

UNIVERSITY OF PORT HARCOURT

**STROKE:
A PREVENTABLE DISASTER
WAITING TO HAPPEN**

An Inaugural Lecture

By

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INAUGURAL LECTURE SERIES

NO. 135

OCTOBER 27, 2016.

University of Port Harcourt Press Ltd.
University of Port Harcourt
Port Harcourt
Nigeria
Email: uniport.press@uniport.edu.ng

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ISSN: 1119-9849
INAUGURAL LECTURE SERIES NO. 135
DELIVERED: 27TH OCTOBER, 2016

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Designed, Printed and Bound By UPPL

ORDER OF PROCEEDINGS

2:45pm: Guests are seated
3.00pm: Academic Procession Begins

The Procession shall enter the Ebitimi Banigo Auditorium, University Park and Congregation shall stand as the procession enters the hall in the following order:

ACADEMIC OFFICER
PROFESSORS
DEANS OF FACULTIES
PROVOST COLLEGE OF HEALTH SCIENCES
REGISTRAR
ORATOR
LECTURER
DEPUTY VICE-CHANCELLOR (ACADEMIC)
DEPUTY VICE- CHANCELLOR (ADMINISTRATION)
VICE-CHANCELLOR

After the Vice-Chancellor has ascended the dais, the congregation shall remain standing for the University of Port Harcourt Anthem. The congregation shall thereafter resume their seats.

THE VICE-CHANCELLOR'S OPENING REMARKS

The Registrar shall rise, cap; and invite the Vice-Chancellor to make his Opening Remarks.

THE VICE-CHANCELLOR SHALL THEN RISE, CAP AND MAKE HIS OPENING REMARKS AND RESUME HIS SEAT.

THE INAUGURAL LECTURE

The Registrar shall rise, cap and invite the Orator, **Professor Emmanuel C. Emasealu**, to introduce the Lecturer.

The Lecturer shall remain standing during the introduction. The Lecturer shall step on the rostrum, cap and deliver his Inaugural Lecture. After the Lecture, he shall step towards the Vice-Chancellor, cap and deliver a copy of the Inaugural Lecture to the Vice-Chancellor and resume his seat. The Vice-Chancellor shall present the document to the Registrar.

CLOSING

The Registrar shall cap and invite the Vice-Chancellor to make his Closing Remarks.

The Vice-Chancellor shall then rise, cap and make his Closing Remarks. The Congregation shall rise for the University of Port Harcourt Anthem and remain standing as the Academic (Honour) Procession retreat in the following order:

THE VICE- CHANCELLOR

DEPUTY VICE-CHANCELLOR (ADMINISTRATION)

DEPUTY VICE-CHANCELLOR (ACADEMIC)

LECTURER

ORATOR

REGISTRAR

PROVOST COLLEGE OF HEALTH SCIENCES

DEANS OF FACULTIES

PROFESSORS

ACADEMIC OFFICER

DEDICATION

With utmost humility, I dedicate this lecture to God Almighty, who has made it possible for me to be what I am today.

My late parents, Mazi Moses Igwe and Ezinne Victoria Egejuru Onwuchekwa who sacrificed their all to give their two children good education.

My caring wife, Dr (Mrs) Chinwe R. Onwuchekwa and lovely children Ijeoma, Ugonna, Obinna and Ebere for their enduring love, unflinching support and untiring prayers as I strived to achieve academic excellence.

Finally, I dedicate this lecture to my patients without whom my work would have been impossible.

ACKNOWLEDGEMENT

I wish to express my immense gratitude to the Omnipotent, Omnipresent and Omniscient God who has led and sustained me through thick and thin.

I am eternally indebted to my late parents, Mazi Moses Igwe and Ezinne Victoria Egejuru Onwuchekwa for sacrificing their all to enable me go back to school at the end of the civil war.

I wish to specially acknowledge and appreciate my only sister, Mrs Bertha I. George and her husband Barrister S.S. George. They have been very supportive and are my confidants.

I acknowledge all my relations from the Onwuchekwa family for their wonderful love and show of solidarity at all times.

My profound appreciation goes to my in-laws- the Okpara family of Akokwa, Ideato North LGA of Imo State, for all their support and encouragement. Late Mr. Sylvanus Nzenwa was a primary school teacher who saw me from afar, identified and encouraged me, I am very grateful.

Special thanks to Professor Dagogo Fubara who as a young surveyor with SPDC gave my father (his uncle's bossom friend and business associate) pipelaying contracts without asking for any kick-back. This gesture enabled me to go to secondary school in 1964 as his palm produce business had collapsed at that time. May God continue to bless him.

My aunt, Mrs. Patience Cookey, deserves special mention at this auspicious occasion. As a young nurse at the General Hospital, Port-Harcourt, she encouraged me by paying my school fees during my higher school days at Umuahia.

I thank my numerous teachers who moulded my professional career. Professors Scarborough (late), Ledingham (late), K. S. Chugh (late),

Idris Mohammed, Jibrin Aminu, Sunday Bwala and Dr. Eugene Ugwu all of the Department of Internal Medicine, University of Maiduguri. I will ever remain grateful to these and several others.

I acknowledge Professor Ndu Eke who initiated me into academic paper writing. He always made very useful comments and corrections in a number of my research papers. I also thank him, Professors Michael N.Oti and John U. Okoli for going through my manuscript and making useful corrections for this inaugural lecture. I acknowledge the assistance of my former residents who were my foot soldiers and co-workers as we collected data and published papers. These include Dr. E G. Asekomeh of Chevron Clinic, Port-Harcourt, Dr. A. M. Iyagba, a lecturer/consultant neurologist at the University of Port-Harcourt and Dr. (Mrs) O. C. Okunoye who is now resident in Dubai.

My thanks go to Professor Christian Anah: my former teacher at University of Benin, former provost, College of Health Sciences of the University of Port-Harcourt and my mentor. He and the then Dr. O. J. Odia (now Prof. O. J. Odia), both physicians secured the approval of the then Vice Chancellor Professor Harrison to employ me as a lecturer in 1990.

I must not fail to mention my spiritual fathers- Rt. Rev Johnson Onuoha, the Pioneer Bishop of Arochukwu/Ohafia Diocese; my home diocese, Rt. Rev Chigozirim U. Onyeagbulem of Ikwuano Diocese, Ven. Dr. S. C. Nwachuku, Ven. Prof. Wotogbe Weneka, Ven. Samuel Chimela, Rev. Canon Benjamin Orji and the entire members of St. Nicholas Anglican Church, Aluu, Uniport for all their spiritual assistance.

I must mention my special friend and former classmate Professor John Ikimalo. Not only did he look after my father when he was ill (and I was at Maiduguri), he pestered all those who mattered for my relocation to Port-Harcourt. He is a team player.

Finally, I wish to acknowledge and appreciate my darling wife: Dr. (Mrs) Chinwe Regina Onwuchekwa, a senior lecturer and consultant Radiologist in the faculty of Clinical Sciences, College of Medicine, University of Port-Harcourt. I still toast and court her. She is my best friend, my lover, my research partner, sister and a great confidant. I must recognize my children who have given me immense inspiration and courage- Ijeoma, Ugonna, Obinna and Ebere

Protocol

The Vice Chancellor Sir

Deputy Vice-Chancellors

Registrar and other Principal Officers

Provost, College of Health Sciences

Dean Faculty of Clinical Sciences

Deans of Faculties

Professorial Colleagues and Heads of Departments

My Lords Spiritual and Temporal

Our Royal Fathers

Gentlemen of the Press

Students of Unique University of Port Harcourt

Distinguished Ladies and Gentlemen

INTRODUCTION

I welcome you all to the 135th inaugural lecture of this unique university – The University of Port Harcourt. I am very grateful to our Vice- Chancellor Professor Ndowa Lale, for giving his approval for me to perform my statutory function as a professor.

This is the first inaugural lecture in the field of Neurology to be delivered in this great institution.

WHAT IS NEUROLOGY?

Neurology is the medical science that deals with disorders of the nervous system. This term is often used synonymously with clinical neurology which is the medical specialty concerned with the diagnosis, treatment and prevention of neurological disorders. This is distinct from psychiatry, which is the management of mental illness.¹ Neurology is a component of Neuroscience which is the scientific study of the nervous system in humans and animals. This involves the study of the brain, spinal cord and networks of sensory, motor and autonomic nerves throughout the body and how they develop, function, regulate behaviour and change with age. Neuroscience integrates knowledge and techniques from a number of disciplines which include biology, psychology, computer science, statistics, physics, chemistry, philosophy, and medicine. Physicians who specialize in neurology are called neurologists.

Beginning of Neurology

Diseases of the nervous system have been known since the beginning of medical sciences but neurology as defined today is founded upon the excellent work of Sir Thomas Willis (1621-75) an Oxford Neuro-anatomist of the Circle of Willis fame. Willis' work led to the first advances in the knowledge of the nervous system. His book "De Cerebri Anatome" (Anatomy of the brain) published in 1664, was the first to use the term Neurology.

In 1817, a famous London physician, James Parkinson added to the growth of neurology by describing a movement disorder which he called "the shaking palsy". This condition is now known as

Parkinson's disease eponymously named after him. It was this condition that took the shine off the legendary king of boxing Mohammed Ali, who used to fly like a butterfly and sting like a bee in the ring.

Sir Charles Bell (1774-1842), a professor of surgery in Edinburgh made significant contributions to the knowledge of the nervous system. His famous book, "The Nervous system of the human body" was published in 1830. This book was so popular then, that it was translated two years after, into German by Romberg. This earned Romberg the post of a lecturer in neurology in Berlin.

Jean- Martin Charcot (1825-93) under whom the French school of neurology rose to prominence was the first to establish clinical neurology as an autonomous discipline. In 1882, he was appointed the first professor of the nervous system in Europe. His name is associated with many clinical syndromes in neurology such as Charcot disease (now better known as motor neuron disease), Charcot's joint in diabetes and syphilis and Charcot's triad in hepatology.

In June 1860, the National Hospital for the Relief and Cure of the Paralyzed and Epileptic as it was originally called, was opened in an old, dilapidated and minuscule house in Queen Square, London. The credit for this set-up goes to Miss Johanna Chandler, who for 15 years devoted her life to its welfare and to the comfort of its patients. She started with 8 patients but today this hospital, now known as the National Hospital for Neurology and Neurosurgery, Queen Square London with a compliment of 244 beds, has become a centre of excellence for neurology in the UK and internationally (Figure 1).



Figure 1

Neurology in Nigeria

In the early sixties, the Rockefeller Foundation of America was prosecuting a program of establishing centres of excellence in some chosen fields in some higher institutions in the developing parts of the world. The aim was to promote manpower development in those countries. University of Ibadan (UI) was already in existence at the time and Dr. Adeoye Lambo had made an indelible mark with the establishment of the village system treatment in Neuro-psychiatry at Aro-Abeokuta. It was not therefore difficult for the then Vice-Chancellor of University of Ibadan, Professor Kenneth Dike, and the then Dean, Faculty of Medicine, Professor Joseph Edozien to attract the foundation to UI in order to promote Neuro-Science at the institution. It was headed by Adeoye Lambo and called the Rockefeller Department of Psychiatry, Neurology and Neurosurgery.²

This department was short lived; as with the establishment of the University of Lagos in 1962, some of the founding staff like Dr. G.I. Monekosso and Dr Olufemi Dada moved from Ibadan to Lagos. Professor B.O. Osuntokun was to emerge after a successful and brilliant scholarship in clinical neurology in Newcastle in 1965. He became the pillar of Neurology in Ibadan. He worked with his

colleague (and classmate) Dr Paul Chuke, his senior registrar, (and later) Professor Olajide Bademosi, Professor A.O. Adeuja and much later Professor Adesola Ogunniyi whom they mentored. This team put Neurological services at Ibadan in the world medical map. Today, the Neurology Unit at the University College Hospital, Ibadan (UCH) has been designated a WHO collaborating centre for research and training. The speaker had part of his special posting in neurology under Professors Bademosi and Adeuja as a resident in 1986. Neurology training as a discipline in the University of Port Harcourt commenced on my joining the Department of Internal Medicine in December 1990. Since then, the unit has trained 5 neurologists who are working as consultants in various institutions in Nigeria and beyond.

