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INFORMATION

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EDITORIAL

COVID-19: A PANDEMIC EMERGENCY

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As we write this editorial, the world is going through a never before imagined pandemic caused by "Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2)" first referred to as "2019 novel Coronavirus (2019-nCoV)". It causes "Coronavirus disease 2019 (COVID-19)" [1].

COVID-19 is a respiratory tract infection caused by the emergent coronavirus, SARS-CoV-2, a Pleomorphic RNA virus, first recognized in Wuhan city, Hubei Province China, in December 2019. Genetic sequencing of the virus suggests that SARS-CoV-2 is a beta-coronavirus closely linked to the SARS virus [1, 2].

On 30 January 2020, the World Health Organization (WHO) declared the outbreak of SARS-CoV-2 a Public Health Emergency of International Concern [2, 3]. The Director-General of WHO declared COVID-19 a Pandemic on the 11 March, 2020. This prompted all governments to intensify their regional- and country-level responses to COVID-19 in the following weeks [2, 3].

Within three months, the infection escalated sharply, infecting more than 81,000 and killing more than 3,200 people in China alone, and spreading to more than 196 countries, areas and territories worldwide by 25 March 2020 [3, 4]. While most people with COVID-19 develop mild or uncomplicated illness, approximately 14% develop severe disease requiring hospitalization and oxygen support, and 5% require admission to an intensive care unit [4, 5]. In severe cases, COVID-19 can be complicated by acute respiratory disease syndrome (ARDS), sepsis and septic shock, multi-organ failure, including acute kidney injury and cardiac injury. Increased age and underlying health conditions have been reported as risk factors for high mortality [3 - 6].

The WHO developed and recommended detailed guidance for member states to use in fighting the pandemic. Some of the signs and symptoms of COVID-19 include respiratory disorders, fever, cough and shortness of breath. In more severe cases, the infection can cause pneumonia, severe acute respiratory syndrome and sometimes death. Standard recommendations to prevent the spread of COVID-19 include frequent washing of hands using alcohol-based hand rub or soap and water; covering the nose and mouth with a flexed elbow or disposable tissue when coughing and sneezing, use of appropriate face

mask and avoiding close contact with anyone that has a fever and cough [5, 6].

Governments are advised to develop an incident management system, surveillance case definitions, and laboratory diagnosis; they are to ensure appropriate clinical management, infection prevention and control in health care settings. While home care is recommended for mild patients, effective awareness campaign, risk communication with public engagement, provision of personal protective equipment (PPE) for all first responders, doctors, nurses and health professionals at the frontlines of the fight against COVID-19 are a priority [4, 5].

Currently, in the absence of a vaccine or approved drugs against SARS-CoV-2, the WHO has recommended social distancing as the major strategy available to try to slow the spread of the virus. Entire countries have implemented aggressive lockdowns, closing schools, cancelling sporting events, banning public gatherings and shutting down a range of non-essential businesses indefinitely [4, 5]. These unprecedented measures have had a profound impact on society. Schools, universities and research institutes worldwide have modified their academic programs by facilitating flexible on-line learning, work-at-home arrangements, as well as paid leave for some workers in the resource-rich countries. People are social distancing and finding new ways to connect and communicate with colleagues and administrators [4, 5].

For the Christian community, Easter Sunday is traditionally celebrated with the zeal of a Christ as though He just defeated death on the day where even non-Christians join in the fanfare. On Easter Sunday (April 12) this year, the world woke up to the ever-amplifying nightmare of the COVID-19 pandemic, dampening the celebration with the news of over 1,777,515 confirmed cases in all of the world's 192 countries, with 108,862 deaths – that number increasing by the minute [7].

Chilling as these figures are, they do not necessarily reflect the actual numbers of those infected, as not everybody who is feverish, has a cough and/or shortness of breath, or in care homes and community are tested to determine whether they are infected with COVID-19. Moreover, the mortality rate is likely to increase even more sharply as the pandemic spreads in low and middle income countries which have limited infrastructure, reduced laboratory and personnel capacity to test large numbers of people and which are, therefore, less able to deal with severe cases [8].

Despite member states' response with best anticipated preparedness, the ferocity of COVID-19 impact left even the most advanced healthcare systems in the world reeling. The speed with which the epidemic spreads within nation states has lead member states to implement never before disease containment measures that have included lockdown, declaration of state of emergency (SOE) and enforcing social distancing of 1.5-2 metres for

groups of people. It is these containment measures that are proving to be most trying, tenuous, painful or even controversial, affecting other health, economic and socioeconomic issues. It is how effectively member states prioritize and balance all these issues in the fight against COVID-19 that will determine the long term outcomes of this pandemic.

The first country in the Pacific to declare a state of emergency (SOE) in response to COVID-19 was Papua New Guinea (PNG). This was in accordance with Section 226 of the constitution of PNG. It stated that "*outbreak of pestilence or infectious disease" as grounds for declaring a national emergency*. The first recorded case in PNG on 13 March 2020 was sufficient reason for the National Executive Council (NEC) to declare an SOE [9]. The emergency lockdown prevented the movement of people between provinces and put restrictions on international and domestic flights. All schools, universities, and non-essential services were closed, including most government departments, the law courts and small businesses. The only exceptions were essential services, such as banks, hospitals and shopping malls. Effective awareness campaign highlighting the negative consequences of COVID-19 and the need to ensure strict implementation of the WHO guidelines is in progress. This has enabled the country to be COVID-19 free up at the date of this publication. The testing of suspected cases is progressing [9].

