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The Exploration of the Long-Term Effects of Stroke Patients in the ICU

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NURS 498VH Honor's Thesis

Dr. Ballentine and Dr. Scott

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Abstract

Hospitalization in the Intensive Care Unit (ICU) has been shown to have poorer long-term effects in stroke patients from the time of admission up to one year of discharge. Throughout the world, people suffer from the complications of having a stroke and being in the ICU. Increased mortality rate, dysphagia, poor speech, loss of mental status, and decreased muscle movement are found in stroke patients who received treatment in the ICU. The poorer long-term effects in stroke patients receiving treatment in the ICU may be caused by the type of stroke, comorbidities, or mental status at admission. The long-term effects in stroke patients are also accompanied by if the patient has had a previous transient ischemic attack, known as a mini stroke, before being admitted into the ICU for treatment. This study uses research on the characteristics of stroke patients in the ICU and the long-term effects following the treatment through graphs and tables from 2009-2020. A total of four articles were selected and Golstianian, et. al. qualified for review due to its quality research that has been conducted showing the different risk factors and mechanical ventilation interventions in the ICU for the effects of the stroke patient in the ICU. As shown in the four reviews used from published abstracts and articles, the results indicate that the usage of the ICU makes the stroke patient have a poorer outcome by increasing the mortality rate, decreasing gait, and impairing memory. The results also show that mechanical ventilators and percutaneous endoscopic gastrostomy tubes aid in how the patient recovers from a stroke.

Keywords: Strokes, Stroke Patients, Neuro ICU, Effects of Strokes

Introduction

In patients admitted into the ICU with a diagnosis of a stroke, what are the long-term consequences and characteristics of recovery? Every stroke patient is unique in the way in which they recover from the medical condition, and not every patient who has a stroke suffers from the same complications and prognosis. Ischemic, hemorrhagic, and transient ischemic strokes require medical attention as soon as possible, and the severity of the stroke will predict the patient's chance of recovery (AHA, 2018). There is considerable evidence showing that those patients who need mechanical ventilation having a Glasgow Coma Scale of moderate to severe and percutaneous endoscopic gastrostomy tube put in place have a poorer prognosis of leaving the Intensive Care Unit better than they came into the hospital (Alonso, et. al., 2015). There is a trend showing that many patients have increased long-term effects from the stroke after being admitted to the Intensive Care Unit following one month to one year of discharge; however, the short-term and long-term death rates of the patient in the ICU who has been admitted for a stroke have been declining. Strokes are one of the main causes of medical disability in people seen around the world, and they are also the second most cause of death (Alonso, et. al., 2015). Although receiving treatment in the ICU is thought to provide the best outcome for the patient, decrease the long-term effects, and lower the mortality rates of stroke patients, it has been shown that this may not always be the case. Being treated in a stroke unit shows better outcomes and lower mortality than the patient being in the ICU (Ungerer, et. al., 2020). The outcome for those having a stroke and being placed in the ICU often have a higher mortality rate following discharge from the ICU or more significant long-term effects following the stroke (Ho, et. al., 2015). A stroke patient being treated in the stroke unit has a more favorable outcome than if he

or she was to be treated in the ICU (Ungerer, et. al., 2020) Age, health status, comorbidities, and type of stroke all play integral roles of the final outcome of the patient. All types of strokes can lead to death of a patient and can cause permanent disability. Patients who have suffered a stroke that are admitted to the ICU have a one-year survival rate following admission to the ICU, and this is any ICU that accepts and treats stroke patients (KR Lees, et. al., 2015). Ischemic, subarachnoid hemorrhage, and intracranial hemorrhage strokes are the subtypes shown in this study. The acute phases of strokes determine whether or not the patient needs ICU or not. Those who are elderly are more at risk for having a stroke due to the fact many of them have comorbidities that increase the risk of developing blood clots (Golestanian, et. al., 2009). The blood clots in turn can produce a stroke. Mechanical ventilation has a higher risk of death following discharge of the ICU, and almost half of all patients who suffer from a stroke require intensive care treatment in a hospital (Golestanian, et. al., 2009). Those who are admitted to the ICU with a stroke suffer from an increased risk of death, cognitive impairments, and physical impairments (Creutzfeldt, et. al., 2015). One long-term effect of a stroke patient being admitted to the ICU is the inability to regain the same muscle strength he or she once had prior to admission. The longer the stroke patient is immobile in the hospital the worse the long-term effects are after the patient is discharged, and the patient has a higher chance of being discharged sooner rather than later when he or she is not immobile (Creutzfeldt, et. al., 2015).