SCOPE OF NEUROLOGICAL PRACTICE IN NIGERIA

Neurological disorders include *Headache*, a common ailment, *Epilepsy*, which affects more than 70 million people worldwide, with majority in sub-Saharan Africa, *Nervous System infections* such as *Tetanus*, and *Meningitis*, *Movement Disorders* such as *Parkinson's disease* and *Stroke*, which the speaker will discuss this afternoon. Others include *Dementia*- a condition we are beginning to see more frequently because of aging population, *Neuromuscular diseases* such as *Myasthenia gravis*, *Demylinating diseases* such as *Multiple Sclerosis*, *Myelopathies*, *Neuro-oncology* (cancers of the nervous system), and *Neuro-AIDS* (the spectrum of AIDS-related neurological diseases). These conditions, constitute 6.4% of world disease burden and 12% of global deaths.³ In Nigeria, with less than 100 practising Neurologists, in a population of over 180 million people, we can rightly say as in the Bible that in this field of neurology, the harvest truly is plentiful, but the labourers are few.

The Human Brain

Mr. Vice Chancellor Sir, nothing in the world can compare with the human brain in structure, complexity and function. This densely packed, intricately patterned, well organised wonder of nature, the brain, serves as the centre of the nervous system. The brain exerts centralized control over other organs of the body and has been

eminently described as the crown jewel of the human body.⁴ It is the source of all the qualities that define our humanity, from benevolence to crime and from a tout to a professor.

In simple terms, the brain can be said to be a biological computer similar in sense to an electronic computer, in that it acquires information from the surrounding world, stores it and processes it in a variety of ways to proffer solutions. Similar to the cables coming out from the back of the computer, all the nerves, arteries and veins exit from the base of the skull through holes called *foramina*. The brain is the size of 2 fists joined together and weighing 1.4 kilograms. It is composed of the *Cerebrum*, *Cerebellum* and *Brainstem* (Figure 2).

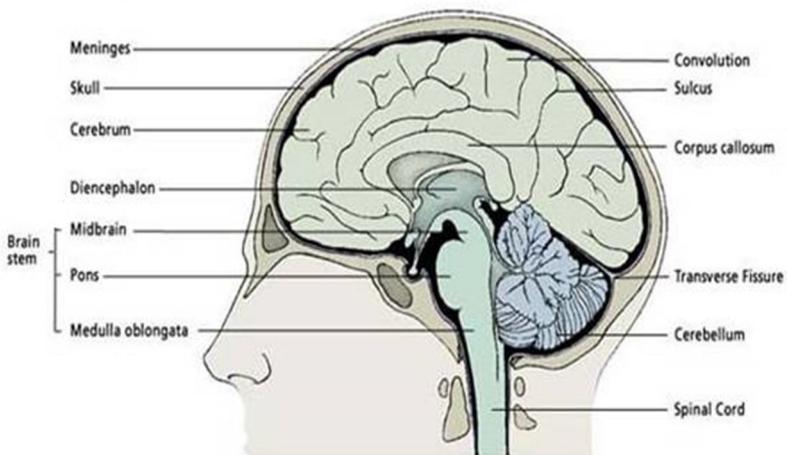


Figure 2: The major portions of the Brain include the Cerebrum, Cerebellum and Brain Stem

The Cerebrum

The cerebrum is the largest part of the brain and is composed of the right and left hemispheres. Both hemispheres are joined by a bundle of nerve fibres called *Corpus Callosum*. The corpus callosum delivers messages from one side to the other. Each hemisphere controls the opposite side of the body. Thus, if an injury occurs on

the right side of the brain, the left side of the body will be affected. If you want to demobilize a right-handed murderer, short of capital punishment, you could do a left lobectomy! Although the two hemispheres look like mirror images of each other, not all the functions of the hemispheres are shared. In general, the left hemisphere controls speech, comprehension, arithmetic and writing. It can be referred to as the brain of the scientist. The right hemisphere controls creativity, spatial ability, artistic and musical skills. It can be referred to as the brain of the artist. Delivering his inaugural lecture recently, at the University of Lagos, titled "the African Brain: effects of African environment on brain diseases", Professor Mustapha Danesi had observed that past and present pieces of evidence suggest overwhelming dominance of activities of the right brain in Africans as evidenced by Africans excelling in Arts: Nobel prize in literature and several book prizes by African literary authors, Nigerians excelling in drama (Nollywood) recently described by Facebook founder, Mark Zuckerberg, as a national treasure and cash cow. Nigerian music and entertainment have dominated the world space. Indeed, very important work of African arts adorn museums all over the world.⁵ He wondered if this is as a result of social environment or genetic endowments. I had asked, if this is the case, perhaps, William Shakespeare the great poet, and George Frederic Handel of Handel Messiah (the world famous oratorios) had African roots! Be that as it may, the left hemisphere is called the dominant hemisphere as it controls the use of the right hand and more than 60% of the use of the left hand.

The Cerebellum

This organ, that looks like a mushroom, is located under the cerebrum. The principal function of the cerebellum is to regulate and maintain balance and to co-ordinate timing and precision of body movements. In other words, the cerebellum is a timing device for movement including information about planning of a movement. Would one be right to suggest that the cerebellum of the African be further studied to find out more about 'African time' i.e. the cultural inability of the average African to keep to time?

The Brain Stem

The Brain Stem includes the *Mid brain*, *Pons* and *Medulla*. This is regarded as the life support system. It acts as a relay centre connecting the cerebrum and cerebellum to the spinal cord. It performs many automatic functions such as breathing, heart rate, body temperature, digestion, sneezing, coughing and vomiting. Ten of the twelve cranial nerves (and the spinal cord) through which the brain communicates with the whole body originate in the brain stem. The other two cranial nerves being *olfactory nerve* for smell and *optic nerve* for vision. These first two nerves originate from the cerebrum. The brain and spinal cord are covered and protected by three layers of tissue called *Meninges*. The brain has hollow fluid filled cavities called *Ventricles*. Inside the ventricle is a ribbon-like structure called *Choroid Plexus* that forms a clear fluid called *Cerebrospinal Fluid (CSF)*.

This fluid flows within and around the brain and spinal cord to help cushion it from injuries. There are pathways through which CSF flows from the ventricles to bathe the protective layer of tissue-meninges. The brain is protected from the outside by the bony skull.

Mr. Vice Chancellor Sir, early philosophers were divided as to whether the seat of the soul lies in the brain or the heart. Aristotle like early Egyptians, favoured the heart and thought that the function of the brain was merely to cool the blood. Even in Chinese Traditional Medicine which practice was different from Western Medicine, the heart was thought to govern thinking as well as blood circulation in vessels while the brain was mentioned as "mere pool of marrow"- an unimportant organ.⁶ Thus you hear people exclaim, "He has broken my heart", or "My heart is full of joy" or "sweet heart" to express emotions.

The inventor of Atomic theory of Matter, Democritus, a Greek Philosopher (470BC), argued a three part soul with intellect in the brain, emotion in the heart, and lust in the biliary system. We often hear people say among us that one has 'bad belle' for another, meaning that he is jealous.

It was Hippocrates (460-370BC), “the father of medicine”, who came down unequivocally in favour of the brain as the seat of the soul (mind), “men ought to know that from nothing else but the brain come joys, delight, laughter, sports, sorrows, griefs, despondency and lamentations”⁷

Blood Supply to the Human Brain

Blood is carried to the brain by two paired arteries: the *Internal Carotid* arteries in front and the *Vertebral* arteries behind. The internal carotid arteries supply most of the cerebrum.

The vertebral arteries supply the cerebellum, the brain stem and the under surface of the cerebrum. After passing through the skull, the right and left vertebral arteries join together to form the *Basilar Artery*.

The basilar artery and the internal carotid arteries communicate via the *Posterior Communicating Artery* at the base of the brain to form the *Circle of Willis* (Figure 3).

This arrangement is an important safety feature of the brain. If one major artery is blocked, it is possible for collateral blood flow to come across the circle of Willis and prevent brain damage.

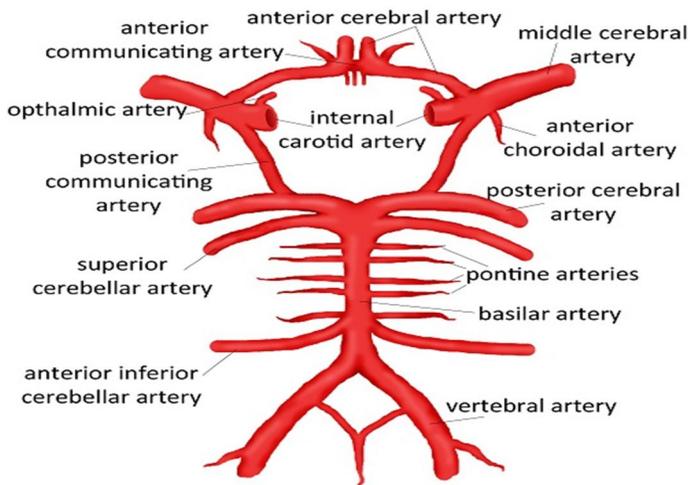


Figure 3: Circle of Willis

HYPOTHESIS FOR THE INAUGURAL LECTURE

In 1971, an Arab scholar Abdel Omran in his classic paper predicted the transition in global health from infectious diseases to Non-Communicable Diseases (NCD) .⁸ Whereas the Western World had since passed through this phase, today, in developing countries which include the sub-Saharan Africa with Nigeria being the most populous, this prediction is fast becoming a reality. We are witnessing a double burden of disease with infections such as HIV/AIDS, tuberculosis and malaria on one hand, and NCD, due to life style changes, on the other hand. This lecture addresses the hypothesis based on our observation, that among the emerging NCD in sub-Saharan Africa in our adult population, stroke is the forerunner in the health transition.

WHAT IS STROKE?

Stroke is defined by the World Health Organization as a rapidly developing clinical signs of focal (or global) disturbance of cerebral (brain) function lasting more than 24 hours or leading to death with no apparent cause other than vascular origin .⁹ Stroke results when blood flow to the brain is interrupted (Figure 4). This leads to cell death.

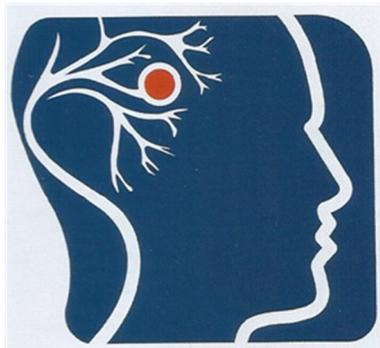


Figure 4: Site of Stroke. Red circle denotes area of stroke.

This manifests as inability to move or have sensation on one side of the body, problems of understanding or speaking, feeling like the world is spinning (dizziness) or loss of vision to one or both sides.

This is usually sudden in onset within seconds and minutes. If the symptoms last less than 24 hours (usually <1 hour) and resolve completely with no residual deficit, it is known as *Transient Ischaemic Attack* (TIA) or *mini stroke*. Other features of stroke are headache, confusion, loss of consciousness or sudden death. Hippocrates first described this syndrome of sudden paralysis that is often associated with stroke. Apoplexy, from the Greek word meaning, "struck down by violence" was seen as a way of dying- a dreadful visitation or summons by the gods, some may say. Then, it was seen as caused by spiritual attack- The "witch theory" or the "wicked mother in-law" or "wicked step mother theory". They could not understand how an apparently healthy man could retire to bed at night and wake up the next day speechless and paralyzed or how a vibrant politician on the rostrum delivering campaign promises would suddenly collapse, paralyzed, speechless or dead. Till date, in Igbo parlance, it is known as *Mbanmuo*. In Yoruba dialect, it is called *Agbero*, *Ota* or *Ifa*.¹⁰ In Hausa, it is called *Bugun-Jini*. Izon language refers to it as *Famu-Koromo*, all conveying the same meaning of spiritual attack as the ancient Greek. The classical feature of stroke was what the children of Israel described about 500-600 BC in Psalm 137 when they were asked by their captors in Babylon to entertain them with one of their songs. "Sing us one of the songs of Zion". In their melancholy, they lamented "How shall we sing the Lord's song in a strange land?" In verses 5&6, they continued " If I forget you O Jerusalem, let my right hand forget its cunning (get paralyzed). If I do not remember you, let my tongue cleave to the roof of my mouth (remain speechless) if I prefer not Jerusalem above my chief joy". The significance of Psalm 137 is the invocation of a punishment for those who forget Jerusalem which will manifest as stroke involving the dominant (left) hemisphere causing motor aphasia and right hemiparesis. This encounter was used to compose a beautiful song for our Christian brethren by Boney M titled "Rivers Of Babylon Lyrics". Centuries later, after Hippocrates description of stroke, Jacob Wepfer, a Swiss pathologist/pharmacologist, in mid 1600s, dedicated his life to the dissection of corpses in the morgue of the University of Padua in Italy. Wepfer discovered that something disrupted the blood supply

in the brain of people who died from apoplexy. In some of these cases the arteries were blocked. In others, there was massive bleeding into the brain tissue. The growing awareness and acceptance of vascular theory and recognition of a sudden disruption in the vascular supply of the brain led to the use of the term *Cerebro-vascular Accident* in 1927. We no longer favour the use of the term 'accident' as it gives the impression of a chance event instead of emphasizing on the preventable risk factors. It is rather called *Cerebrovascular Disease*.