The National Parliament of PNG extended the SOE for two months starting 2 April 2020. The SOE Controller issued the following emergency orders on 7 April 2020 for immediate implementation: "*continued restrictions on all incoming international flights; limited/restricted domestic flights; only essential services to be continued; cancellation of churches and mass gatherings during the SOE; and closure of schools until 27 April 2020*" [10]. On 7 April, PNG joined the rest of the world to commemorate the World Health Day honouring the contribution of the nurses, midwives and health workers in the COVID-19 pandemic response, putting their own health at risk to protect the broader community [10].

We join the chorus of voices calling for prudent implementation of the ever evolving WHO guidance to bring an end to the pandemic sooner rather than later.

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A RE-EMERGING CORONAVIRUS (2019-nCov): A REVIEW

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ABSTRACT

SARS-CoV-2 or 2019-nCov is the Coronavirus first named in 2019 that originated in the city of Wuhan in Hubei province China in December 2019. It causes severe acute respiratory syndrome (SARS). The clinical disease is called COVID-19 by the World Health Organization. SARS-CoV-2 enters the cell via the ACE-2 receptor. COVID-19 rapidly evolved into a pandemic by late February 2020. This review article focuses on the epidemiology, biology, pathogenesis, management and prevention of this virus that has high morbidity and mortality globally. The epicenter of the pandemic rapidly moved from China to Europe, with Italy being the most severely affected; it has since moved to USA, with New York State as the most severely affected. It is transmitted via aerosols and fomites. It causes severe upper and lower respiratory infections. The symptoms include fever, dry cough and malaise. These often rapidly progress to respiratory failure needing aggressive respiratory support. Confirmation of the diagnosis is usually by using Reverse Transcriptase Polymerase Chain Reaction (RTPCR). Some of the WHO recommended preventive measures include, among others, using alcohol based sanitizers, N95 face mask and strict quarantine of patients and contacts.

Keywords: SARS-nCoV-2, COVID-19, morbidity, mortality, pandemic, quarantine, respiratory tract infection, Vaccine.

INTRODUCTION

As the world was welcoming the new year of 2020, little did we know that this will be accompanied by a new infectious agent that would decimate the sanctity of the world in so short a time. In December 2019, Wuhan, Hubei Province of China became the center of an outbreak of pneumonia of unknown cause. This raised an intense attention within China and globally [1]. By early January of 2020, Chinese scientists had isolated a novel coronavirus from patients. The genetic sequence of the virus named 2019-nCoV, enabled the rapid development of RT-PCR diagnostic test specific for 2019-nCoV [1]. The rapid expansion of this outbreak is indication of efficient human to human transmission. The virus has been detected in lower respiratory

tract samples from patients with high viral load in upper respiratory tract samples [2, 3]. Jasper Fuk-Woo and colleagues reported infections in health-care workers caring for patients with 2019-nCov which confirms that there is person to person transmission, indicating that there is risk of much wider spread of the disease [2].

EPIDEMIOLOGY

Chaolin Huang and colleagues reported clinical features of the first 41 patients admitted to designated hospital in Wuhan who were confirmed to be infected with 2019-nCoV by January 2020. Their findings provided first-hand data about the severity of the emerging infection whose symptoms include fever, dry cough and malaise [4, 5]. Unlike other human coronavirus infections, upper respiratory symptoms were notably infrequent; and intestinal presentations observed with Severe Acute Respiratory Syndrome (SARS) also appeared uncommon, although 2 of the 6 cases reported by Chan and colleagues had diarrhoea [2]. The case-fatality proportion appears to be closer to 3% based on wider studies [4]. In 1918 the Influenza pandemic that claimed about 30 million lives had case-fatality ratio to be less than 5% [5]. As an RNA virus, 2019-nCoV still has the inherent potential of high mutation rate thus making this zoonotic pathogen to adapt to become more efficiently transmitted from person to person and possibly more virulent [1]. The Current 2019-nCov outbreak has undoubtedly caused memories of SARS and Middle East Respiratory Syndrome (MERS) to resurface in many people. Considering that substantial numbers of patients with SARS and MERS were infected in health care settings, precautions need to be taken, as suggested by several authors, to prevent nosocomial spread of the virus [6 – 9]. The same should be applicable to 2019-nCoV.

As at April 03 2020, the global cases stood as 1,041,126 with mortality at 55,132. So far, a total of 187 countries have been affected and one international conveyance (Diamond Princess). The World Health Organization (WHO) has since declared COVID-19 a pandemic. A new study on 2019-nCoV in China, involving 200 patients, found that blood group type A patients were more susceptible to infection and tended to develop more severe symptoms, while patients with blood type O seemed more resistant to the disease. Blood types of 206 patients who died from the disease in Wuhan, the epicenter of the virus, were studied. Eighty-five had type A blood group, while 52 had type O [10].

VIROLOGY

SARS-CoV2 (2019-nCoV) belongs to the genus *Betacoronavirus* of the Family *Coronaviridae* along with other Coronaviruses (SARS coronavirus, MERS-CoV coronavirus, human coronavirus HKU 1 and human coronavirus HCoV-OC43) [11, 12]. Coronaviruses have an enveloped helical nucleocapsid, a diameter of 80-160 nm, and

widely spaced club- or petal-shaped projections, 20 nm in diameter, covering the envelope figure 1 [11 – 14]. They have a linear, non-segmented, single-stranded RNA with positive sense.