Methods

For the literature review, the information used was formed by the following question: In patients admitted into the ICU with a diagnosis of a stroke, what are the long-term consequences and characteristics of recovery. Literature search was done using CINAHL and PubMed.gov to find appropriate resources to determine current evidence on stroke patients in the ICU. In order for

the articles to be added into the literature review, they had to meet certain requirements. The articles used were peer reviewed, published in the English language, and full-text. The keywords for the search used on these websites were strokes, effects of strokes, ICU for stroke patients, and Neuro ICU for the research question. The articles used were published from 2009-2020 to compare and contrast data from the previous few years. Research from around the world was taken into consideration for the study to get a wider view of the situation. To be included into the study, the articles had to show long-term effects of stroke patients, mortality rates from the ICU, comorbidities of patients at admission into the unit, and participants were real patients in the ICU above the age of 60-years-old. Starting off, twenty-five sources were selected to be used, but they did not meet all of the criteria needed for the study. It was then narrowed down for the top four research articles found for the study that showed a wide variety of information for the chosen topic. Alonso et. al. (2015) performed a study that was approved by the Institutional Review Board at the University of Heidelberg. A statistical analysis was used with a p value <0.05 showing statistical significance. With this article, there is substantial research done looking at other countries around the world and patient's status and interventions that affect the outcomes of the stroke patient. The factors that contributed to the outcomes included age, hypertension, diabetes, sedentary lifestyle, coronary artery disease, atrial fibrillation, neurological status, and previous stroke of a transient ischemic attack. While reading through the material, age and mechanical ventilation played the highest role in having the poorest outcome for the long-term effects of a stroke (Alonso, et. al., 2015). Mechanical ventilation is used as an intervention for patients suffering from a stroke being admitted to the ICU. With stroke patients being ventilated, the longer they are on the mechanical ventilator they will have a poorer long-term effect from it (Alonso, et. al., 2015). Golestanian et. al. found what the death rate and long-

term effects of the stroke were from the time the patients were discharged from the intensive care unit to one year after being discharged. A patient's comorbidities were also looked at for the research. Those patients requiring mechanical ventilation and percutaneous gastrostomy were studied to draw comparisons and contrasts of the final outcome. Stata version 9.0 was the method used for this research, and it was found to be statistically significant with a p value <0.05 . Logistic regression was used to see the mortality rates of stroke patients leaving the ICU. Stroke patient outcomes one month after discharge to one year after discharge were evaluated. The usage of a mechanical ventilator and percutaneous endoscopic gastrostomy was evaluated in determining the long-term effects of being in the ICU from a stroke. A two-way interaction between mechanical ventilation and percutaneous endoscopic gastrostomy tube were the variables used in the logistic regression models (Golestanian, et. al., 2009). Based off of the study from Ho et. al. (2016), an independent t test and chi square test were completed for analysis of the medical conditions. Researchers then looked at patient variables to see if they play a main role in how the patient recovers from a stroke in the intensive care unit. Nomograms were also used to compare the data found from ischemic strokes and hemorrhagic strokes of the stroke patient in the ICU (Ho, et. al., 2016). Ungerer et. al. (2020) performed a study on 10,811 patients suffering from an intracerebral hemorrhage. Research done by Ungerer et. al. was conducted over a seven-year period. If the patient was already in a comatose setting or needed immediate mechanical ventilation, the stroke patient was not included in the study. A statistical analysis was done at 0.05 level of significance with a two-sided 95% confidence interval. Researchers looked at stroke patients being admitted to the ICU, Stroke Unit, and NW and what the outcomes were of the patient (Ungerer, et. al., 2020).

