



Community Health Priorities for Stroke

Literature reviews play a critical role as an infrastructure for various forms of research (Snyder, 2019). When well conducted, literature reviews have the capacity to stimulate and induce new directions and ideas for a particular field, provide evidence of an effect, create guidelines for practice and policy, and serve as a basis for knowledge development (Snyder, 2019). This discussion includes a semi-systematic review to be shared with citizens and other healthcare professionals regarding stroke. The article illustrates the research process, data alignment with the priority community health issue related to stroke, and evidence-based strategies to mitigate or solve the health problem.

Research Questions

Research Question 1: How does hyperbaric oxygen therapy (HBOT) affect stroke victims?

Research Question 2: How does hyperbaric oxygen therapy (HBOT) affect motor function domains, cognitive function domains, oxidative stress, inflammation, neural apoptosis, cell death, physiological and pharmacological effects of stroke, cellular, tissue, and organ oxygenation, and tissue repair mechanisms?

Stroke – A Community Health Issue

The prioritized issue according to a community health needs assessment is the high prevalence of stroke in adults in the United States. The CDC reports the following facts regarding stroke:

- “In 2018, 1 in every 6 deaths from cardiovascular disease was due to stroke.
- Someone in the United States has a stroke every 40 seconds. Every 4 minutes, someone dies of stroke.
- Every year, more than 795,000 people in the United States have a stroke. About 610,000 of these are first or new strokes.
- About 185,000 strokes—nearly 1 of 4—are in people who have had a previous stroke.
- About 87% of all strokes are ischemic strokes, in which blood flow to the brain is blocked.
- Stroke-related costs in the United States came to nearly \$46 billion between 2014 and 2015. This total includes the cost of health care services, medicines to treat stroke, and missed days of work.
- Stroke is a leading cause of serious long-term disability. Stroke reduces mobility in more than half of stroke survivors age 65 and over” (CDC, 2021).

Background

The background of the study involves a research agenda requiring data collection for HBOT for stroke healing, prevention, and recurrence.

RESEARCH METHODOLOGY

The study involves a literature review and specifically a semi-systematic review of the literature to address the research questions. A semi-systematic or narrative review methodology may be utilized for topics studied by disparate and varied types of analysts (Snyder, 2019; Wong et al., 2013). In addition, a semi-systematic review may be used to uniquely conceptualize themes throughout various diverse disciplines (Snyder, 2019; Wong et al., 2013). Furthermore, a semi-systematic method can be used when a full systematic review process is hindered or not feasible (Snyder, 2019; Wong et al., 2013). If reviewing every relevant article on a topic(s) is not possible, another approach can be designed. The narrative review or semi-systematic approach is used often in business journal articles (Snyder, 2019; Wong et al., 2013). In addition to providing an overview analysis on a topic, the semi-systematic approach oftentimes allows a researcher the ability to observe how a topic has advanced across research traditions or how studies within a specified field have changed or evolved over time (Snyder, 2019; Wong et al., 2013).