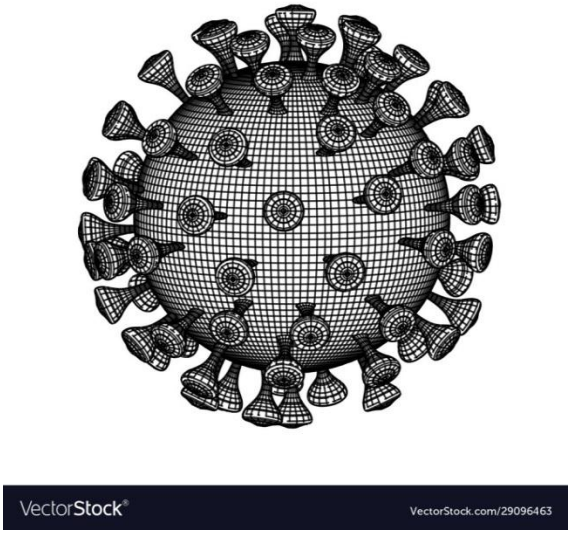

Fig 1: 3D Illustration of Coronavirus. Downloaded (29th March 2020) https://www.vectorstock.com/royalty-free-vector/coronavirus-2019-ncov-virus-3d-vector-29096463 [13]

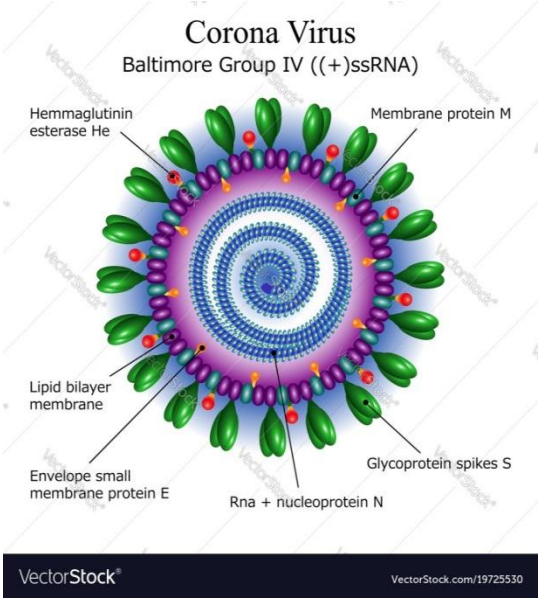

Fig 2: Artists representation of Coronavirus Downloaded (29th March 2020) https://www.vectorstock.com/royalty-free-vector/diagram-of-corona-virus-particle-structure-vector-19725530 [14]

The structural proteins in the virus of SARS-CoV2 (2019-Cov) include a 50-60 kDa Phosphorylated Nucleocapsid (N) protein, a 20-35 kDa Membrane (M) glycoprotein – a Matrix protein embedded in the lipoprotein bilayer, a 180-220 kDa Spike glycoprotein (S) – the petal-shaped peplomers, and a 65 kDa glycoprotein, (Haemagglutinin Esterase dimer HE), which causes haemagglutination, and has Acetylesterase activity figure 2 [14].

VIRAL ATTACHMENT AND REPLICATION

The virus uses defined receptor-binding domain (RBD) on the glycoprotein spikes (S or HE) that specifically recognizes the host receptor Angiotensin-Converting Enzyme-2 (ACE-2) on the epithelial cells of the nasopharynx and oropharynx. They get into these cells by means of endocytosis. Mast cells contribute to SARS-CoV2 (2019-nCoV)-induced inflammation of the submucosa of the respiratory tract and the nasal cavity.

Histamine, protease, IL-1 and IL-33 are released, thus leading to inflammation and oedema [17]. On getting inside the cells viral uncoating takes place and viral RNA is released. Viral specific RNA-dependent polymerase is produced by translation of the relevant open reading frame (ORF) on viral RNA. This enables the host cells to translate minus-sense strands of viral RNA from positive sense viral RNA. Minus-sense strands of viral RNA serve as template for the production of several copies of positive-sense viral RNA, which then leads to the production of both constitutive and non-constitutive viral proteins, viral components are produced.

Helical nucleocapsids are assembled in the cytoplasm. The Spike protein (S) is heavily glycosylated, and it utilizes an N-terminal signal sequence to gain access to the endoplasmic reticulum (ER). Upon budding through host rough endoplasmic reticulum (ER) and Golgi apparatus (GA), the nucleocapsids acquire their membranes (from ER or GA), thus forming mature viral particles [18]. Upon the death of the endothelial cells, mature viral particles get released. It is also possible that SARS-CoV2 (2019-nCoV) can establish persistent infection, and are therefore not always cytocidal [18]. All coronaviruses exhibit a high frequency of mutation and recombination during viral replication. This might have contributed to the evolution of this new coronavirus SARS-CoV2 (2019-nCoV).

PATHOGENESIS

SARS-CoV2 (2019-nCovV), like other coronaviruses, may have Chinese horseshoe bats, chickens and pigs as their reservoir. The index case was probably zoonotic. They have tropism for the epithelial cells of the respiratory tract. And so, human-to-human transmission of infection easily occurs through aerosols, kissing and fomites [11,12,17,18].

Respiratory tract infections:

Critical damage to the epithelial cells of the respiratory tract, and subsequent descending infection into the lungs lead to upper respiratory tract infection, pneumonia and severe oedema of the lung tissue. Patients may present with acute respiratory distress syndrome (ARDS) and are featured by refractory hypoxemia, and dyspnea [8]. Chest CT would reveal pure ground-glass opacities (GGOs) in 77% of patients, GGOs with interstitial and/or interlobular septal thickening in 75% of patients, and GGOs with consolidation in 59% of patients [19].