Results

After looking through the articles and journals found, four articles were chosen to represent the specific topic. The articles included research of health history, type of stroke, effects of a stroke, and ICU length of stay. All four of the resources were reviewed and analyzed for the long-term effects of stroke patients in the ICU. The four sources combined had similar results with the patient outcomes from the effects of the stroke. Golestanian et. al. conducted research with 31,301 stroke patients that included different races, ages, and comorbidities. The study was conducted in a hospital setting spanning over a few years. Twenty-six percent of the stroke patients were admitted for ICU and suffered long-term effects from the admission. Most of the patients admitted to the ICU were of older age above the age of 75-years-old. The stroke patients sent to the ICU had a higher chance of being male with 39.2%. Those who were under mechanical ventilation and had a percutaneous endoscopic gastrostomy placed had a poorer outcome from being in the ICU and suffered from more significant long-term effects after discharge. An increased probability of having poorer speech and memory, paralysis in one or multiple limbs, and mortality rates are shown in the long-term effects after being discharged from the ICU. The mortality rate in these patients was highest at less than or equal to one month post-discharge. From the research conducted, 30% of stroke patients who did not go into the ICU had better long-term effects and were able to get back to their normal life through rehabilitation. 65% of mechanically ventilated patients at the one-month mark following discharge from the ICU die (Golstianian, et. al., 2009). Those who suffer from a stroke have a 34% chance of mortality if they do not get admitted and have treatment from the ICU (Golstianian, et. al., 2009). Ho, et. al (2016) did research on 1210 ischemic stroke patients and 1445 hemorrhagic stroke patients. By looking at the research done, the patients who go on the mechanical ventilator have poor mental status at admission into the ICU and are in critical condition. Ho, et. al. (2016) saw

patients suffering from an ischemic stroke who have a higher National Institutes of Health Stroke Scale, higher white blood cell count, higher blood pressure, and increased age have a poorer prognosis of the stroke and being treated in the ICU. The long-term effects were better in ischemic strokes than hemorrhagic strokes with survival, regaining strength, and being able to get back to where the patient was mentally before the stroke. Those who suffer from an ischemic stroke less than 70-years-old have a better chance of recovery than those who are 75-years-old or older. Those who suffered from a hemorrhagic stroke 62-years-old or younger either died or survived with long-term complications. Hemorrhagic stroke patients who were tachycardic, carriers of heart disease, and had a low systolic blood pressure rate demonstrated the poorest outcomes for stroke patients (Ho, et. al., 2016) Per the research found with the types of strokes, hemorrhagic stroke patients who get discharged from the ICU have a .8% of surviving after thirty days after being discharged (Golstian, et. al., 2009). If the hemorrhagic stroke patient survives after discharge, the patient will suffer from decreased mental status and impaired memory and gait. Being on a mechanical ventilator further worsens the effects following a hemorrhagic stroke (Ho, et. al., 2016). After a patient suffers from an ischemic stroke, they have over a 1% chance of surviving as soon as they are discharged from the ICU. These patients over time can regain the strength they once had prior to the ischemic stroke with physical and occupational therapy. Ischemic stroke patients after being discharged suffer from dysphagia, apraxia, impaired memory and gait, and paralysis (KR Lee, et. al., 2015). Alonso et. al. conducted a study on 4,958 patients who were sent to the Emergency Department for an ischemic stroke. 347 of the patients were admitted to the ICU. They found the outcomes and long-term effects of stroke patients who were in the ICU worse. From a medical standpoint, patients who have newly diagnosed or known atrial fibrillation were more likely to develop a