Research Design

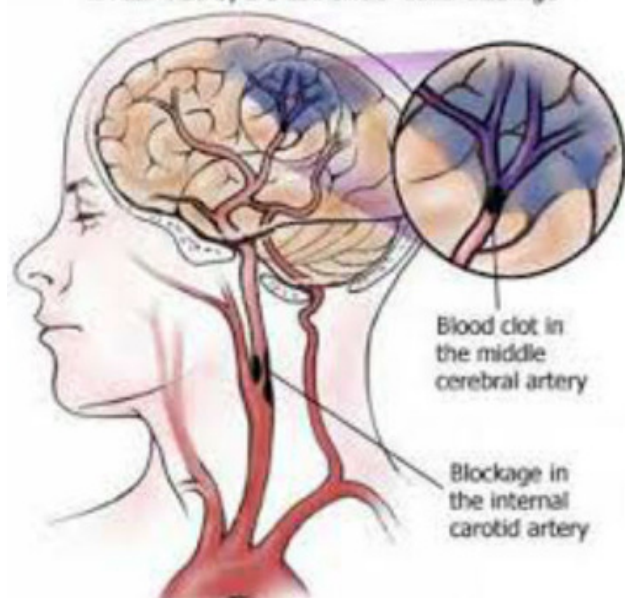
A semi-systematic review allows a researcher the ability to understand and identify all possible research traditions that could be relevant in addition to those that may have implications for the topic(s) (Snyder, 2019; Wong et al., 2013). Moreover, the approach allows the researcher the ability to synthesize themes using meta-narratives rather than measuring a size of effect (Snyder, 2019; Wong et al., 2013). A research design of this nature can provide additional knowledge and awareness in areas involving complexity (Snyder, 2019; Wong et al., 2013). Despite researching disparate types of studies and wide topics, a research process should have a developed research strategy and should be transparent to enable others to evaluate if judgments and arguments presented are reasonably valid from a methodological perspective for a chosen topic (Snyder, 2019; Wong et al., 2013). This research design involves a semi-systematic approach with a qualitative coded and thematic strategy to present findings and conclusions related to the research questions.

SETTING & DEMOGRAPHICS

The affected population for inclusion in the semi-systematic review includes adult stroke patients, any age, and any gender, in the U.S. who have experienced HBOT as a healing remedy. Studies for inclusion include these parameters so as to evaluate the broadest findings and conclusions related to stroke, HBOT, and the research questions.

Ischemic Stroke

Occurs when oxygen-rich blood flow to the brain is restricted by a blood clot or other blockage



A systematic review is known as the most rigorous and accurate methodology when collecting articles as there is confidence in the system that all data relevant to the topic(s) are included (Snyder, 2019). The method necessitates a research question that is narrow rather than broad (Snyder, 2019). In addition, a systematic review may not be suitable or feasible for every type of project (Snyder, 2019). A semi-systematic review or narrative review may be helpful for certain projects and research questions. However, this approach can be somewhat problematic because steps are fewer and possibly less clear when compared to a systematic review (Snyder, 2019; Wong et al., 2013). As a methodology choice, a systematic review is fairly straightforward and adheres to highly strict standards and rules while a semi-systematic review strategy requires more tailoring and development for a specific project design (Snyder, 2019; Wong et al., 2013).