The term *Brain Attack* was recently introduced for use to underline the acute nature of stroke just like heart attack.

Pathophysiology

Stroke occurs due to loss of blood supply to parts of the brain either by blocking the artery with cessation/loss of distal blood supply or rupture of the artery with blood accumulating in the brain tissue and compressing the structures. We could liken this to a flexible pipe carrying water to a house. The pipe could be blocked by debris or go into spasm and reduce the volume of water getting to the house, thereby depriving that house of water. On the other hand, the pipe could burst open within the watertight house usually as a result of high pressure or abnormalities within the pipes inside the house. The result also is that the house will be flooded with water and thereby cause damage.

Brain tissue ceases to function if deprived of oxygen (and glucose) for more than 60-90 seconds, hence the suddenness of stroke features. After approximately 3-4 hours the tissue will suffer irreversible injury if nothing is done. This will result in the death of the brain tissue, a process known as infarction.

As oxygen and glucose are depleted in ischaemic (starved) brain tissue, the production of high energy phosphate compounds such as adenosine triphosphate (ATP) fails, leading to failure of energy dependent processes necessary for the survival of the neurons. This process leads to a cascade of events resulting in the release of by-

products such as lactic acid, glutamine and oxygen free radicals. All these substances are injurious to brain cells. In the case of haemorrhagic stroke, the blood released by the bleeding appears to have direct toxic effects on the brain tissue and vasculature.

Stroke symptoms usually start suddenly within seconds to minutes. The symptoms depend on the area of the brain affected and the function of that area. The more extensive the area of the brain affected the more functions are likely to be lost. The commonest way to recognize stroke is by the use of the acronym FAST:

F- facial deviation

A- arm weakness

S- slurred speech

T- Time is brain (emphasizing the urgency in stroke intervention).



Figure 5: Signs of Stroke

These features of facial deviation, weakness of one half of the body and speech difficulty are present in more than 88% of all strokes and TIA. These features are what some laymen and some doctors erroneously refer to as partial stroke. **THERE IS NOTHING LIKE PARTIAL STROKE.** It is a misnomer. This unilateral or focal presentation is what makes it stroke and is of course the commonest way of stroke presentation. It is potentially dangerous!

Time is brain (neuron)

Mr. Vice Chancellor Sir, kindly spare me a moment to explain why neurologists always harp on this slogan. This phrase emphasizes that with human brain, when stroke occurs, any delay in restoring circulation is brain lost. This is a clarion call for urgent action in acute stroke care. The term traces its origin to Benjamin Franklin, one of the founding fathers of United States of America (he was one of the signatories to American independence), a great statesman, a diplomat, a politician, an intellectual colossus and a onetime postmaster general of U.S.A. whose face appears on the United States 100 dollar bill till date. Everything this man said in his time was full of wisdom, one of which was "We must all hang together or, assuredly, we will all hang separately". He it was, who also said "time is money" a slogan that has been echoed by a Nigerian musician in "Time na money". This slogan has been modified by neurologists to "time is brain" to serve as a rallying cry to patients and healthcare providers underscoring the sense of urgency in acute stroke management.

The total number of neurons in a human brain is about 130 billion. It has also been estimated that the total length of neurons in the human cerebrum would cover about 135,000 km (84,500 miles). The average duration of ischaemic stroke evolution is 10 hours (range 6 to 18 hours).

Every minute in which a large vessel ischaemic stroke is untreated, the average patient loses 1.9 million neurons, 13.8 billion synapses (junctions were these neurons join each other), and 12 km (7.5 miles) of nerve fibers (Table 1). Each hour in which treatment fails

to occur, the brain loses as many neurons as it does in almost 3.6 years of normal aging.¹¹ Thus for every one – stroke patient, the spouse, relation of the patient, concerned neighbour, the doctor and allied health worker involved in managing the patient – once a stroke occurs, every second counts. Acute stroke patients should be handled like acute victims of serious road traffic accident or heart attack by immediately instituting therapeutic interventions. *Treat within the golden hour because time is brain.*

Table 1: Estimated Pace of Neural Circuitry Loss in Typical Large Vessel, Supratentorial Acute Ischemic Stroke

	Neurons Lost	Synapses Lost	Myelinated fibers lost	Accelerated Aging
Per stroke	1.2 billion	8.3 trillion	7140km/4470 miles	36 yr
Per hour	120 million	830 billion	714km/447 miles	3.6 yr
Per minute	1.9 million	14 billion	12km/7.5 miles	3.1 wk
Per second	32 thousand	230 million	200 metres/218 yards	8.7 hr

Stroke Classification

Stroke can be classified into two major categories: *Ischaemic* and *Haemorrhagic*. Ischaemic stroke (Figure 6), also referred to as *Cerebral Infarction (CI)*, is caused by interruption of blood supply to the brain. This can be as a result of thrombosis i.e. clot formation at the point of injury that is adherent to the internal wall of a blood vessel (Figure 7A) thereby obstructing that blood vessel. It can also be by embolism i.e. blood clot detaching from a thrombus and is carried in the blood vessel to another more distant narrower branch in the brain where it blocks the vessel. An embolus can also result from the heart (Figure 7B) that is beating irregularly - a condition referred to as *Atrial Fibrillation*. The blood clot is carried to the brain where it gets to a smaller blood vessel and blocks it. An ischaemic stroke can also be due to systemic hypoperfusion as may result from shock or rapid reduction in blood pressure or inability of the heart to pump blood to the brain resulting from heart attack or heart failure.

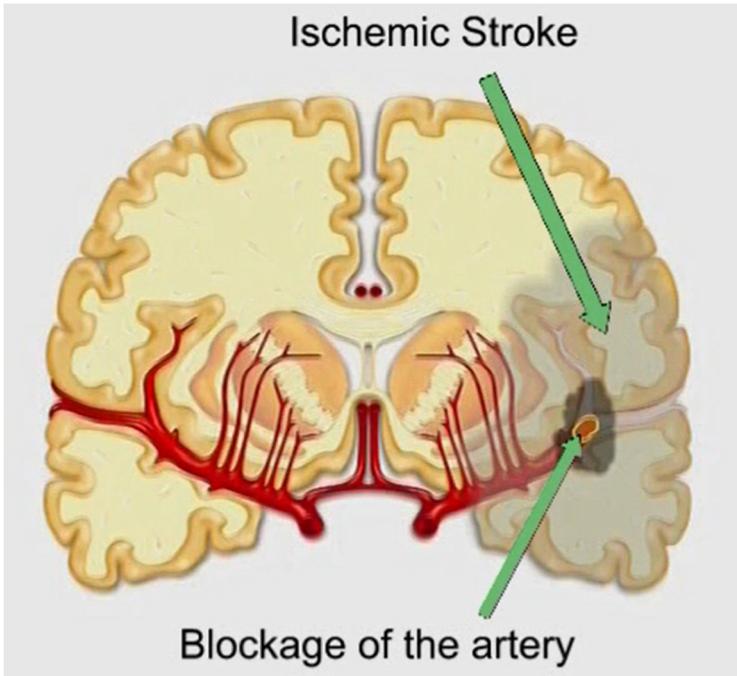


Figure 6: Ischaemic stroke. Source: Stroke Education Limited

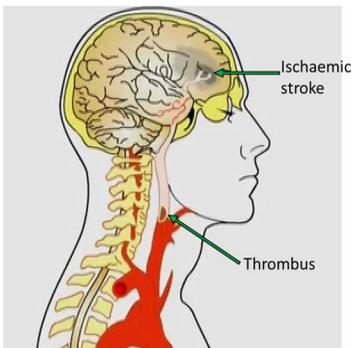


Figure 7 A. Thrombus at the bifurcation of the common carotid artery. Source: Stroke Education Limited

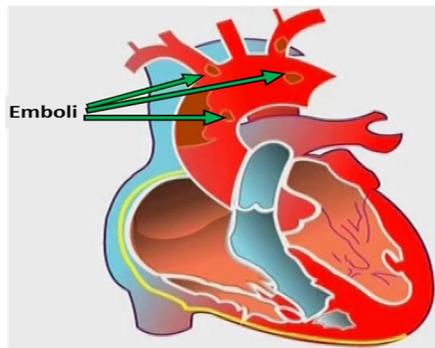


Figure 7 B. Emboli that form in the heart during Atrial Fibrillation. Source: Stroke Education Limited

Haemorrhagic stroke results from bleeding into the brain tissue due to the rupture of blood vessels, a condition called *Intra Cerebral Haemorrhage* (ICH) (Figure 8) or bleeding into the subarachnoid space i.e. the space in the brain between the two layers of the meninges (pia and arachnoid mater) that carries the protective fluid (CSF) earlier mentioned. This is called *Subarachnoid Haemorrhage* (SAH) (Figure 9). Any of these bleeding processes will lead to accumulation of blood in the brain, causing headache and disruption of the orderliness of nerves because of pressure effect. This may further lead to confusion, coma or death. In the case of SAH, the blood may track down the subarachnoid space in the spinal cord and cause neck stiffness in addition. The headache is usually "explosive" described as thunderclap, like someone has used a hammer to hit the patient's head from behind. At the University of Port-Harcourt Teaching Hospital, we have developed a Stroke Registry where we record all stroke cases seen at the hospital. We found that over a period of 3 years, Cerebral Infarction constituted 64.1% of the stroke subtype, 31.1% was Haemorrhagic while 3.8% had mixed strokes (i.e haemorrhagic and ischaemic). This finding was presented at the conference of the American Academy of Neurology, Washington DC, in April 2015 and also published in *Neurology*, one of Americas leading journals in neurosciences.¹²

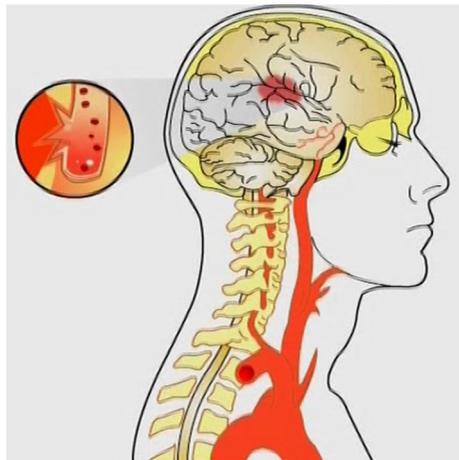


Figure 8: Haemorrhagic Stroke. Source: Stroke Education Limited

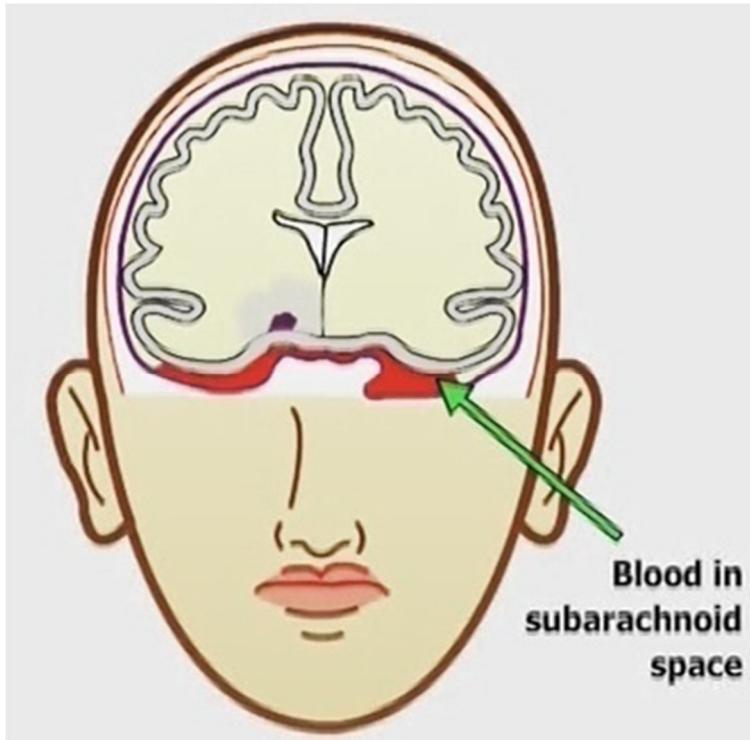


Figure 9: Subarachnoid Haemorrhage. Source: Stroke Education Limited

Stroke Diagnosis

Stroke is diagnosed by various methods. The commonest is the age old method which is a thorough clinical and neurological examination. This method alone is fraught with errors as some conditions which may appear like stroke called stroke mimics may be missed. Such conditions include low blood sugar (hypoglycaemia), brain abscess, subdural haematoma, brain tumour, some brain infections such as cerebral toxoplasmosis. We have reported a case of a 52 year old hypertensive who was HIV positive. He presented with features of stroke but turned out to have cerebral toxoplasmosis.¹³ Clinical examination alone will not be able to distinguish the stroke subtype. The main investigation which will help to confirm stroke and determine its subtype is a Brain

Computerized Tomography (CT) scan. This is regarded as the gold standard. CT scan (Figure 10) uses X-rays to create axial sections of detailed image of the brain.