Septic shock**:**

SARS-CoV2 (2019-nCoV) can cause damage and dysfunction of other organs. When dysfunction of extrapulmonary system such as blood and digestive system occurs, development of sepsis and septic shock should be considered; and mortality rate increases significantly [19, 20]. Coagulation disorders (prolonged prothrombin time and elevated level of d-dimer); myocardial damage (increased level of myocardial enzyme, electrocardiogram

ST-T changes, cardiomegaly and cardiac insufficiency in severe cases); gastrointestinal dysfunctions with raised level of liver enzymes are frequently observed.

DIAGNOSIS:

Early clinical diagnosis of infection needs a high degree of suspicion. People who recently travelled to countries and regions where SARS-CoV2 (2019-nCoV) infection cases have occurred, people with fever, myalgia, pneumonia, cough, rhinorrhea, sore throat and close contacts of test-positive cases need to be quarantined and screened for possible infection.

Specimens to be taken for laboratory diagnosis include nasal, naso-pharyngeal and pharyngeal swabs; stool and blood samples [10]. Laboratory tests include viral RNA antigen detection by reverse transcriptase polymerase chain reaction (RT-PCR), viral load in upper respiratory tract specimens, targeting the constitutive N and non-constitutive Open Reading Frame (ORF) 1b genes [15, 16]. CT scan can demonstrate ground glass appearance of the lung fields, with or without septal thickening and consolidation [11, 12]. Vero monkey kidney cells are useful for viral isolation [17]. Serological markers of COVID-19 agent are shown in Table 1.

TABLE 1: Laboratory markers in SARS-CoV2 (2019-nCOV) infected patients [21]

MOST FREQUENTLY:	
↓	Lymphocytes
↓	Albumin
↓	Hemoglobin
↑	C-Reactive Protein (CRP)
↑	Erythrocyte Sedimentation Rate (ESR)
↑	Lactate Dehydrogenase
↑	D – Dimer
IN SEVERE COVID–19	
↑	Neutrophils
↑	Alanine Amino Transferase
↑	Aspartate Amino Transferase
↑	Cardiac Biomarkers
↑	Procalcitonin

RECOMMENDED MANAGEMENT:

Currently, there are no WHO, National Institute of Health (NIH USA) and USA Food and Drug Administration (FDA) therapies recommended for the treatment of COVID-19. Recently the CDC updated the "Information for Clinicians on Therapeutic Options for COVID-19 Patients" [22]. They listed Remdesivir, Hydroxychloroquine and Chloroquine as investigational treatments. Other drugs such as Lopinavir-Ritonavir were also mentioned. However, they concluded that the current research findings are still preliminary [22]. Currently, both WHO and FDA considered most of the COVID-19 therapies as investigational. This is because their efficacy and safety are not yet fully tested. In addition, most of the medications have some potential adverse effects on patients [22]. The current recommendation is that all suggested therapies should be evaluated on a case-by-case basis by the researchers. The recommendation by WHO is that "use of investigational anti- SARS-CoV2 (COVID-19) treatments must be carried out under proper ethical clearance, randomized controlled trials" [21, 22]. However management should focus mainly on case detection and isolation. Some authors have recommended that the use of broad-spectrum antibiotics and corticosteroids should be avoided for cases with mild symptoms [17, 18].

For the severe and critical cases, antiviral agents, antibiotics to prevent bacterial super infection, corticosteroids, broncho-alveolar lavage, mechanical ventilation, and other more invasive intervention, such as blood purification and extracorporeal membrane oxygenation (EMCO) should be applied cautiously [18].

Multidisciplinary cooperation includes monitoring patient's conditions closely and adjusting the therapeutic protocols timely through multidisciplinary cooperation is of great significance [18-24]. Currently there are no effective antivirals for children. However, appropriate doses of Interferon-α2b nebulization can be administered [18]. Chloroquine phosphate, an old drug for treatment of malaria, has shown apparent efficacy and acceptable safety against SARS-CoV2 (COVID-19) associated pneumonia in multicenter clinical trials conducted in China [19]. With occurrence of acute respiratory distress syndrome (ARDS), encephalitis, encephalopathy, or septic shock, the use of corticosteroids should be considered [18].

Intravenous immunoglobulin can be used in severe cases when indicated, but its efficacy needs further evaluation [18]. Some recommended guidelines to reduce human to human transmission includes travel restrictions, isolation and 14-day quarantine of patients and contacts (the presumed latency period of the virus), social distancing (no handshake, no hugs or kisses), use of gloves, goggles, masks, with brand name as N95 and respirators. Regular hand washing with soap and water and

disinfection with alcohol-based sanitizers before touching face or after touching surfaces like doorknobs, table, chair, gas dispenser, shopping cart and others [18]. All these precautions are very important in containing the spread of COVID-19. SARS-CoV2 is sensitive to ultraviolet radiation and heating. The virus can be inactivated by heating at 56 °C for 30 minutes and by using lipid solvents such as 75% ethanol, chlorine-containing disinfectant, peroxyacetic acid and chloroform, but not by chlorhexidine [18]

VACCINES:

Vaccines against SARS-CoV2 are under investigation. The viral RNA has been reverse transcribed into DNA, and select pieces of the virus that computer simulations have suggested are immunogenic. Those selected bits of DNA are then inserted into bacteria, which produce large quantities of protein snippets to be used in the vaccine-production process [24]. Some investigators have mapped the molecular structure of the spike glycoprotein, in an attempt to use them to produce vaccines that can act specifically on the S glycoprotein. Figure 3 shows an illustration of the 3D atomic scale map or molecular structure, of the SARS-nCoV2 spike protein. The FDA has given an emergency approval to Moderna- a Cambridge, Massachusetts-based biotechnology company- to begin vaccine trial in Seattle, Washington State. The vaccine is called mRNA1273 [24].