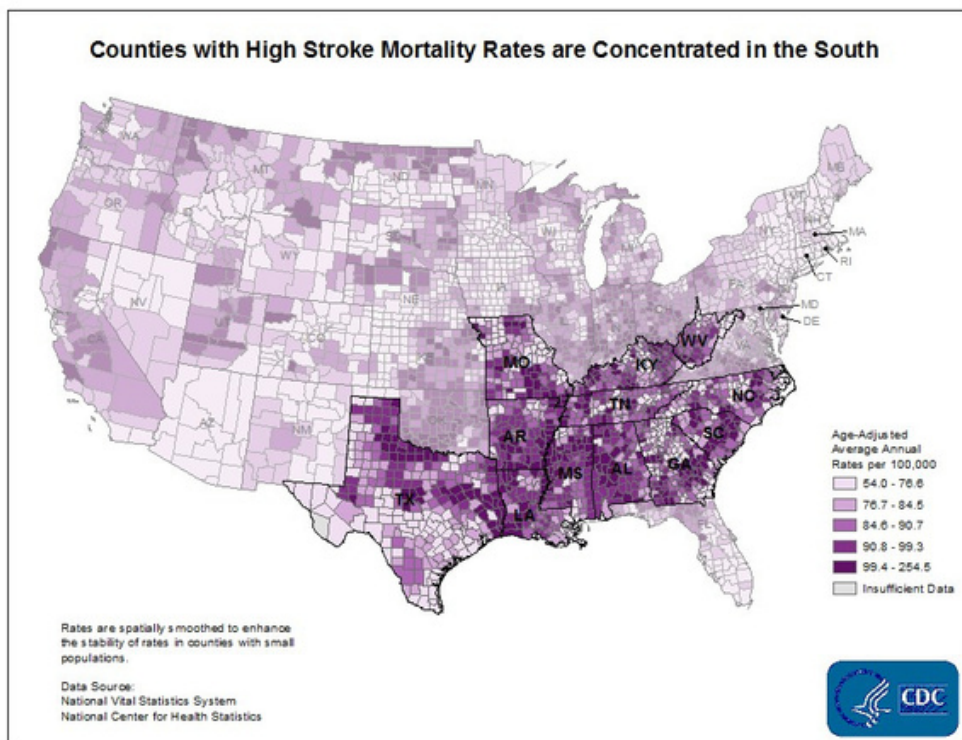
Objectivity & Bias

In many cases, a researcher needs to develop his or her own detailed plan and standards to confirm that suitable research is correctly evaluated in a manner that addresses the research questions (Snyder, 2019; Wong et al., 2013). Moreover, the design and process of a study should be transparent. When executed comprehensively, a semi-systematic review can be a highly effective method for including and evaluating broader topics and more areas than a systematic review can manage (Snyder, 2019; Wong et al., 2013). This study will include a collection of qualitative, quantitative, and mixed methodology relevant current research related to the research questions to report findings and conclusions relating to stroke public health education. A pilot test for search inclusion terms, protocol, and review process was conducted and two outside reviewers were involved to aid in the selection of articles to ensure reliability and quality of the search protocol. A narrative findings and conclusions section presents the data collected.

Mortality Rates in Southern U.S. from Stroke

DATA

Inclusion criteria for the semi-systematic review strategy is guided by the identified research questions and content related to the questions. Articles chosen are five years old or less. All types of study designs and methodologies were considered and articles were chosen based upon content related to the research questions rather than methodology used in the studies selected.





Data Alignment from Stroke Community Health Initiative

The potential contribution of a semi-systematic review can provide alignment with the stroke community health issue and education initiative by detecting common issues, theoretical perspectives, or themes within the specified research methodology and discipline for recognizing components of theoretical concepts (Snyder, 2019; Wong et al., 2013). This configuration of alignment has the possibility of contributing to mapping a field of research related to the topic(s), synthesizing a state of knowledge, creating an agenda for further research, or providing a timeline or historical overview of the specific topics (Snyder, 2019; Wong et al., 2013).

Data Collection

Data collected for the study involves published research articles that can be qualitative, quantitative, or mixed methodology studies that address the research questions. The typical purpose of a semi-systematic literature review as a methodology design for a study is to take an overview perspective of a particular research area and track development over time (Snyder, 2019; Wong et al., 2013). Commonly, research questions in this type of study are designed to be somewhat broad in nature and the search strategy may or may not be systematic (Snyder, 2019; Wong et al., 2013). The analysis and evaluation of a semi-systematic review can involve both a quantitative and qualitative approach (Snyder, 2019; Wong et al., 2013). Examples of contribution to the research community can include themes such as theoretical model, research agenda, historical overview, themes in literature, and state of knowledge (Snyder, 2019; Wong et al., 2013). Furthermore, a semi-systematic method is also known as a meta-narrative review which is common in the field of medicine (Snyder, 2019; Wong et al., 2013).

Data Evaluation

A variety of methods may be used to synthesize and analyze findings for a semi-systematic review methodology. In general, these methods can have similar approaches to those used for qualitative methodology. A typically used technique can be a content or thematic analysis that can widely be defined as an approach for reporting, analyzing, and identifying patterns within a text that can be presented as themes (Snyder, 2019; Wong et al., 2013). This kind of format for a review is commonly adhered to in qualitative analysis; however, there are some exceptions. As an example, a statistical meta-analysis process can be combined with a semi-structured approach when collecting literature (Snyder, 2019; Wong et al., 2013). For this review, a straightforward semi-systematic review methodology is used for data collection with evaluation incorporating a qualitative approach to coded and thematic analysis.