Figure 10. Computed Tomography Scanner.

On CT, an acute ischaemic stroke shows as a hypodense region (Figure 11). The hypodensity is due to tissue necrosis. In haemorrhagic stroke, the area of blood collection is hyperdense compared to normal brain tissue (Figure 11). The hyperdensity is caused by released iron molecules present in lysed blood. In the early stage of ischaemic stroke, CT with low resolution capability may not detect the lesion, but with newer model CT machines that can produce up to 264 slides, early signs of infarction can now be

detected. We looked at the computerized tomography findings of stroke patients at UPTH.¹⁴ We found that 13.2% of the patients, despite neurological evidence of stroke (and no stroke mimics), had normal CT findings. Of those with abnormal findings, 79.2% were due to cerebral infarction, while 20.8% were due to haemorrhage.

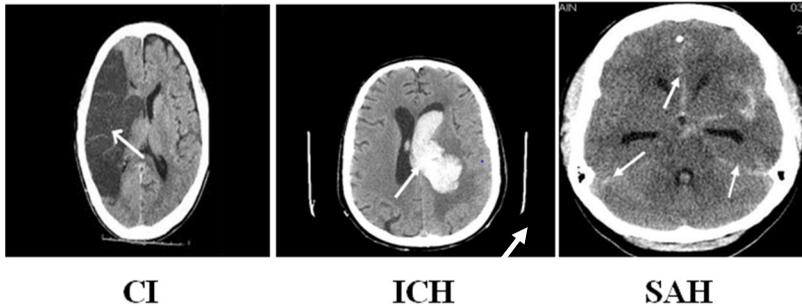


Figure 11

Magnetic Resonance Imaging (MRI) is another imaging technique for diagnosing stroke and its subtype i.e. whether it is *Ischaemic* or *Haemorrhagic*. It is more sensitive but more expensive than CT scan. MRI uses powerful magnetic and radio waves to create detailed multiplanar images of the brain.

A study at UPTH by our team¹⁵ showed that most strokes had a tendency of occurring during the midweek and weekends in Rivers State. These are periods of intense stress associated activities. In addition, cerebral infarction tended to have early morning peaks (66.0%) while cerebral haemorrhage had afternoon peaks (54.2%). Cerebral haemorrhage is known to be activity related and afternoons are usually periods when activity is at its peak for most people.

Further investigation can be carried out to determine the underlying cause of the stroke. Where an embolus is suspected, the common carotid artery and its branches can be checked for narrowing by a procedure called Carotid Doppler Ultrasound. This test uses sound waves to create detailed images of the inside of the carotid artery in the neck. This artery carries blood to the brain. Carotid doppler will

detect the site of the thrombus due to the buildup of fatty deposits called *plaques* or aortic dissection that narrow the blood vessel and impede blood flow to the brain.

If stroke occurs in a patient whose heart is beating irregularly, an electrocardiogram (ECG) should be done. This process maps out the electrical activity of the heart to demonstrate atrial fibrillation or multiple abnormal beats in the ventricle called Ventricular Ectopics.

A Cardiac Ultrasound (Echocardiogram) can also be done to identify abnormal heart valves, abnormal beating of the heart or clots in the heart chamber which may spread to the brain vessels through the blood stream. Echocardiogram uses sound waves to create detailed images of the heart.

A Holter Monitor Study which is a continuous tape recording of the patient's ECG for 24 hours will help to identify intermittent abnormal beats of the heart which can throw up an embolus and cause a stroke.

To demonstrate aneurysms or vascular malformations in the brain, an *Angiography* of the cerebral vessels could be done by the neurologist. This process involves the insertion of a flexible tube called catheter. This is inserted into the major artery (femoral) in the groin and guided to the major arteries of the brain. A contrast (dye) is injected through this catheter and is seen on imaging. The whole process is done under general anaesthesia. This will give a detailed view of the arteries of the neck and brain.

In the last decade, CT angiography (CTA) and MR angiography (MRA) have largely replaced transfemoral angiography for demonstrating intra or extra cerebral vessels.

Where subarachnoid haemorrhage is suspected, lumbar puncture is mandatory in our setting. The CSF is assessed through the space between L3 and L4 or L4 and L5 in a flexed position with the patient

lying on the left side. The CSF so obtained in SAH is *xanthochromic*.

Risk factors for stroke

Conditions that can cause or contribute to stroke include:

- Hypertension (high blood pressure)
- Diabetes mellitus (High level of sugar in the blood)
- High blood cholesterol levels
- Excessive alcohol intake
- Obesity
- Cigarette smoking (active and passive)
- Drug abuse like cocaine, amphetamine
- Atrial fibrillation
- Genetics
- Lack of physical activity
- Increasing age
- Sickle cell disease
- Previous stroke
- Aneurysm in the brain
- Arterio-venous malformation in the brain
- High level of homocysteine in blood
- Human Immuno-Deficiency Virus (HIV)

Hypertension: This condition known also as High Blood Pressure is defined as systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mm Hg or both.¹⁶ Systolic pressure measures the pressure in the arteries when the heart contracts and the blood flow is strongest while diastolic pressure measures the pressure in the arteries when the heart relaxes between heartbeats. Hypertension is the most common cause of stroke irrespective of age, sex, race and stroke sub-type. Globally, hypertension accounts for 35-50% of stroke risk. Hypertension puts a strain on the arteries in the body including those arteries carrying blood to the brain. This causes damage to the inner lining of the arteries. This damage may lead to the formation of clots causing blockage of the brain vessels. On the other hand, the blood vessels in the brain can weaken, balloon out, rupture and bleed. Both of these will result in stroke. Blood pressure

reduction of only 10 mmHg systolic or 5 mmHg diastolic reduces the risk of stroke by about 40%.¹⁷ Controlling blood pressure has been shown to prevent both ischaemic and haemorrhagic stroke. Even patients older than 80 years or those with only systolic hypertension benefit from blood pressure control. Unfortunately, for most people, hypertension is asymptomatic. Hence it is called a 'silent killer'. Such patients are not aware that they have hypertension unless by chance discovery or when they purposely go for medical checkup. Hypertension clinics record poor follow up attendance also. In a study conducted by the speaker at Maiduguri, North East Nigeria,¹⁸ it was found that only 45.5% of hypertensive patients identified, turned up for follow up. Of these, 9.1% were seen only once. About 26.4% kept regular appointment with 14% of the patients controlled. The low prevalence of awareness, treatment and control of hypertension which is the main driver of stroke poses a serious challenge to stroke prevention. Our study of hypertension in the rural community in Rivers State, shows that the prevalence of this 'silent killer' is also high.¹⁹ In the Port-Harcourt Stroke Registry, we observed that hypertension was responsible for 71.3% of stroke cases.¹² Recently, a new vista has been added to the burden of hypertension in the Niger Delta region of Nigeria. In a collaborative work carried out by researchers from our university including the speaker and scholars from Warwick University, UK, we observed that exposure to oil/gas pollution may be associated with an increased risk of hypertension. This observation was recently published in the *American Journal of Hypertension*.²⁰

Paradoxically, blood pressure is the most important amenable risk factor to change in low income settings like ours. This is because screening programs need inexpensive and easy to use equipment with little expertise.²¹ Blood pressure can easily be reduced by cheap generic drugs and life style changes e.g. low salt intake, and fruits which we have in abundance.

Diabetes Mellitus: Diabetes Mellitus has been shown to increase the risk of stroke by 2-3 times. This is because high levels of blood sugar can damage blood vessels, making them harder and narrower

and more likely to become blocked. If this happens to a blood vessel leading to the brain, it could cause stroke. When we looked at the common presenting features of newly diagnosed elderly diabetics, we observed that stroke was common.²² In our Stroke Registry at UPTH, diabetes mellitus was responsible for 35.4% of all stroke cases.

Cholesterol: This is blood fat or lipid. There are two major types of fat, *high density lipoprotein* (good fat) and *low density lipoprotein* (bad fat). Our main concern here is bad fat. The body gets this fat from the food we eat especially Fast Food Takeaways, such as Butter, Cheese, Red Meat, Egg-yolk, Baked Pastries. In local gatherings, this saturated fat is served as "Ngwo-Ngwo" "Isi-Ewu", "Kanda", "Goat-Meat", "Cow-Leg", "Marching Ground". People who are obese or overweight, have hypertension, diabetes, smoke cigarettes, are physically inactive or take a lot of these processed and fried foods tend to have high cholesterol levels. When there is too much fat in the blood, the fat starts to build up inside the arteries making them rigid and narrower. Rigid arteries cannot expand to allow more blood to flow through them when necessary and can rupture. Lumps of fat can block smaller arteries in the brain starving them of blood and causing ischaemic stroke. In the Port-Harcourt Stroke Registry, high cholesterol level in blood was responsible for 8.4% of stroke cases.¹²

There have been conflicting reports on the role of palm oil, one of our staple food items in Nigeria, on blood fat (lipid). While some reports from the Western World state that there is an increase in total cholesterol in the blood of those who take palm oil, other reports mainly from Asia claim the contrary. A team of workers at the University of Port-Harcourt, including the speaker and scientists in the Department of Biochemistry, examined the effect of palm oil diet on the cholesterol level of Wister albino rats fed for 12 weeks.²³

We found that palm oil did not increase blood fat but rather lowered it and as such could help to prevent stroke. We recommend that further work should be done on this observation on humans. This

controversy is a strong pointer to how medicine can at times drive economic interests.

Although unhealthy foods with saturated fat causing high cholesterol levels in blood are considered major risk factors in developed countries, poor nutrition with low vitamin intake appears to be a very important factor for stroke in sub-Saharan Africa.⁵

Many studies have shown association between increased levels of *homocysteine* in blood and stroke. Thus diets low in Vitamin B6, Vitamin B12, Folic acid, due to poor nutrition have been associated with increased levels of homocysteine in the blood. Homocysteine is a sulphur- containing amino acid derived from demethylation of dietary methionine. High levels of homocysteine can cause oxidative damage to vascular endothelium with proliferation of vascular smooth muscle and creates a prothrombotic environment leading to clot formation.²⁴ A study in Gombe, North East Nigeria, found high Homocysteine levels among stroke patients in that area.²⁵ Presently, we have an ongoing research at UPTH on the total plasma homocysteine level and its relationship to ischaemic stroke in the Niger Delta region of Nigeria.

Alcohol: This is taken in various forms which have been aptly described in the 80th inaugural lecture series of the University of Port Harcourt by Prof. Ihekwaba.²⁶ Excessive Alcohol can cause either ischaemic or haemorrhagic stroke by leading to hypertension or cause heart muscle disease called *Alcoholic Cardiomyopathy*. This heart muscle disease can cause irregular heartbeats, thereby throwing up clots. Alcohol can also stimulate the heart directly and cause irregular heartbeats following a binge. Alcohol can cause clogging of platelets or clotting disorders. In the Port Harcourt Stroke Registry, 30.8% of our stroke patients gave a history of excessive alcohol intake. Excessive alcohol is more than two drinks per day for men or more than one drink a day for women. A drink is equal to 1 beer (340ml), or a small glass of wine (142ml), or a shot of liquor (43ml) (Figure 12) Binge drink is more than 5 drinks per day at least once per month.