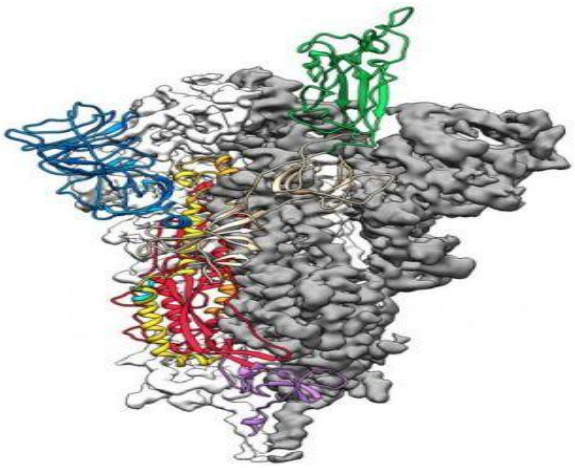

Fig 3: This is a 3D atomic scale map, or molecular structure, of the SARS-CoV2 (2019-nCoV) spike protein. The protein takes on two different shapes, called conformations – one before it infects a host cell and another during infection. This structure represents the protein before it infects a cell, called the prefusion conformation. (credit: Jason McLellan/UT at Austin). This was done in an attempt to develop vaccines against some viral epitope that is perceived to be immunogenic [25]. https://www.livescience.com/coronavirus-spike-protein-structure.html

Antibodies against SARS-CoV2 are also being developed, but mainly aimed at developing ELISA and other sero-diagnostic reagents [26].

SUMMARY:

SARS-CoV2 (COVID-19) is a new mutant of the Coronavirus that first appeared in Wuhan in December 2019 and became an epidemic in China within one month [1, 2]. As at April 03 2020, the global cases stood as 1,041,126 with mortality at 55,132 according to reports from Johns Hopkins University. The virus was quickly sequenced which makes it possible to prepare diagnostic reagents for quick identification. The virus is transmitted through aerosols and fomites [11]. It multiplies in the epithelium of the upper respiratory tract, with an incubation period of 4-10 days before producing the first symptoms [12]. During this period, the virus can be transmitted from humans to humans through aerosols. The first symptoms are nasopharyngeal irritation and dry cough. Viral replication leads to descending infection into the lower respiratory tract and the intestinal tract [11, 12]. The virus produces ground glass opacities in the lungs as a result of inflammatory changes and consolidation [15, 18]. These may lead to dyspnea, and severe respiratory distress. Viraemia follows rapidly and may lead to cardiomyopathies and renal dysfunction [17, 18].

Several investigational therapies are under considerations [27 – 29]. Specimens for viral antigen identification are those of naso-pharyngeal swabs, sputum (if any), stool, urine, and blood samples. Currently RT-PCR is one of the best methods for viral identification [15-16]. Vaccines are under production. They focus on targeting the glycoprotein spikes (S) and the haemagglutinin esterase (HE) on the viral surface (24, 25]. Antibodies are also being developed for quick identification procedures, such as ELISA [26].

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COMMENTARY

COVID-19: PREGNANCY AND BREASTFEEDING

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Several cases of Severe Acute Respiratory Syndrome (SARS) were reported in Wuhan City, Hubei province, China, in late December 2019 [1,2]. The causative agent was soon identified as a novel coronavirus. It was called Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2 or 2019-nCoV) [1,2]. It is a new strain of coronavirus that has not been previously identified in humans. The disease is now referred to as Corona-Virus Disease 2019 (COVID-19) [1]. The initial outbreak in Wuhan spread rapidly, affecting other parts of China. Cases were soon detected in several other countries. Outbreaks and clusters of the disease have since been observed globally. The World Health Organisation (WHO) declared COVID-19 a pandemic on 11 March 2020 [3].

COVID-19 is transmitted from person-to-person mainly via small respiratory droplets through sneezing, coughing, or by interaction with each other for some time in close proximity. The droplets can be inhaled, or they can land on surfaces that another person may touch, then get infected when they touch their nose, mouth or eyes. It has been reported that SARS-CoV-2 can survive on different surfaces from several hours up to a few days [1,2,4]. The incubation period for COVID-19, which is the time between exposure to the virus and onset of symptoms, has been estimated to be between 2 and 14 days [1].

The major focus of my commentary is the implication of SARS-CoV-2 for pregnant and breastfeeding women. There is limited scientific evidence on the severity of illness in pregnant women after COVID-19 infection. Available information indicates that pregnant women tend to experience similar clinical manifestations as non-pregnant women who have progressed to COVID-19 pneumonia. In addition, no published data is available to suggest that infection with COVID-19 during pregnancy has a negative effect on the foetus.

At present, there is no evidence of transmission of COVID-19 from mother to baby during pregnancy and only one confirmed COVID-19 neonatal case has been reported to date [1].

According to the European Centre for Disease Prevention and Control (ECDC), it is important that currently all pregnant women should follow the same general precautions for the prevention of COVID-19, including regular hand washing, avoiding individuals who are sick, and self-isolating in case of any symptoms, while consulting a healthcare provider by telephone for advice [1].

Breastfeeding protects newborns from getting sick and also helps protect them throughout their infancy and childhood. Breastfeeding is particularly effective against infectious diseases [5-7]. There are numerous live constituents in human milk, including the immunoglobulins, antiviral factors, cytokines and leucocytes that help to destroy harmful pathogens and boost the baby's immune system [7].