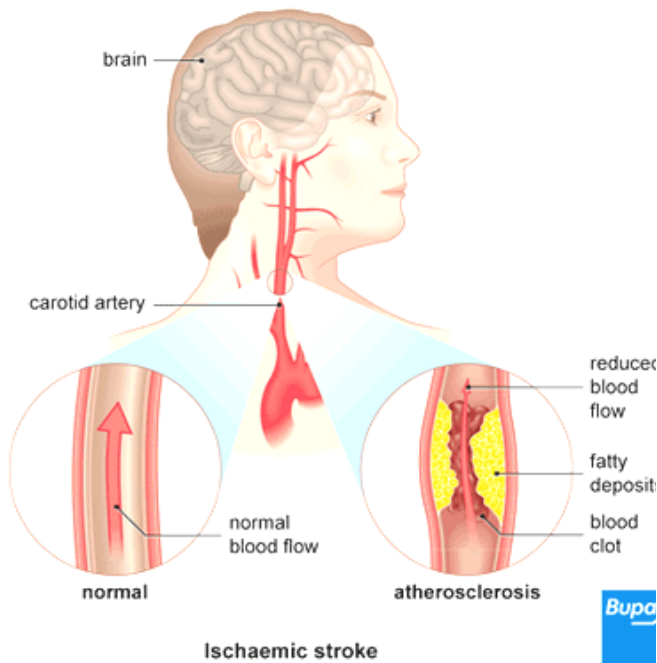
Findings & Conclusions

Prioritized Strategies

Public health educators can mitigate the occurrence of stroke by designing comprehensive stroke education modules, workshops, brochures, materials, advertisements, and curriculum to address the issue within communities and for targeted populations in need. In addition, education regarding hyperbaric oxygen therapy for stroke victims as well as diet therapy before and after stroke can be developed for community members and targeted populations. Furthermore, policy and law should address corporations promoting and selling food products that are harmful to the public and that are predictors of stroke prevalence when consumed (Hartman et al., 2018; Nyberg, 2021). Corporations, manufacturers, grocers, and suppliers should be held accountable for the toxic food-like products they promote and sell to the public that are harmful to health and wellness. Implementing policies of this nature within law can aid in mitigating stroke health risks (Hartman et al., 2018; Nyberg, 2021).

Evidence-based

- "Previous studies have shown that hyperbaric oxygen therapy (HBOT) can improve the motor functions and memory of post-stroke patients in the chronic stage" (Hadanny et al., 2020).
- "HBOT induced a significant increase in all the cognitive function domains ($p < 0.05$), with 86% of the stroke victims achieving Clinically Significant Improvements (CSI)" (Hadanny et al., 2020).
- "Hemorrhagic strokes had a significantly higher improvement in information processing speed post-HBOT ($p < 0.05$)" (Hadanny et al., 2020).
- "Left hemisphere strokes had a higher increase in the motor domain ($p < 0.05$)" (Hadanny et al., 2020).
- "HBOT induces significant improvements in all cognitive domains even in the late chronic stage" (Hadanny et al., 2020).



Evidence-based

- "The use of hyperbaric oxygen therapy (HBOT) demonstrates pre-clinical effectiveness for the treatment of acute ischemic stroke and reports reductions in oxidative stress, inflammation, and neural apoptosis.
- These pathophysiological benefits contribute to improved functional recovery.
- Mild oxidative stress may be able to prime the brain to tolerate full extensive oxidative stress that occurs during a stroke, and HBOT preconditioning has displayed efficacy in establishing such ischemic tolerance.
- HBOT as a stem cell preconditioning is a promising strategy, thus maximizing the use of HBOT for ischemic stroke" (Cozene et al., 2020).
- "Study demonstrated the ability of HBOT preconditioning as a treatment for inflammation in stroke and TBI, with the transfer of mitochondria from astrocytes to primary rat neuronal cells (PRNCs) reducing cell death" (Gonzales-Portillo et al., 2019).