Figure 12

The Port Harcourt Stroke Registry showed that 32.5% of stroke cases had a family history of stroke. There appears to be a **genetic** tendency for stroke in a family. Hypertension and diabetes which are major causes of stroke run in families as well as malformed blood vessels which result in ICH/SAH. It is also thought that family members can share lifestyles that can contribute to stroke. Similarly, having had a stroke in the past (**previous stroke**) increases the risk of future stroke which is usually more fatal. This trend that a stroke can reoccur with a more devastating effect was captured in the 19th century by the advice given to a French General, Napoleon by his physician, Corvisart. He likened a first attack as a "summons without cost" (probably TIA), a second attack as "summons with cost" but a third attack as an "execution" on the patient. What this simply means is that the risk factors are already established and worsen with time unless secondary preventive measures are instituted. In the Port Harcourt Stroke Registry, 21.5% of the stroke patients have had a previous stroke.

Obesity: Obesity is defined as body mass index (BMI) $\geq 30\text{kg/m}^2$. This can increase the risk of stroke due to inflammation caused by

excess fatty tissue deposited in the lining of blood vessels. This can lead to difficulty in blood flow and an increased risk of blockage, both of which can cause stroke. Obesity is a known risk factor for both hypertension and type 2 diabetes mellitus. These two conditions as discussed above are strong stroke risk factors.

Individuals who are obese suffer more from disordered breathing called sleep apnoea. They snore and have intermittent breathing cessation. Patients with sleep apnoea run the risk of having high blood pressure and irregular heartbeats both of which can cause stroke.

Sickle cell disease (SCD): This is the major cause of ischaemic stroke in children in Nigeria. The sickle-shaped red blood cells clump up and block vessels carrying blood to the brain which will result to stroke.

Age: The incidence of stroke increases with age. Advanced age is one of the most significant non-modifiable risk factors for stroke. From our work at UPTH, we found that the peak age for stroke was in the 7th decade (60-69years).²⁷ The mean age for stroke was 62.61years. This is far much earlier than in the developed countries thereby resulting in a greater number of years of potential life lost.²⁸

On the other hand, stroke in young Nigerian adults (18-45years) at UPTH was found to be associated with not only hypertension but those who abuse drugs like cocaine, alcohol or have HIV infection.²⁹ This study also showed that 8.8% of the stroke patients were young adults. Working at the University of Maiduguri Teaching Hospital many years ago, we found that *rheumatic heart diseases* complicated by infective endocarditis caused stroke among the young patients.³⁰

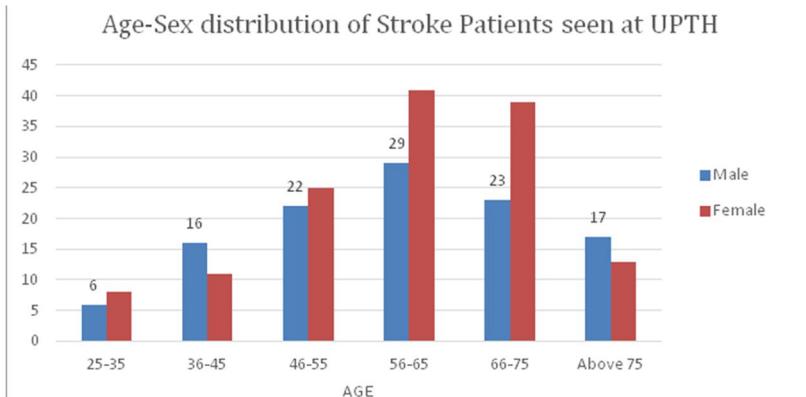


Figure 13

The bar chart on the age and sex distribution of stroke patients managed in the medical wards of UPTH (Figure 13) has a lot to say. This has been consistent in most of our research publications on stroke where we observed that more females than men had stroke. It has debunked the writings in many text books that stroke occurs more frequently in males than females. In line with these facts, the World Stroke Organization chose the theme for the World Stroke Day 2015 as 'I am a woman'. This is because a woman is:

- * more at risk of having a stroke.
- * more likely to die from a stroke than a man.
- * less likely to receive acute care and rehabilitation than a man, even though she responds equally well to treatment
- * more likely to experience severe decline in cognitive function, and runs a higher risk of post-stroke depression and institutionalization.
- * more likely than a man to experience hypertension, diabetes mellitus, atrial fibrillation (irregular heartbeat), depression and obesity, all of which increase stroke risk.
- * more likely to take on the care giving role.
- * have more stroke risks like pregnancy related diabetes, preeclampsia, use of birth control pills (contraceptives), hormone replacement therapy and undergo menopause. Women also live longer and advanced age is a risk factor for stroke.

ATHEROSCLEROSIS: THE FINAL COMMON PATHWAY.

More than two thirds of all strokes, and indeed the most important risk factors for stroke discussed above, are caused by *atherosclerosis* (Figure 14). This is often regarded as the "hardening of the arteries". The word comes from the Greek words *athero* meaning (gruel or paste) and *sclerosis* meaning hardness. The process involves the deposits of fatty substances, cholesterol, calcium, platelets, cellular waste products, fibrous tissue in the inner lining of an artery. This process starts in childhood and progresses with age peaking between 50 -60 years. This build up is called a *plaque*. It usually affects the large and medium sized arteries, in the case of stroke- vertebral, internal carotid and vessels of the Circle of Willis. These cells and surrounding materials thicken the endothelium thereby narrowing the affected blood vessel, decreasing blood flow to the brain. This will reduce oxygen (and nutrient) supply to the brain. Two things can happen here. A blood clot may form on the plaque surface blocking the artery to the brain. This is a thrombus. The plaque can also be fragile and break off forming an embolus. If this embolus blocks a blood vessel to the brain, it can also cause a stroke.

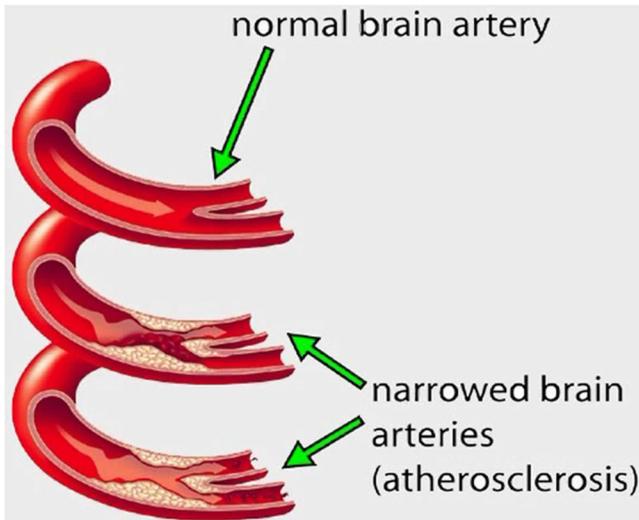


Figure 14: A diagram illustrating narrowed blood flow to brain arteries due to atherosclerosis. Source: Stroke Education Limited

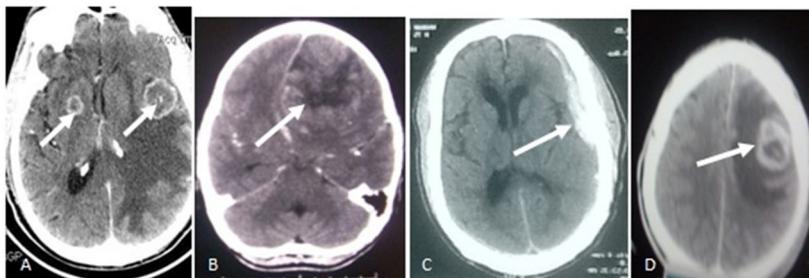
ACUTE TREATMENT OF STROKE:

Stroke is a medical emergency. I will discuss selected issues encountered during the management of acute stroke in the Accident and Emergency Department, the Intensive Care Unit (ICU) or in the Medical Ward.

Stroke Unit:

A stroke victim should ideally be managed in a stroke unit by a stroke team. This is an organized in-hospital facility that is entirely devoted to the care for patients with stroke. It is fully functional 24 hours a day and 7 days a week. It is staffed by a multi-disciplinary team with special knowledge in the care of stroke victims. It consists of a neurologist, stroke nurses, physiotherapists, occupational therapists, speech therapist, psychologists, pharmacists, dieticians and social workers. The activity of the stroke team is coordinated through regular meetings (mini-conferences) on the welfare of the patients. Patients managed in stroke units have a higher chance of survival than those admitted elsewhere in the hospital. Mortality is reduced by 14%. No single factor has been identified to be responsible for this benefit outside the team work. Does the Holy Book not tell us in Psalm 133 *"Behold how good and how pleasant it is for brethren to dwell together in unity! It is like a precious ointment upon the head, Running down on the beard, The beard of Aaron, Running down on the edge of his garments. It is like the dew of Hermon. Descending upon the mountains of Zion; For there the LORD commanded the blessing- Life forevermore"*. This quotation emphasizes the need for our health workers to work in harmony for the good of our patients. We have made a case for the establishment of stroke units in Nigeria.³¹ This can be started by having specific designated beds in a section of medical wards with the care assigned to specifically trained and allied medical health providers.

The first investigation to be done for any stroke patient or suspected stroke case is a brain CT or MRI (and blood sugar). This is very important and mandatory. This will determine the stroke subtype or exclude stroke mimics (Figure 15).



A. Cerebral toxoplasmosis

B. Cerebral Tumour

C. Subdural Haematoma

D. Brain Abscess

Figure 15 showing stroke mimics.

Management will depend on the stroke subtype. Unfortunately this neuro-imaging facility is unavailable in most health centres in Nigeria and sub-Saharan Africa.

Ischaemic stroke: The goal of treatment is to restore blood flow to the affected area of the brain as quickly as possible within 3-4 ½ hours of stroke onset.

This can be done with intravenous thrombolytic therapy called tissue plasminogen activator (tPA, alteplase). It is also called a “Clot buster” and works by dissolving clots that are blocking blood flow within arteries of the brain. The first recorded use of 'spiritual clot buster' was in Luke, Chapter 5, verses 18-25.

"And behold, some men were bringing on a stretcher a man who was paralyzed and they tried to carry him in and lay him before Jesus....."

He said to the paralyzed man, I say to you, arise, pick up your litter (stretcher), and go to your own house!....."

And instantly (the man) stood up before them and picked up what he was lying on and went away to his house, recognizing and praising and thanking God".

Unfortunately less than 10% of stroke victims benefit from this therapy in the most advanced countries of the world, others present late. In Nigeria, like other countries of sub-Saharan Africa, the situation is abysmal. We found that 16% of stroke patients presented to UPTH after one week of stroke, 44% presented after 24 hours, while 40% presented within 24 hours but none within the window period of 4½ hours.¹⁵ In another study, we found that the interval between the arrival to the hospital and CT evaluation at UPTH ranged from 3 days to 4 weeks with a mean of 9 days.¹⁴ Thus none fulfilled the criteria for the use of this wonder drug even if it were available.

Another treatment option is a procedure called *Endovascular Surgery* in which the blood clot is removed by quickly sending a catheter from the groin to the site of the blocked vessel in the brain. Some times alteplase can be administered directly into the blood clot. This is called intra-arterial treatment. This procedure is highly specialized and can only be carried out within 6 hours of stroke onset in developed countries where it is practised.

Role of Aspirin in Acute Stroke treatment:

Aspirin is an anti platelet agent with rapid onset of action. Platelets are tiny fragments of cells in the blood that clump together to stop bleeding. This clumping leads to the formation of a blood clot. In ischaemic strokes, platelets clump together inside narrowed arteries in the brain. Aspirin because of its fast action, can prevent new clots from developing. A tablet of Aspirin (300mg) can be taken within 48 hours of the start of ischaemic stroke. Aspirin is not given in haemorrhagic stroke as it will worsen the bleeding! Though useful in ischaemic stroke, its role is limited but as the saying goes, 'half bread is better than none'.