There is currently no evidence to suggest intrauterine infection caused by vertical transmission in women who develop COVID-19 pneumonia in late pregnancy [8-10]. Presently there is also no evidence that COVID-19 can be transmitted through breast milk of COVID-19 infected mothers to their infants [8-12]. According to UNICEF the benefits of breastfeeding outweigh any potential risks of transmission of the COVID-19 virus through breast milk [7]. Breastfeeding has been recognised as the cornerstone of child survival, nutrition and development and maternal health. All health professionals should protect, promote and support breastfeeding [7,13]. However, as with all confirmed or suspected COVID-19 cases, mothers with suspected or confirmed COVID-19 who are breastfeeding or practicing skin-to-skin contact (Kangaroo mother-care) should be isolated and appropriate precautions taken [6,7].

It is important for health professionals to advise mothers to always wash hands thoroughly with soap and water for a minimum of 2 minutes at critical times, including before and after contact with the infant. If available, the use of a face mask when breastfeeding or caring for the infant is recommended. Surfaces around the home that the mother has been in contact with should be regularly cleaned using soap and water. Mother with her infant should practice physical distancing from other people (at least 1.5 m), avoid touching eyes, nose and mouth and use cough etiquette. Mothers need to be re-assured that it is safe to breastfeed their children [14,15]. Ensure alignment with the International Code of Marketing of Breast-milk Substitutes and subsequent relevant World Health Assembly resolutions as commercial companies may take advantage of this situation to try and promote their products through the health care system [16]. In situations when severe illness in a mother with COVID-19 or other health complications prevents her from caring for her infant or prevents her from continuing direct breastfeeding, mothers and families should be encouraged and supported to express breastmilk, and safely provide breastmilk to the infant, while applying appropriate hygiene measures. These include

washing her hands before touching the breast pump or bottle parts and clean the breast pump thoroughly after each use. Common areas such as kitchens should have door handles and surfaces wiped down frequently. If mother is very unwell then assistance to pump breastmilk must be provided to maintain supply and a support person can feed the expressed breastmilk to the infant. The expressed breastmilk should be fed to the child using a clean cup and/or spoon, preferably by a person who has no signs or symptoms of illness [6,14,15].

In conclusion, I am aware of the limitations of this commentary. However, as the scientific community learns more about COVID-19, more evidence about the implications for pregnancy and breastfeeding will become available. I nevertheless think this commentary is appropriate and timely for publication in Pacific Journal of Medical Sciences since there is currently a paucity of relevant published data on this topic. One major concern is that child and maternal malnutrition is currently the leading cause of maternal and child morbidity and mortality in resource limited countries like Papua New Guinea [17,18]. Exclusive breastfeeding for the first six months of life is essential for healthy growth and development of infants and for maternal health [6]. Thus, it is important that health professionals, especially in low and middle income countries, are reminded of the importance to continue to protect, promote and support breastfeeding.

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A SHORT REPORT ON THE COVID-19 RESPONSE AND PREPAREDNESS ACTIVITIES IN POHNPEI, FEDERATED STATES OF MICRONESIA

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ABSTRACT:
On January 31st 2020 the President of the Federate States of Micronesia declared a public health emergency due to the global outbreak of Corona Virus Disease 2019 (COVID-19). This short report presents an overview of the COVID-19 response and preparedness activities in the state of Pohnpei following this declaration.

Keywords: Pohnpei, SARS-CoV-2, COVID-19, corona virus disease 2019, Federated States of Micronesia

INTRODUCTION:

Corona virus disease 2019 (COVID-19) is caused by severe acute respiratory syndrome corona virus-2 or SARS-CoV-2 [1]. COVID-19 has spread to all continents and the World Health Organization (WHO) predicts that the disease will reach every country in the world by the end of 2020. The COVID-19 outbreak once again highlights the importance of outbreak preparedness [2]. Small Pacific Island Countries (PICs) have very limited resources compared to other countries in the pacific and are more vulnerable to disease outbreaks because of fragile health systems. Early implementation of public health measures is a key strategy for the PICs so that their health system can manage and contain the disease to prevent their health system being overwhelmed. The Federated States of Micronesia (FSM) is an island nation consisting of a total of 607 high and low islands in the Northwestern Pacific Ocean. The four states that make up the FSM are Pohnpei, Chuuk, Kosrae and Yap. This short report presents an overview of COVID-19 preparedness and response activities that occurred in Pohnpei between February and March 2020.

Establishment of response and preparedness management structure:

Following the issue of the public health emergency declaration by the President of FSM on January 31st 2020 an executive directive order was issued by the Governor of Pohnpei on the 1st of February 2020 enabling the creation and establishment of the Pohnpei Corona Virus Task Force. The key function of the task force was to submit an action plan to guide and coordinate the response and preparedness activities in the State of Pohnpei. The directors of the following departments made up the Corona Virus Task Force committee: Health and Social Services, Education, Treasury and Administration, Environment Protection Agency (EPA) and Public Safety. Government officials from Transportation and Infrastructure, Attorney General, Budget office, Public Affairs office, Pohnpei Broadcasting Corporation and Pohnpei Port Authority (PPA) were also invited to be part of the task force. Representatives from the WHO, UNICEF, International Organization for Migration (IOM), Red Cross, and Pohnpei Chamber of Commerce also participated in meetings and provided technical advice. The Corona Virus Task Force managed the budget for the preparedness activities and reported directly to the governor of Pohnpei.