stroke. Atrial fibrillation is one of the leading causes of someone to have a stroke because of the blood pooling in the atria forming blood clots (AHA, 2018). If the patient already had severe neurological deficits at admission into the ICU, the chances of them surviving the stroke or having better long-term effects from the stroke are slim. Based off of the trends, a stroke patient being admitted to the ICU has a higher rate of poor prognosis during the hospital stay and after discharge. ICU stroke patients have more of an unfavorable outcome than if they were admitted to a stroke unit (Ungerer, et. al., 2020). Fifty- seven percent of stroke patients going on the mechanical ventilator in the ICU have the worst outcome (Alonso, et. al., 2015). Ungerer et. al. conducted a study on 10,811 intracerebral hemorrhagic patients who were sent to the ICU, stroke unit (SU), or normal ward (NW). There were 2,185 patients sent to the ICU, and 1,676 of the patients were sent to the NW. They found these patients to have a higher mortality rate and a poorer functional outcome compared to the patients in the stroke unit. In the SU, 6,950 patients showed a decrease in mortality and an increase in functional outcome. Those in the SU had a decreased amount of rehabilitation after being discharged from the hospital (Ungerer, et. al., 2020).

Study	Subjects	Median Age	Sex	Risk Factors	Long- Term Effects
Ungerer, Ringleb, Reuter, Stock, Ippen, Hyrenbach, Bruder, Martus, & Gumbinger (2020)	<ul style="list-style-type: none"> • 10,811 Total ICH Stroke Patients • 6,950 Stroke Patients in the SU • 2,185 Stroke Patients in the ICU • 1,676 Stroke Patients in the NW 	<ul style="list-style-type: none"> • Average Age 73.77 • N/A Range Given 	<ul style="list-style-type: none"> • N/A Males • 5,212 Females 	<ul style="list-style-type: none"> • Diabetes 2,150 • Hypertension 6,599 • Atrial Fibrillation 2,594 • Previous Stroke 2,247 	<ul style="list-style-type: none"> • Increased Disability • Increased Rehabilitation • Death
Alonso, Ebert, Kern, Rapp, Hennerici, & Fatar (2015)	<ul style="list-style-type: none"> • 4,958 Stroke Patients • 347 of the Patients were Admitted to the Intensive Care Unit 	<ul style="list-style-type: none"> • Range 28-95 • 70.8 Average Age 	<ul style="list-style-type: none"> • 164 Males • 183 Females 	<ul style="list-style-type: none"> • Atrial Fibrillation 140 • Hypertension 290 • Diabetes 125 • Coronary Artery Disease 79 • Dyslipidemia 114 	<ul style="list-style-type: none"> • Death • Increased Rehabilitation • Decreased Mental Status

				<ul style="list-style-type: none"> • Previous Stroke 62 	
Golstanian, Liou, & Smith (2009)	<ul style="list-style-type: none"> • 31,301 Stroke Patients with Acute Ischemic Strokes • 8,185 Admitted into the ICU 	<ul style="list-style-type: none"> • 79.9 Average Age • Range 65- >85 	<ul style="list-style-type: none"> • 11,737 Males • N/A Females 	<ul style="list-style-type: none"> • Hypertension 23,475 • Diabetes 7,199 • Peripheral Vascular Disorder 4,695 • Dyslipidemia 7,825 	<ul style="list-style-type: none"> • Death • Increased Rehabilitation Time • Decreased Mental Status • Increased Muscle Atrophy
Ho, Lin, Wang, Liou, Chang, Lee, Peng, Yang, Chang, & Lee (2016)	<ul style="list-style-type: none"> • 2655 Stroke Patients • 1210 Ischemic Stroke Patients and 1445 ICH Stroke Patients 	<ul style="list-style-type: none"> • 69.8 Average Age • N/A Range Given 	<ul style="list-style-type: none"> • 304 Males • N/A Females 	<ul style="list-style-type: none"> • Hypertension 839 • Diabetes 317 • Heart Disease 308 • Dyslipidemia 114 • Previous Stroke 254 	<ul style="list-style-type: none"> • Death • Increased Rehabilitation Time • Increased Memory Loss • Impaired Gait