Blood Pressure Control in Acute Stroke:

Blood pressure management in acute stroke setting deserves special mention. Blood pressure should not be lowered during the acute phase of stroke except in special circumstances. This phase is between the first 7-14 days. Lowering BP can result in further

neurological impairment because increased BP may be necessary to maintain the flow and oxygen supply to the surrounding zone called *penumbra*. This zone is at risk of dying and therefore dependent on collateral blood flow around the infarcted brain tissue (Figure 16). This can be boosted by increasing the amount of fluid and decreasing the stickiness (viscosity) of blood by giving isotonic infusion. Paradoxically, it is at this stage that patients and relations mount pressure on doctors to reduce blood pressure with erroneous belief that control of blood pressure will ensure patients survival. Thus the "crashing" of blood pressure with hydralazine or other antihypertensives is to be avoided in acute stroke setting.

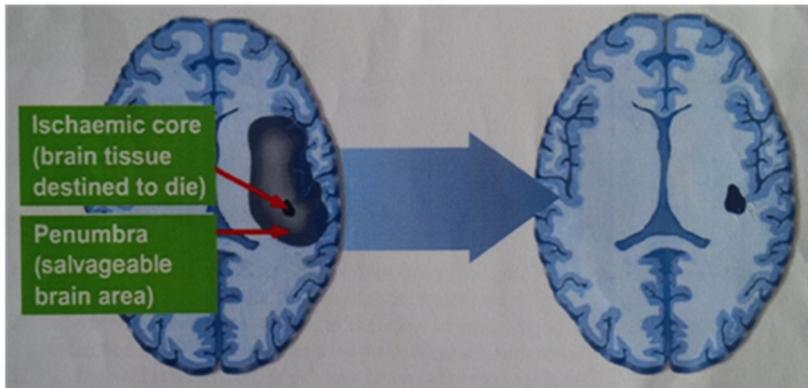


Figure 16

Treating high blood sugar with soluble insulin in the acute stage and fat (lipid) levels with statins may also help the neurons recover fast. In certain instances, supplemental Oxygen and Ventilatory support can be given. In all cases, the ABC of managing critically ill patients is applied.

MANAGEMENT OF INTRACEREBRAL HAEMORRHAGE:

In patients on oral anticoagulants, the drug is stopped immediately and intravenous vitamin K given slowly. Raised intracranial pressure is lowered using 20% mannitol as boluses or hypertonic saline. Neurosurgical intervention may be sought.

MANAGEMENT OF SUBARACHNOID HAEMORRHAGE

The commonest cause of SAH is berry aneurysm (70%). This is a balloon-like bulge of an artery wall. With time, this aneurysm becomes more distended, thinner, and weaker and can rupture, releasing blood into the subarachnoid space. This usually develops within the circle of Willis. Treatment is best when detected early and is by neurosurgical clipping or endovascular coiling.

POST STROKE REHABILITATION (Physical Therapy, Occupational Therapy and Speech Therapy)

The patient is referred to the therapists within 24 hours of admission for assessment and treatment. They (therapists) should be put on notice as soon as the patient comes in. Early rehabilitation therapy should be provided as soon as the patient's medical status is stable. The use of therapeutic exercises and task-oriented training help in functional recovery of stroke patients. Figure 17 shows the physiotherapists at work on stroke patients at the Rehabilitation section of its Department at UPTH.

A. Facial Palsy



B. Difficulty in standing



C. Difficulty in correcting knee hyperextension



D. Hemiplegic gait



E. Abnormally flexed elbow and hyper extended knee



Figure 17

COMPLICATIONS AFTER A STROKE

Stroke mortality is usually high ranging from 30% to 40%. Haemorrhagic strokes have higher mortalities than ischaemic

strokes. The high mortality is partly due to late presentation to the hospital, absence of stroke units, manpower shortages, poor knowledge in stroke management by some medical practitioners who would crash blood pressure on presentation thereby compromising cerebral perfusion, shortages of physiotherapists and stroke nurses. Other factors that will affect mortality include the site of the stroke (brain stem stroke carries worse prognosis) and the extent of the stroke. Some stroke patients are first taken to traditional healing homes or prayer houses where all sorts of things are done ignoring giving attention to the risk factors. By the time such patients get to the hospital when the condition might have deteriorated further, it would be late. Time is brain! Using standard protocols to manage patients in UPTH, we have been able to reduce the mortality rate to about 14% in the first week of the ictus.¹² This is comparable to the figure in some developed countries such as in (southern) Spain.³² However, unlike in these developed countries, the extent of disability is immense.

More than 75% of stroke survivors develop complications after the event. This is usually devastating and affects their employability and quality of life. Stroke is the leading cause of disability worldwide. These disabilities can be physical, mental, psychological or a combination of the three. They include: aphasia which is language disturbance due to the affectation of the language centre (Broca's and Wernicke's areas) in the brain. Others are muscle weakness on the affected side causing paralysis such that the victim cannot walk and may become wheelchair bound. The muscle weakness may result to falls should the patient risk moving unassisted. There may be numbness and pain on the affected side. These disabilities will affect the daily activities of the patient such as eating, cooking, bathing, dressing, talking, walking, reading, writing, toileting etc. Such patients may develop pressure sores due to lying on the same side for weeks, months or even years. Deep vein thrombosis (clots in the legs) may occur with resultant pulmonary embolism. They may have pneumonia due to feeding difficulties. Stroke patients commonly develop epilepsy. This results from the site of the stroke in the injured brain becoming the site of epileptic discharges.

Mental disabilities include memory loss (dementia) and attention deficit.

Emotional disabilities following stroke can result from the affectation of the emotional centre in the brain or frustration that may arise due to the emerging physical challenges. These include depression, anger, irritability, anxiety, panic attacks and frank psychosis. Some stroke patients may have inappropriate behaviour and emotional lability i.e cry when happy or without provocation or vice versa. Stroke obviously will affect the conjugal life of the victim. It is very frustrating for a stroke patient who is unable to communicate. Stroke brings about a big change in the victims life: grief for loss of independence and uncertainty for what the future holds. The burden on the care giver is equally immense. They need to provide both emotional and practical support to the stroke patient. Caregivers need to exercise a lot of patience for the stroke victim.

Our experience on stroke at UPTH:

Mr. Vice Chancellor Sir, in 1992 shortly after I had assumed duty in the University of Port Harcourt, Odia and Wokoma (now professors) published a paper on their findings on the causes of medical mortality at UPTH over a four year period- January 1985 to December 1988.³³ Stroke was the leading cause of death, accounting for 15.9% of all medical mortalities.

The Accident and Emergency (A&E) Department of any teaching hospital is the entry point for most patients into that health institution. It is the window through which you can gauge what is happening in that health institution. We studied the causes of medical mortality in the A&E Department among adults.³⁴ Stroke was leading with 24.5%, followed closely by HIV/AIDS 22.7%. From this simple study in 2008, what was obvious was that 2 major diseases had emerged. One that is well known is HIV/AIDS. The second that is silent is STROKE. Interestingly, the patients who died of HIV/AIDS were mainly in the age group 20-39 years while the patients who died of stroke were mainly in the age group 50-69 years. This is the age when most people have acquired experience

for nation building in their various callings. Such people may have reached the peak of their profession and mentoring the upcoming generation. I refer to this group as the aging but not yet aged set. This is the stage when their children are in higher institution of learning or just graduated and about to settle down and need parental guidance. This is the age when workers are retiring either from the public or private sector. The Holy Book says in Psalm128, verse 2 “*You shall eat the fruit of your labours: happy shall you be and all shall go well with you*”. It went further to reassure us in Isaiah 65:21-23

They shall build houses and inhabit them

They shall plant vineyards and eat their fruit

They shall not build and another inhabit

They shall not plant and another eat

For as the days of a tree, so shall be the days of My people

And My elect shall long enjoy the works of their hands

They shall not labour in vain.

All these promises could be cut short by stroke resulting in loss of a highly valued pool of hard – to – replace human capital and economic investment.

We moved to the medical wards and looked at the causes of admission among patients aged 60 years and above.³⁵ Cardiovascular events were the main reasons for admission accounting for 43.7%. Of these events, stroke was leading with 47.4%. Stroke is classified as a cardiovascular event because it involves the blood vessels of the brain.

We looked at the causes of death among patients aged ≥ 60 years at UPTH.³⁶ Cardiovascular causes were responsible, accounting for 50% of deaths during the period. Stroke was responsible for 75.2% of total cardiovascular deaths.

A study of all the neurological disorders at the medical wards during the same period showed that stroke was responsible for 78.7% of all neurological admissions.³⁷ Similarly, we carried out a study on

stroke in young adult Nigerians aged 18-45 years. The prevalence of stroke in this group was 8.8%.²⁸ Thus stroke is not confined to only the old or middle aged but can also affect the young.

In all stroke cases all over the world, hypertension has been the main cause of stroke just as it is also the main cause of heart failure and renal failure.³⁸ A study of the clinical profile of hypertension over 5 years (January 2002 to December 2006) at UPTH by my team, showed that stroke was the leading cause of admission from hypertension related complications, accounting for 40% of complications and 50% of hypertension related deaths.³⁹

In collaboration with colleagues in the Department of Preventive and Social Medicine, we went to Ke-Dere, a rural community in the Niger Delta region to ascertain the prevalence of stroke in 2008.⁴⁰ The result was astounding as much as it was horrifying. 8.5 per 1000 suffered a stroke. This result was far higher than 0.58 per 1000 at Ibadan⁴¹, three decades before our study, and 1.14 per 1000 in urban Lagos city⁴², a decade before our study. Our work is a landmark study published in a cutting edge journal of *Stroke and Cerebrovascular Diseases*, an official journal of National Stroke Association of America and Japan Stroke Association. The article has been widely cited. This experience is not confined to only the studies above. A recent study at UCH shows that stroke is also the leading cause of adult medical admissions and the leading cause of medical coma.⁴³

Our experience was aptly captured in a public lecture delivered in commemoration of the retirement of Professor C.O. Anah, one of the founding fathers of the Department of Medicine, University of Port Harcourt. This lecture was by no other person than our eminent Emeritus Professor Nimi D. Briggs, our 5th Vice Chancellor, on the 3rd of August 2007, at Ebitimi Banigo Auditorium. Based on the data that Professor Briggs got from various workers in the Department of Internal Medicine,⁴⁴ he analyzed the causes of Admissions and Deaths in the Medical Wards of UPTH over a 10 year period 1996-2005 (Tables 2&3). Stroke was clearly the leading

cause accounting for 18.09% medical admissions and 41.52% medical mortalities, far greater than infectious diseases such as tuberculosis, HIV and malaria put together.

Table 2: Admissions into Medical Ward (1996-2005) of UPTH

Disease	Number	%
Cerebrovascular disease (stroke)	272	18.09
Hypertension	262	17.42
Tuberculosis	168	11.17
Congestive cardiac failure	154	10.24
Chronic renal failure	136	9.04
Diabetes mellitus	96	6.38
Diabetic foot ulcer	70	4.65
Chronic liver disease	68	4.52
Hyperglycaemic coma	46	3.06
Primary liver cell carcinoma	46	3.06
Subtotal	1318	
Others	186	12.37
Total admissions	1504	
Total outpatients seen	139,803(M), 182,551(F)	

Table 3: Deaths in Medical ward (1996-2005) of UPTH

Disease	Number	%
Cerebrovascular disease(stroke)	94	39.83
Chronic renal failure	44	18.64
Diabetes mellitus	20	8.47
Primary liver cell carcinoma	16	6.78
Congestive cardiac failure	14	5.93
Hypertension	12	5.08
Tuberculosis	20	8.47
Chronic liver disease	4	1.69
Retroviral disease	8	3.39
Subarachnoid haemorrhage (stroke)	4	1.69
Total	236	

The summary of all these is that stroke is on the increase and rapidly so. It is a disaster in waiting!

Global burden of stroke

Stroke is the second leading cause of death worldwide after Coronary heart disease.⁴⁵ In USA every 40sec someone has stroke

and every 4 minutes someone dies of stroke. In UK every 5 minutes someone dies of stroke. In Canada every 7 minutes someone dies of stroke. In China with the world's largest population of 1.4 billion people, and grouped as a developing country, stroke is the leading cause of death among all diseases.⁴⁶ Globally, one out of five persons will suffer stroke in a lifetime.⁴⁷

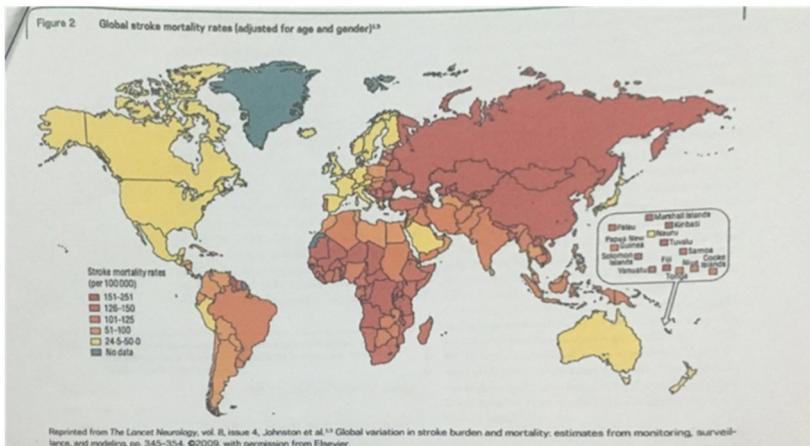


Figure 18.