Pohnpei State Response and Preparedness:

A COVID-19 response and preparedness action plan was developed by the task force and was managed under the following general areas: Risk communication, Enhanced screening and Surveillance at all port of entries, Infection control and prevention, Clinical case management, Quarantine and Laboratory testing. The Pohnpei department of health and social services (PDHSS) was the lead department supported by the other agencies as per the executive directive from the governor of Pohnpei. Using the action plan, PDHSS in partnership with WHO developed a COVID-19 contingency plan. The contingency plan was designed to scale up or scale down activities using number of projected COVID-19 cases as triggers to commence or stop activities (Table 1). The plan was submitted to the task force where it was approved for use by the state agencies.

Table 1: Summary of Pohnpei State COVID-19 contingency plan

Condition 5: All clear
Condition 4a: Zero cases but COVID-19 threat exists • **Establish incident command health structure and link with Disaster Taskforce.** • **Open COVID-19 Command Centre. Daily meetings. Weekly situation report (sitrep).** • **Set up a triage screening station, included signs at Emergency Room and outpatients.**

- Identify alternative locations for routine outpatient care. Establish 1st wave medical care team for COVID-19 patients. Consider how to surge hospital staff.
- Ensure adequate resources and training.
- Implement risk communication, focusing on awareness and prevention.
- Continue routine surveillance.
- Identify and establish isolation and quarantine facilities, and plan how to manage these.
- Support port of entry activities around travel restrictions.

Condition 4b: Zero cases in Pohnpei but confirmed COVID-19 case in Guam, Republic of Marshal Islands, Palau, Commonwealth of Northern Mariana Islands, Hawaii, Chuuk, Yap, Kosrae.

- Declare state of public health emergency.
- Fast track completion of all condition 4 activities.
- Commence condition 3 activities as required.

Condition 3: 1-10 cases (FIRST CASES)

- Daily sitrep to stakeholders.
- Ensure separate triage area at hospital or open COVID-19 clinic. Activate 1st wave of healthcare workers.
- IMMEDIATELY start contact tracing (Day 1, first suspected case) – close and casual contacts.
- Quarantine or self-isolation of contacts of suspected cases.
- Strengthen risk communication activities, focusing on social distancing, hand and respiratory hygiene, addressing rumors and misinformation, partnership with all sectors.
- Continue surveillance activities.
- Mitigate transmission through social distancing measures – consider telemedicine, school closures, and reduced social activities, limit sporting events, limit church gatherings.
- Build more hand-washing stations at hospital, clinics, schools, main town and villages.
- Consider limiting travel to outer islands.

Condition 2: >10-100 cases

- Daily situation report to stakeholders.
- Cease contact tracing if more than 10 cases or 100 close contacts.
- Consider ceasing mandated quarantine and encourage self-isolation/home quarantine.
- Cease port of entry screening.
- Strengthen social distancing measures. Sick people should not go to work.
- Risk communication and outreach - focus on what we know/don't know/what we're doing/what you can do, social distancing, home quarantine, hand and respiratory hygiene.
- Open overflow areas/tents in hospital for ill cases. Activate 2nd wave of healthcare workers. Employ student nurses for surge. Use alternative venues for routine outpatient care. Implement telemedicine.
- Mildly sick people should not be hospitalised. Consider cohorting mildly sick people in external venue or home-based care.
- Surveillance continues.
- Repurpose staff from other government departments to help with response.

Condition 1: >100 cases

- Daily then weekly sitreps if outbreak continues >2 months.
- Continue social distancing strategies.
- Cease quarantine.
- Encourage self-isolation/home-care of mildly sick patients.
- Focus risk communication on reassurance, self-help measures, social distancing.
- Review hospital capacity. Consider opening additional overflow areas/tents in hospital. Use alternative venues for routine outpatient care and medication resupplies.
- Surveillance to continue and commence sentinel testing.
- Plan for return to business-as-usual.

The public health department developed a risk communication strategy with a focus on public awareness, community engagement and addressing any misinformation on social media. The activities were coordinated by a risk communication educator and worked in partnership with the state public information office. Multiple messages were developed and distributed using social media, the local newspaper and short messaging services in collaboration with FSM Telecom.

Screening and surveillance procedures were established and used to screen crews on fishing ships, cargo ships and airline passengers. At the health facilities the existing syndromic surveillance system (Influenza like illness) was enhanced by running refresher training for doctors. Doctors were also trained to be alert for any severe acute respiratory illness (SARI) with influenza symptoms requiring admission and to obtain travel history. Clinical management guidelines were accessed from the WHO website and distributed via email to all doctors working in the state [3]. The WHO guidelines were used to develop local treatment guidelines for doctors. Infection prevention and control (IPC) was identified as a key area of improvement so a training program was developed and conducted targeting all employees at the state hospital as well as key agencies such as EPA, public safety officers (first responders), police officers and PPA employees. A four bed isolation ward with negative pressure system was renovated and refurbished to house suspected and confirmed COVD-19 cases. In addition a surge capacity plan was developed to cater for any rise in number of cases should the need arise. An abandoned beach resort was renovated and furbished for quarantine purposes. Laboratory testing algorithm was developed and distributed to all doctors and nurses. Arrangements were established to send all samples for testing to the Centers for Disease Control and Prevention (CDC) laboratory in Guam or Hawaii.

The task force committee also established communication with business houses, the International Organization for Migration (IOM), churches and Red Cross to help disseminate public awareness messages and information. Technical advice and support was also provided to the task force by IOM (tents), WHO (PPEs) and UNICEF (established hand washing stations under the WASH program).

