dictum is to provide education on prevention of stroke or recurrence of previous brain attack through intensive stroke lectures and practice sharing. Patient L.A.D.C is hypertensive without any maintenance medications and she had never sought medical consultation. Issuance of BGHMC Stroke prevention leaflets was given. Goal and activities was discussed along with relatives and give emphasis on the following:

- Adherence to prescribed medications and follow up consultation.
- Physical rehabilitation.
- Modification of diet, activities and lifestyle.

Psychosocial Aspect of Nursing Care and Support

Stroke is a debilitating and a life changing disease that can affect various ages. In this case, patient is an accountant by profession and suffered from weakness of dominant hand which can affect the resumption of ADL's and professional career. Family support is one of the essential part of the support system that can mitigate the patients status post hospitalization and aid in easily establishing of an effective coping response. Optimism was observed on patient LADC during her confinement at NSU, she was very positive on the outcome of her treatment and very eager to undergo neurosurgical operation. This kind of behaviour catalyses decision making dilemmas of patient's immediate family. During her follow up consultation, inquiries including resumption of sexual activities was raised. Neurologist together with Stroke Nurse started post hospitalization family conference was held to address queries and to maintain the positive outlook of the patient and family towards complete recovery and return to normal ADL's.

Nursing Model: Levine's Four Conservation Theory

The objective of Myra Levine's Four Conservation Principles model is to underscore promotion in adaptation and maintaining wholeness of care. This is the theory selected by the researchers for it encompasses numerous aspects of stroke and bundle of care that it caters and needs. Nurses, as primary healthcare providers, accomplish the goal of the model

through the conservation of energy, its principles, structures, personal and social integrity.

a. Conservation of energy refers to the balancing energy input and output to prevent too much fatigue, include adequate sleep, rest, nutrition and exercise. Patients with stroke is highly dependent to caregivers for their ADL's. Nurses serve as their hands and feet as they cope with their disability and resumption of their usual activities.

b. Conservation of structural integrity refers to maintaining or restoring the structure of the body preventing physical breakdown and promoting healing. Bundle of care in stroke includes multidisciplinary approaches including nutrition, physical rehabilitation, occupational therapy, health education and/or discharge planning compliance. These activities promote awareness of their disease process and how healing can still be achieved despite neurologic deficit or disability.

c. Conservation of personal integrity promotes the patient as to achieve recognition, respect, self-awareness, and self-determination. Psychosocial aspects are addressed as families and other support systems are engaged in treatment or management of patients. Effective bedside care of nurses promotes nurse-patient relationships that encourage and channel hope to patients.

d. Conservation of social integrity sees patient as a recognized as someone who resides within a family, a community, a religious group, an ethnic group, a political system and a nation. Effective coping mechanisms are key in alleviating patients' anxiety and promoting self-efficacy as they live with their disease not within it.

Conclusion and Recommendation

Evolution of nursing function is inevitable due to changing approach in healthcare settings. Nurse-initiated management executed by trained Nurses in field of Neuroscience is a promising program that will elicit delays and standardized nursing and medical treatment modalities for Stroke or other types of diseases. Nurses is positioned in the very important part of platform of healthcare professionals, we spend the most of our time in patient care compared to other allied healthcare profession. Utilization of evidence-based practice and guidelines is exhibited in this case and showed outstanding outcome as evidence of patients maximal recovery to almost no neurologic deficit assessed during followed up consultation.

At our present setting, our institutions are lacking of special programs that will improve skills, knowledge and attitude of nurses in different field of specializations. Nursing functions are very limited. As a recommendation, nurse specialization and nurse initiated programs are needed in our healthcare situation which multiple studies revealed that there is significant effect of special trainings, assignment and standardized treatment in patients outcome.

References

1. Revilla-Pacheco F, Escalante-Seyffert MC, Herrada-Pineda T, Manrique-Guzman S, Perez-Zuniga I, et al. Prevalence of Incidental Clinoid Segment Saccular Aneurysms. *World Neurosurg.* 2018; 244-251.
2. Lee KS, Shim JJ, Shim JH, Oh JS, Yoon SM. Cerebral Aneurysms in Judicial Precedents. *J Korean Neurosurg Soc.* 2018; 474-477.
3. N K de Rooij, F H H Linn, J A van der Plas, A Algra, G J E Rinkel. Incidence Of Subarachnoid Hemorrhage: A Systematic Review With Emphasis On Region, Age, Gender And Time Trends. 2007; 4.
4. Nima Etminan, Bruce A Buchholz, Rita Dreier, Peter Bruckner, James C Torner, et al. Cerebral Aneurysms: Formation, Progression and Developmental Chronology. 2014; 3.
5. Marion Johnson, Sue Moorhead, Gloria Bulechek, Howard Butcher, Meridean Maas et al. NOC and NIC Linkages to NANDA-1 and Clinical Conditions, Supporting Critical Reasoning and Quality Care 3rd Edition. 2012; 44-46,161, 240, 308, 394.