In Nigeria, it was estimated that stroke mortality in 2005 was 126/100,000 population.⁴⁸ Every 2 minutes someone dies of stroke in Nigeria. The chart (Figure 18) above from Lancet Neurology (2009) speaks for itself. According to WHO, 85% of all stroke deaths in the world occur in people living in low and middle-income countries in which Nigeria is one of the most populated.⁴⁹ In the South African Aging Cohort Study, stroke was the commonest cause of death in the age group 55-74 years and the second commonest in the age group 35-54 years and above 75 years.⁵⁰

Generally, blacks all over the world have a higher stroke risk and incidence and for them it runs an aggressive clinical course. This is thought to be genetic. Consequently, the rate of disability is also high, primarily due to lack of available post stroke care. With this scenario, the big question ladies and gentlemen, Mr Vice Chancellor

Sir, is where do we go from here? I will attempt to answer this question by proffering a three pronged strategy.

1. Strengthening our health systems so that they can deal with strokes.
2. Embarking on effective stroke prevention campaigns
3. Embarking on robust macroeconomic policies by the 3 tiers of government

STRENGTHENING OUR HEALTH SYSTEM

Improved healthcare systems starting with primary care. This is provided by local government. These include village healthcare clinics and district health centres. These should be manned by medical officer/youth corps doctors. In primary care, patient should have early investigation such as blood sugar to detect diabetes mellitus, genotype for sickle cell disease in children, blood pressure measurements. and lipid profiles. Health promotion leaflets and health talks could be given by community health nurses on the importance of life style changes and good nutrition.

Secondary Healthcare

State Governments are responsible for secondary health care. The state owned general hospitals serve as referral centres for primary health care. Investigations such as ECG could help detect patient with cardiac arrhythmias. Lipid profile of patients with diabetes mellitus, HBP etc could be carried out also.

Tertiary Healthcare

There are many teaching hospitals / federal medical centers that can provide tertiary care to stroke patients. Stroke units should mainly be at the tertiary healthcare level. Such centers would have facilities such as CT scan, MRI, and thrombolytic drugs.

There should also be in these centres, rehabilitation facilities for physiotherapy, occupational therapy and speech therapy. In Nigeria, there are no special centres for stroke management, not even at regional/geopolitical level. There should also be trained specialists in clinical neurology. All these are hindered by lack of funds and

commitment by health policy makers. These are worsened by unhealthy rivalry between health workers resulting in incessant strikes. Our patients deserve better treatment. Patients with stroke/TIA should be managed in stroke units/ clinics.

Private Medical Practitioners

Individuals or private groups provide more than half of the functioning medical services in Nigeria. These medical services are mainly concentrated in major cities with very few in rural areas.

These private health establishments are manned by general medical practitioners with inadequate knowledge on stroke care. There is need to embark on Continuous Medical Education for these general medical practitioners to improve their knowledge on stroke management.

All these programs are capital intensive and costly – equipment, training personnel, laboratory facilities, clinical testing capacity, ambulance services, telemedicine are needed to guarantee reliability and continuity. These facilities also change with time, some break down and will need replacement. These cannot be sustained by developing countries. Even in developed countries, such as United States of America and Western Europe where stroke has moved from the third leading cause of death to the fourth position, clinical program alone has not been effective. Hence the need for effective stroke prevention campaign and strategy.

STROKE PREVENTION STRATEGIES

The adage that prevention is better than cure holds in this instance. Population based strategies which will include community education, using printed materials, audiovisual programs, lectures, television and billboards advertisements, radio jingles. Stroke education should target prospective patients like hypertensive patients, diabetics, old stroke patients, sicklers, the aged and aging etc and their care givers. The campaign should be carried to tertiary, secondary and primary schools, to the churches and mosques. All health workers including medical practitioners, should spend quality

time to educate their patients on preventive measures and the ability to recognize stroke. Another important public education strategy is to advise patients / relatives to take victims to hospital immediately it is noticed. Time is brain! These messages have to be repeated time without number for sustained impact.

The right quality of food to prevent hypertension called DASH (Dietary Approaches to Stop Hypertension) diet should be encouraged. The main goal is to eat more vegetables and fruits while limiting fat intake.

Hypertensive patients have to be commenced on drugs and this is for life. No one antihypertensive drug is better than the other. The cheaper, the better but your doctor should advise you based on individual need, convenience and side effects.

Salt should be limited to 2300 mg a day - roughly a tea spoon levelled out. Salt retains water in the body and raises blood pressure.

Smoking cigarettes should be stopped. Smoking increases blood pressure and damages blood vessels thereby causing stroke. There are over 4000 chemicals in cigarette smoke including carbon monoxide that damage the arteries of the brain. Smoking as well as being a health hazard, is also an anti-social pastime. Those who inhale the fumes from the cigarettes (passive smokers) are worse off. Alcohol should be limited to no more than 2 drinks per day for men and 1 drink per day for women where it cannot be completely avoided.

Exercise should be regular, at least 30 minutes each day. Choose activities you enjoy. This could be dancing, swimming, jogging, brisk walking, cycling, gardening etc, just do something. These activities will help you reduce weight, loose salt by sweating, and thereby reduce blood pressure, improve oxygen to the brain and other vital organs of the body.

Maintain body weight and keep it in proportion to your height (BMI) which is in the range of 18.5-24.9 Kg/m². This will also help lower blood pressure.

MACROECONOMIC POLICIES TO STROKE PREVENTION

The Ministry of Health alone does not control the primary levers critical to preventing stroke. Macroeconomic policies such as heavy taxation on tobacco companies, breweries and shops that sell alcohol and cigarettes to discourage consumers of such products should be introduced. The ban on smoking cigarettes and drinking of alcohol in public places will further help discourage the use of such harmful products.

Government should embark on Agricultural policies that will help shift nutrition towards healthier patterns, such as to favour fish farming (fish oil is protective to the brain), and vegetable oil instead of animal fat which has been found to contain harmful bad oil.

State and Local Governments should embark in urban planning that is conducive to physical activity with adequate security to enable citizens exercise freely without threats to life.

Government should provide adequate and regular power supply so that equipments in the hospitals do not break down. When power is steady, security will improve and this will provide the enabling environment for people to go out and exercise, a veritable component in blood pressure reduction.

All tiers of Government should construct good road networks so that people can get to their destinations easily and avoid stresses on roads that can lead to hypertension. Good roads will also make it easier for stroke victims to be taken to hospitals on time without delay. Time is brain!

Educational institutions at all levels should formulate educational programs that inform and teach pupils and students lifetime behaviours such as regular exercise, healthy eating habits, avoidance of smoking and excessive alcohol that promote good health.

The Ministry of Information should see it as a corporate social responsibility to constantly educate the public on the risk factors of stroke, the signs and symptoms of stroke and the need to seek immediate medical attention once they are recognized. Being the watchdog of the people, the Ministry of Information should always draw the attention of the Government to the dilapidated state of our health institutions.

Stroke is the new face of chronic, Non Communicable Disease in sub-Saharan Africa, a forerunner of health transition in developing countries, and a preventable disaster waiting to happen! Dealing with stroke will involve policy makers in health, education, transport, finance, power, agriculture, information, youths and sports acting in concert.

CONCLUSION

Mr. Vice Chancellor Sir, for about an hour you have given me the opportunity to discuss to a mixed audience the historical background of my specialty (Neurology) and what it entails. I have also talked about my stewardship, and the burden of stroke to my region- a topic that is dear to my heart.

This is a discipline that I have devoted more than 25 years of my life as a university teacher, consultant physician and a steward. The Jews in John 1:19-23, had sent priests and Levites from Jerusalem to John to ask him, "*who are you?*"

Are you Christ? He answered, " I am not the Christ"

"What then? Are you Elijah?" He said, " I am not."

"Are you the prophet?" He answered, "No."

Then they said to him, Who then are you that we may give an answer to those who sent us? What do you say about yourself?."

Today, like John, similar questions may be coming to me from my audience and my response is that I am the voice of one among few labourers, crying in the wilderness,

Change your life style, Stroke is a preventable disaster waiting to happen!

Thank you for listening.

REFERENCE

1. Baker M G, Kale R, Menken M. The wall between neurology and psychiatry. *British Medical Journal* 2002; 324 :1468-1469
2. Adeloye A. Beginning of neurosciences in Ibadan, Nigeria. *Archives of Ibadan Medicine* 2009/2010; 10: 1-6.
3. World Health Organization. Neurological disorders- public health challenges. World Health Organization. Geneva 2006.
4. http://www.ninds.nih.gov/disorders/brain_basics/know_your_brain.htm
5. Danesi M A. The African brain: Effects of African environment on brain diseases. Inaugural lecture series , University of Lagos, Nigeria 2015.
6. Yin W. Chinese traditional medicine and stroke. [www.comtec.com>yin-plenary](http://www.comtec.com/yin-plenary)
7. [http:// en. wikipedia.org/wiki/brain](http://en.wikipedia.org/wiki/brain)
8. Omran AR. The epidemiologic transition: A theory of the epidemiology of population change, *Milbank Memorial Fund Quarterly* 1971: 49; 509-538
9. World Health Organization Monica Project, Principal Investigators. The World Health Organization Monica Project (Monitoring trends and determinants in cardiovascular disease) a major international collaboration. *Journal of clinical epidemiology*. 1988; 41:105-114
10. Ogun S A . Of Neurology and brain attacks : The good, the bad, the ugly. 51st Inaugural lecture series. Olabisi Onabanjo University, Ago-Iwoye. 2009.
11. Saver J L. Time is Brain – Quantified. *Stroke*. 2006; 37: 263-266
12. Okunoye C, Asekomeh G, Iyayba A, **Onwuchekwa A C**. Port Harcourt Stroke registry: A prospective Hospital Based Study. *Neurology*. 2015; 84: P1.574.
13. Okunoye OC, Okoli N, Iyagba AM, Asekomeh EG, **Onwuchekwa AC**. Case report of a 52 year old hypertensive with cerebral toxoplasmosis as stroke mimic. *The Nigerian Health Journal* 2013;13(4):182-186
14. Onwuchekwa RC, **Onwuchekwa AC**. Computerized tomography of the brain findings in stroke patients at the

- University of Port Harcourt Teaching Hospital *West. African Journal of Radiology* 2009;16:25-31.
15. Chapp –Jumbo E N, **Onwuchekwa AC**. Clinical pattern of stroke in the University of Port Harcourt Teaching Hospital – a prospective study. *Port Harcourt Medical Journal* 2009;3:247-255.
 16. Chobanian AV, Bakris G I, Black HR et-al. The Seventh Report of the joint National committee on Prevention, Detection, Evaluation and Treatment of high blood pressure, *Hypertension* 2003; 42(6): 1206 – 1252
 17. Law MR, Morris JK, Wald NJ. Use of blood pressure lowering drugs in the prevention of cardiovascular disease: meta analysis of 147 randomized trials in the context of expectations from prospective epidemiological studies 2009; *British Medical Journal* (Clinical Research edition) 338
 18. **Onwuchekwa AC** (May 1989). Clinical Profile of Hypertension at the University of Maiduguri Teaching Hospital. FMCP Thesis for the National Postgraduate Medical College of Nigeria.
 19. **Onwuchekwa AC**, Mezie-Okoye MM, Babatunde S. Prevalence of hypertension in Kegbara-Dere, a rural community in the Niger Delta region, Nigeria. *Ethnicity&Disease* 2012;22(3):340-346
 20. Ezejimofor MC, U Uthman OA, Maduka O, Ezeabasili AC, **Onwuchekwa AC**, Ezejimofor BC, Asuquo E, Chen YF, Stranges S, Kandala NB. The burden of hypertension in an Oil and Gas polluted environment: A comparative cross-sectional study. *American Journal of Hypertension* 2016; <http://ajh.oxfordjournals.org/guest>
 21. **Onwuchekwa AC**. Problem of Hypertensive care in Nigeria. *Nigerian Medical Practitioner* 1996; 31:94-96.
 22. Chinenye S, Young EE, **Onwuchekwa AC**. Diabetes mellitus in the elderly-Niger Delta experience. *Archives Diabetes & Cardio Med* 2012;1;7- 10
 23. Onyeali UE, **Onwuchekwa AC**, Monago CC, Monanu OM. Plasma lipid profile of wister albino rats fed palm oil-supplemented diets. *International Journal of Biological and Chemical Sciences* 2010; 4 (4):1163-1169.