Findings & Conclusions

Evidence-based

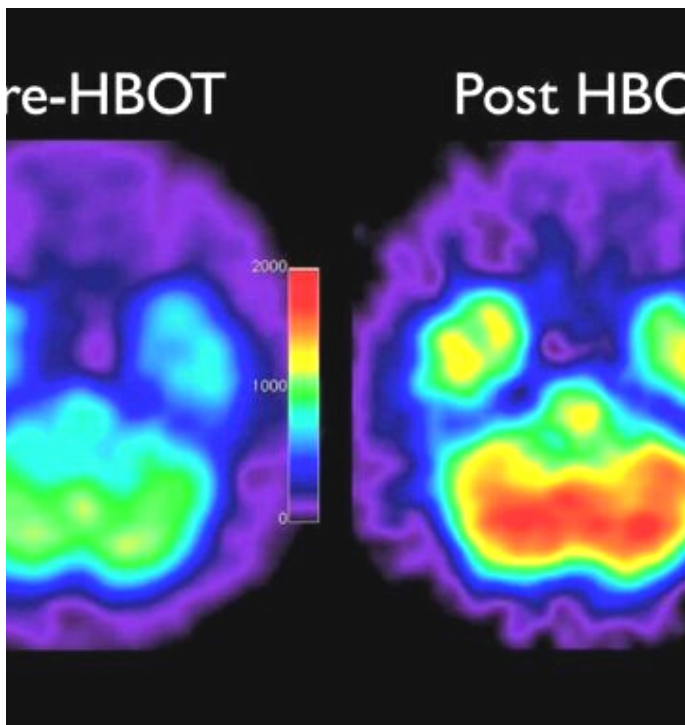
- "Study found more cell viability in the primary rat neuronal cells (PRNCs) that had received HBOT precondition and a mitochondrial transfer" (Gonzales-Portillo et al., 2019).
- "Study finds considerable observation based, as well as experimental evidence, to suggest that oxygen therapy exerts a significant physiological and pharmacological effects that improves cellular, tissue, and organ oxygenation, exerts anti-inflammatory, anti-bacterial effects, and improves tissue repair mechanisms.
- Oxygen therapy may play a very important role, in preventing hypoxia-mediated cell death, and protect the tissue and organ damage.
- Early intervention with combined oxygen therapy will significantly reduce hypoxia mediated, -inflammation, respiratory distress, organ failure and loss of lives" (Muralidharan & Rao, 2020).
- "Due to the data on the effectiveness and safety of hyperbaric oxygen therapy, the present meta-analysis suggested that hyperbaric oxygen therapy can be recommended as an effective and safe complementary therapy for the treatment of vascular dementia which is a common type of disease in the elderly.
- The indications of hyperbaric oxygen therapy also include: (1) chronic fatigue syndrome, weather dependence and migraines; (2) to enhance the recover after surgical operations and medical procedures, injuries and stress; (3) to improve brain function, memory, increase concentration.
- After the HBOT session individuals usually experience fatigue relief, improved mood, increased stamina, general feel of improving well-being" (Tullina et al., 2020).
- "Hyperbaric oxygen therapy (HBOT) has demonstrated significant pre-clinical effectiveness for the treatment of acute ischemic stroke, and limited potential in treating chronic neurological deficits" (Liska et al., 2018).