Discussion

The findings solidified the long-term effects of stroke patients in the ICU. Providers need to weigh the pros and cons and choose what is best for the patient's overall care. The goal of this study was to evaluate and compare whether or not being admitted to the ICU after having a stroke affected the long-term effects following the medical condition. The results were similar and consistent with each other on the predictions and probability of the final outcome with those being admitted to the ICU. The results displayed similar characteristics of age, sex, comorbidities, type of stroke, length of hospital admission, neurological status at admission, and medical machines used during intensive care treatment.

When a patient goes on a mechanical ventilator, their muscles atrophy, and the longer the patient is on the mechanical ventilator the worse this gets. The patient can develop ventilator-associated pneumonia and decrease even more of the oxygen being sent to the patient's brain following the stroke. Hemorrhagic strokes are the most deadly strokes a patient can experience due to the amount of bleeding and pressure increasing inside of the patient's skull. Ischemic strokes arise from a blocked artery that reduces blood flow to the brain from a blood clot. As shown in the research, those who have an ischemic stroke have better long-term effects than those who have a hemorrhagic stroke. A patient's underlying medical conditions play a huge part in how the patient handles the stroke and effects of it. Also, someone of an older age is going to have a worse prognosis than someone who is younger. Even though the charts, graphs, and tables showed primarily the same results, there were still gaps in the research that could have skewed the data found.

A few limitations were found during the literature review. One of the limitations with the research found is that the people who were studied that had the strokes were all over the age of

sixty. None of the studies reviewed had patients of younger ages. The more comorbidities a patient has the more at risk he or she is for having a stroke. Another limitation in the research is that those who had transient ischemic attacks were not readily studied in the research, and this skewed some of the data presented by not having those who have had transient ischemic attacks provided. After having a transient ischemic attack, this increases a person's risk of having a stroke. There was not any research conducted on these types of events and how these strokes affect a person's long-term outcome. In some of the studies, only men were in the group for the study, and this decreased the relatability of the projects. In the charts that were given, the United States was not the only country shown or studied. Other countries around the world were also compared and contrasted with the research found to further solidify the effects and risks of being in the ICU. This provided a clearer approach to the topic, and it made it more well-rounded. This enabled readers to see a clearer picture on the different healthcare systems and how they affect those living in different countries overall death.

Overall, the ICU usage for patients suffering from a stroke does have a poorer long-term effect on the patient. To reduce the chances of someone having a stroke, providing education to those on lifestyle changes is important to prevent the chances of a stroke ever occurring. It is important to realize that many of these patients who are admitted to the ICU are severely ill, and the chances of them having healthy long-term effects after being discharged are unlikely.

Conclusion

Strokes are a common medical condition that occur every day around the world. The factors of the patient admitted into the ICU play a direct part in how the patient will recover. Increased age, type of stroke, and comorbidities directly play in role in how the stroke patient will recover. For future studies, women need to be included in the studies. Not having both sexes

in research makes data less accurate because no one knows if certain comorbidities in women make the effects of a stroke worse. Patients younger than 60-years-old need to be researched on the long-term effects following a stroke. Age needs to be seen if it plays a role in the outcome of a stroke or if the effects following a stroke are the same regardless of age. More focus on transient ischemic attacks would be beneficial to see how the patient handles the stroke following being put into the ICU. Due to the effects of COVID-19, research needs to be studied on the correlation between the increase of blood clots from the virus to the increased risk of having a stroke. Weighing the pros and cons in the event someone is put into the ICU with a stroke is favorable. Every patient responds differently to intensive care treatment, and the result is unknown until the intensive care treatment is given.

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