24. Sadiq M, Alam MT, Kanpurwala MA, Khan MS. Frequency of hyper-homocysteinaemia in ischaemic stroke patients of Karachi. *Journal of Pakistani Medical Association* 2014;64:1063-1066.
25. Calew RH, Okolie H, Crossey M. et al. Serum lipid profiles and homocysteine levels in adults with stroke or myocardial infarction in the town of Gombe in Northern Nigeria. *Journal of health Population Nutrition*.2004; 4:341-347
26. Ihekwaba AE. Eat right, live right that your liver will be right. Inaugural series No 80, 27th June 2011.
27. **Onwuchekwa AC**, Bellgam H I, Asekomeh EG. Stroke at the University of Port Harcourt Teaching Hospital, Rivers State, Nigeria. *Tropical Doctor* 2009;39:150-152.
28. Lemogoum D, Degaute JP, Bovet P. Stroke prevention, treatment, and rehabilitation in sub-Saharan Africa. *American Journal of Preventive Medicine* 2005; 29: 95-101.
29. **Onwuchekwa AC**, Onwuchekwa RC, Asekomeh. EG. Stroke in young Nigerian adults. *Journal of Vascular Nursing* 2009;27:98-102.
30. **Onwuchekwa AC**, Ugwu EC. Pattern of rheumatic heart disease in adults in Maiduguri, north east Nigeria. *Tropical Doctor* 1996; 26:67-69.
31. Bell-Gam HI, **Onwuchekwa AC**, Iyagba AM. Sharing the burden of stroke. *The Nigerian Health Journal* 2012;12(2):31-34.
32. Maestre-Moreno JF, Femandez-Perez MD, Triguero-Cueva L et al. Stroke-related mortality in a tertiary care hospital in Andalusia: Analysis and reflections. *Neurologia* 2016 <http://www.ncbi.nlm.nih.gov/pubmed/27157525>
33. Odia OJ, Wokoma FS. Mortality patterns in the Medical wards of a Nigerian Teaching Hospital. *Orient Journal of Medicine* 1992; 4: 96-101
34. **Onwuchekwa AC**, Asekomeh EG, Iyagba AM, Onung SI. Medical mortality in the Accident and Emergency unit of the University of Port Harcourt Teaching Hospital. *Nigerian Journal of Medicine* 2008;17(2):182-185.

35. **Onwuchekwa, AC**, Asekomeh EG. Geriatric admission in a developing country experience from a tertiary centre in Nigeria. *Ethnicity & Disease* 2009; 19:359-362.
36. **Onwuchekwa AC**, Asekomeh EG. Causes of mortality among the elderly in a Nigerian hospital population. *Tropical Journal of Medical Research* 2009; 13(2): 25-28.
37. Asekomeh E.G, **Onwuchekwa AC**, Iyagba M.A. The burden of neurological disease in a geriatric population of a developing country. *African Journal of Neurological Sciences Online*. 2009; 28; http://ajns.paans.org/article.php3?id_article=305.
38. **Onwuchekwa, AC**, Asekomeh G.E . Pattern of heart failure in a Nigeria teaching Hospital. *Vascular Health and Risk Management* 2009; 5:1-6.
39. **Onwuchekwa AC**, Chinenye S. Clinical profile of hypertension at a Nigerian Teaching Hospital. *Vascular Health and Risk Management* 2010; 6: 511-516.
40. **Onwuchekwa AC**, Tobin-West C, Babatunde S. Prevalence and Risk Factors for Stroke in adult population in a rural community in the Niger Delta, south-south Nigeria. *Journal of Stroke and Cerebrovascular Diseases* 2014; 23(3): 505-510
41. Osuntokun BO, Adeuja AO, Schoenberg BS et al. Neurological admission in Nigerian Africans: a community based study. *Acta Neuro scand*. 1987; 75: 13-21
42. Danesi M, Okubanjo N, Ojini F. Prevalence of Stroke in an urban, mixed income community in Lagos, Nigeria. *Neuro epidemiology* 2007; 28:216-223.
43. Obiako OR, Oparah S, Ogunniyi A. Causes of medical coma in adult patients at the university college hospital, Ibadan, Nigeria. *Nigerian Postgraduate Medical Journal* 2011;18; 1-7.
44. Briggs ND. Where do we go from here? A public lecture delivered in commemoration of the retirement of Professor CO Anah from the service of the University of Port Harcourt 2007. Nimi Briggs at 70. Selected Writings and Addresses 2006-2013
45. O'Donnell M J, Xavier D, Liu L, et. al. Risk factors for ischaemic and intracerebral haemorrhagic stroke in 22 countries

- (the INTERSTROKE study): a case control study
www.thelancet.com 2010;376:112-123
46. Chen Z. The mortality and death cause of national sample areas. In; Chen Z, editor. *The Third National Survey on the cause of Death*. 1st Ed. Beijing Peking Union Medical University Press;2008: 14-15
 47. <http://www.strokeassociation.org>-American Stroke Association
 48. Wahab KW. The burden of stroke in Nigeria. *International Journal of Stroke* 2008;3:290-292.
 49. Lopez AD, Mathers CD, Ezzati M, Jamison DT, Murray CJ. Global and regional burden of disease and risk factors,2001: systemic analysis of population health data. *Lancet* 2006; 367:1747- 1757
 50. Connor MD, Thorogood M, Modi G, Warlow CP. The burden of stroke in sub-Saharan Africa. *American Journal of Preventive Medicine* 2007;33:172-173

**CITATION ON
PROFESSOR ARTHUR CHUKWUBUIKE ONWUCHEKWA**



Prof. Arthur Chukwubuike Onwuchekwa was born at Umuneke, Ngor-Okpala, Imo State, Nigeria on the 12th of March 1953 to late Mazi Moses Igwe and Ezinne Victoria Egejuru Onwuchekwa of Obinkita Village, Arochukwu in Abia State. He is an only son in a family of two children.

He started his primary education at Central School, Imo River in Ukwa West LGA of Abia State, where his father was a palm produce dealer with the United African Company. Sterling performances saw him attending the famous Government Comprehensive Secondary School, Borokiri, Port-Harcourt in 1964.

This was interrupted by the Nigerian Civil War. At the end of hostilities, he completed his secondary education at the prestigious Government College Umuahia and went further to obtain his Higher School Certificate (HSC) in Physics, Chemistry and Biology in the same institution.

With his HSC, he taught for a few months at the Mbaise Girls High School Onicha, Ezinihitte before proceeding to the University of Lagos where he gained direct entry to study Dentistry. He left Unilag for University of Benin after a year but set an enviable record of bagging a distinction in the first Dental Professional Examination (Oral Anatomy/Oral Physiology) that year- a rare feat.

He obtained a Bachelor of Medicine, Bachelor of Surgery degree in 1980, with a distinction in Physiology. He was a Federal Government National Award Scholar- an award given by the Federal Government to academically outstanding students. As a clinical student at the University of Benin, he was appointed a demonstrator for medical students in the Department of Physiology by the late Professor Diete Koki, a renowned physiologist and the Dean, Faculty of Medicine, University of Benin at the time.

He did his housemanship at Mission Hospital, IyiEnu, Ogidi near Onitsha in Anambra state. At the completion of the mandatory National Youth Service at the 15th Mechanized Brigade, Yola in present Adamawa State, he commenced his residency training in Internal Medicine at the University of Maiduguri Teaching Hospital in 1982.

In spite of the several challenges of the programme, he passed each stage of the 3 phased fellowship examination at first attempt and completed the residency training in May 1989. He was the first to bag the fellowship of the National Post Graduate Medical College of Nigeria in Internal Medicine (FMCP) in that institution. Consequently, he was given an automatic appointment as a Lecturer by the University of Maiduguri and a consultant physician by the Teaching Hospital.

Following the death of his father in 1990, the need to get nearer home became inevitable. Thus the journey back to Port-Harcourt was like a second home coming. This coincided with the time University of Port-Harcourt was facing accreditation challenges with the Medical and Dental Council of Nigeria due to poor staffing. He

joined the services of the University of Port-Harcourt with the support of his mentor, former teacher and then Provost of the College of Health Sciences, Professor C. O. Anah, the then Acting Head of Department, Dr O. J. Odia (now Professor O.J. Odia) and encouragement from Professor Sotonye F. Amakiri. He resumed duty as a lecturer on 3rd December 1990.

He rose to the professorial rank in Internal Medicine (Neurology) in 2010. His major research interests are in stroke, hypertension and headache. His research has led to more than 47 peer-reviewed publications in leading international and local journals such as *Headache*, *Tropical Doctor*, *Ethnicity and Disease*, *American Journal of Hypertension*, *Journal of Stroke and Cerebrovascular disease*, *Vascular Health and Risk Management* and *National Post Graduate Medical Journal*.

Professor Onwuchekwa has served the University in several capacities such as Chairman of several University/ Teaching Hospital Committees, Acting Head of Department of Internal Medicine for two terms, External examiner in Internal Medicine to various universities in Nigeria, Examiner at the National Post Graduate Medical College of Nigeria and External Assessor for Professorial candidates. He is the Head of the Neurology Unit of the UPTH

He is a reviewer of many journals including *Ethnicity and Disease*, *Ethnicity and Health*, *Port-Harcourt Medical Journal* and *National Post Graduate Medical Journal*. He has been honoured with many awards in the University by the University of Port-Harcourt Medical Students Association (PUMSA), National Association of Resident Doctors (NARD), Izu Umunna and many religious bodies whose members' lives he has touched.

He was the Vice President of the Association of Resident doctors, University of Maiduguri Teaching Hospital 1985. He is a member of many professional bodies such as Nigerian Medical Association (NMA), Association of Physicians of Nigeria (ASPON), Medical and Dental Consultants Association of Nigeria (MDCAN), Nigerian Society of Neurological Sciences (NSNS), Nigerian Stroke Society,

Nigeria Hypertension Society, Pan African Association of Neurological Sciences (PAANS), World Stroke Organization (WSO) and World Federation of Neurology (WFN).

Professor Onwuchekwa is happily married to Dr. Chinwe Regina Onwuchekwa, a senior lecturer at the University of Port-Harcourt and a consultant Radiologist with the teaching hospital. The marriage is blessed with four children: one girl and three boys.

He is a committed Christian and serves the household of God in various capacities. He is a Knight of St. Christopher of the Anglican Communion, a member of the Parochial Church Council of St. Nicholas Anglican Church, Aluu, Uniport and at his home church Arochukwu, Synod Delegate and Special Physician to His Lordship, the Bishop of Arochukwu/Ohafia Diocese. He has chaired and still chairs many committees in both churches. He is a philanthropist, an Honorary Rotarian and Paul Harris Fellow of Rotary International and Distinguished Old Boy of Government College, Umuahia. A month ago, September 2016, he partnered with O.B. Lulu Briggs foundation to provide free medical services to citizens of Rivers State.

He is a leading light in his hometown, Obinkita, Arochukwu that has been known for decades for its rich culture, scholarship, commerce and enterprise that extend beyond the old Eastern Nigeria. He has been honoured by his community with the coveted title of Okenwa (Great Son) of Obinkita, Arochukwu. He has been nominated by his people as the Chairman of Obinkita Day, Arochukwu on the 28th of December 2016. This is a community development effort for sons, daughters and friends of Obinkita, Arochukwu both at home and the diaspora.. Vice Chancellor Sir, I present to you a humble, God-fearing, focused, hardworking academic to present the 135th Inaugural Lecture of the University of Port-Harcourt; I present to you Professor Arthur Chukwubuike Onwuchekwa.

Professor Emmanuel C. Emasealu
Orator