Evidence-based

- "Reported benefits include reductions in oxidative stress, inflammation, neural apoptosis, and improved physiological metrics such as edema and oxygen perfusion, all of which contribute to improved functional recovery.
- These pathophysiological benefits contribute to improved functional recovery.
- Mild oxidative stress may be able to prime the brain to tolerate full extensive oxidative stress that occurs during a stroke, and HBOT preconditioning has displayed efficacy in establishing such ischemic tolerance.
- HBOT as a stem cell preconditioning is a promising strategy, thus maximizing the use of HBOT for ischemic stroke" (Cozene et al., 2020).
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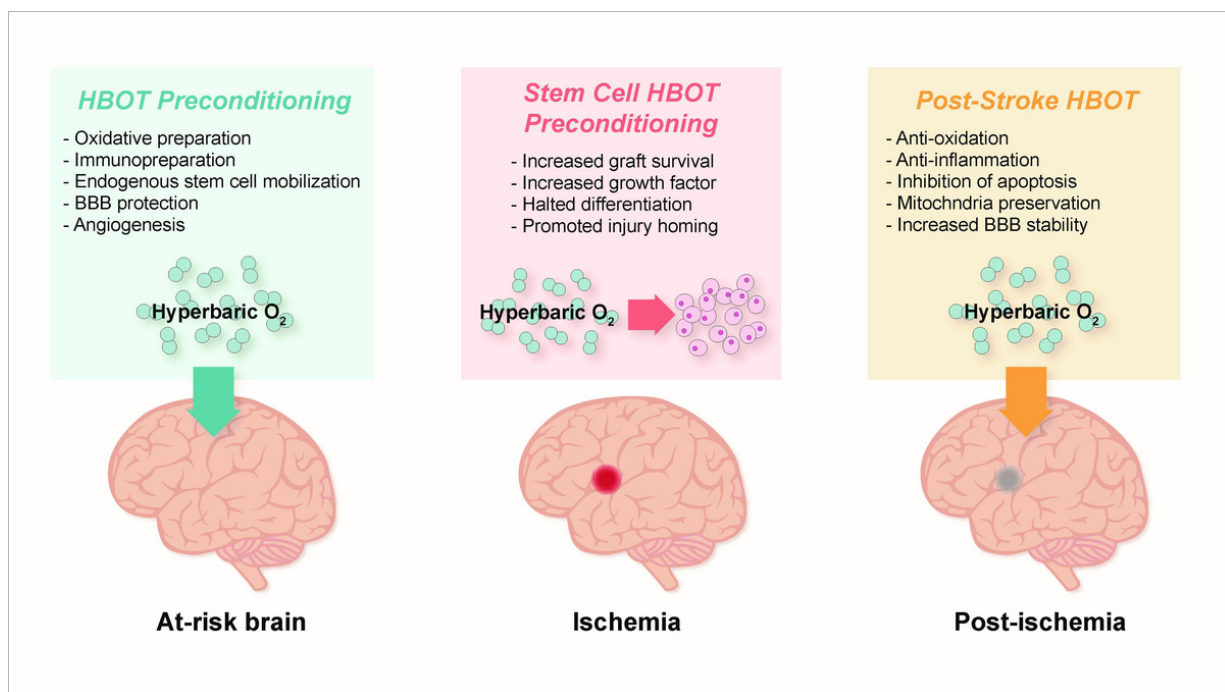
Findings & Conclusions



Evidence-based

- "Study found more cell viability in the primary rat neuronal cells (PRNCs) that had received HBOT preconditioning and a mitochondrial transfer" (Gonzales-Portillo et al., 2019).
- "Based upon the premise of mild oxidative stress priming the brain for tolerating the full-blown oxidative stress inherent in stroke, HBOT preconditioning has displayed extensive efficacy.
- Pre-clinical and clinical evidence supports HBOT delivery following ischemic stroke
- The innovative concept of stem cell preconditioning, in tandem with brain preconditioning, is a promising regenerative pathway for maximizing the application of HBOT for ischemic stroke treatment" (Liska et al., 2018).

HBOT Preconditioning, Stem Cell HBOT Preconditioning, and Post-Stroke HBOT



Adapted from Cozene, B., Sadanandan, N., Gonzales-Portillo, B., Saft, M., Cho, J., Park, Y. J., & Borlongan, C. V. (2020, September 4). An extra breath of fresh air: Hyperbaric oxygenation as a stroke therapeutic. *Biomolecules*, 10(9), 1279. <https://www.mdpi.com/2218-273X/10/9/1279>