Three initial public health strategies that Pohnpei State instituted were (1) enhanced screening at all port of entries (PoEs), (2) travel restrictions and (3) quarantine measures for inbound passengers and fishing vessels. The WHO quarantine guidelines for COVID-19 [4] were used to develop local guidelines and procedures. All sea vessels were required to spend 14 days at sea before arrival in Pohnpei and inbound passengers were required to spend 14 days in a country, area or territory

with no confirmed case of COVID-19 before travelling to Pohnpei. If sea vessels were found to be at sea for less than 14 days then the ship was quarantined at the anchorage area to complete 14 days. Over 90% of inbound passengers came from the United States so passengers were advised to spend 14 days in Hawaii or Guam. However, when cases were confirmed in Hawaii and Guam, all inbound passengers were quarantined for 14 days at two hotels and monitored by the health team. Any person under quarantine that developed fever, cough or shortness of breath were taken to the isolation ward at the state hospital and managed by the hospital internist. Nasopharyngeal samples from suspected cases were sent to Guam Public Health Laboratory for testing. As of March 23rd 2020 Pohnpei has had three suspected cases. All tests were negative for SARS-CoV-2. It is hoped that by the end of April 2020 Genexpert testing for SARS-CoV-2 will be fully operational at the hospital.

Using WHO surveillance case definitions for COVID-19 [5] a simple triage algorithm was developed and implemented at the hospital. The algorithm separated patients with respiratory symptoms from rest of the patients presenting to the emergency or outpatient departments (Figure 1).

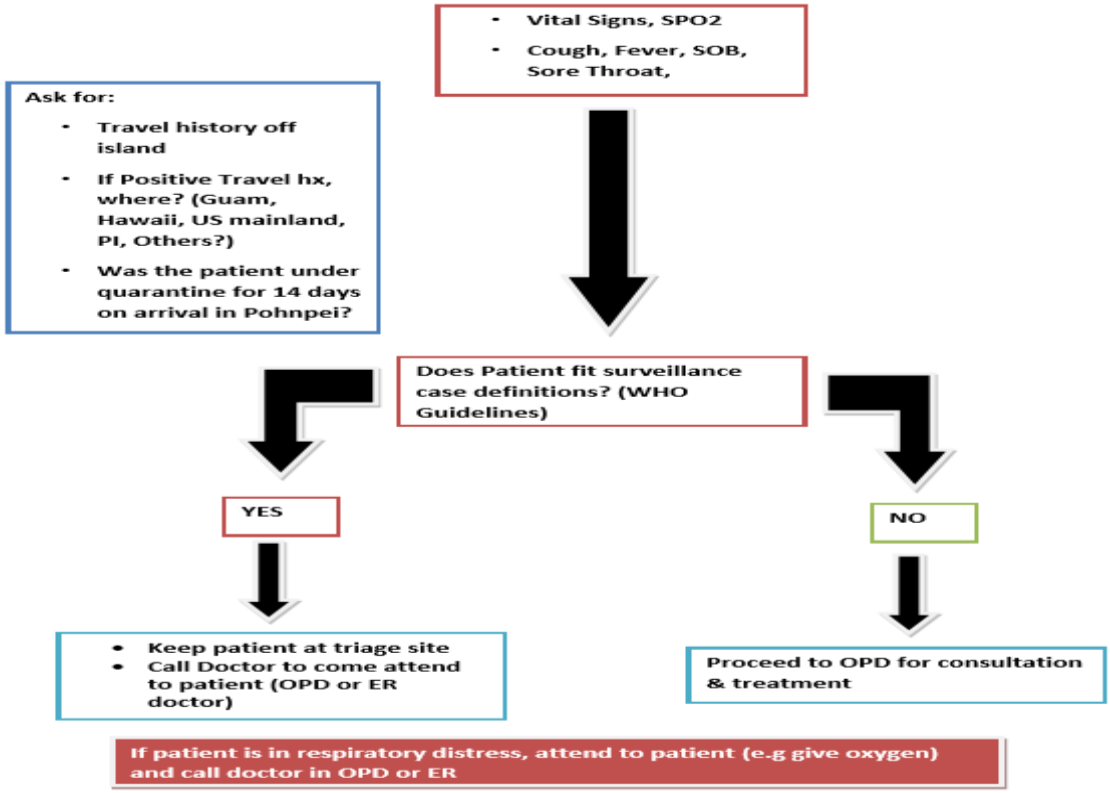

Figure 1: Triage algorithm for screening patients at Pohnpei State Hospital

CONCLUSIONS:

Small PICs are vulnerable to disease outbreaks. The COVID-19 outbreak has revealed how PICs with fragile health systems and limited resources can be overwhelmed by a global outbreak. Our experience in Pohnpei revealed that a key outbreak preparedness response strategy is establishing links with international organizations early in developing preparedness plan and response activities. Despite negative social and economic implications, travel restrictions and quarantine measures are important public health strategies available to small PICs in their effort in preventing COVID-19 entering their countries.

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AUDIT OF TRANSIENT ISCHAEMIC ATTACK (TIA) INPATIENT MANAGEMENT: A RETROSPECTIVE ASSESSMENT

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ABSTRACT:
The aim of this retrospective study was to audit the management of transient ischaemic attack (TIA) patients admitted in 2012 compared to a previous audit (2009 to mid-2010). Data were obtained by reviewing the electronic clinical records of patients. Data on patient demographics, patient assessment and management according to TIA guidelines were collected. A total of 61 patients were admitted to hospital with primary diagnosis of TIA. One in four patients had an alternative diagnosis. TIA severity (ABCD2 score) was not calculated in 13% of the patients. Most patients had computed tomography (CT) brain imaging performed. Antiplatelet therapy was not adjusted in 10% of patients. Carotid doppler ultrasound was not considered in 20% of the patients. Most of the carotid dopplers were done within one week. Only 6.6% of the patients were referred for carotid endarterectomy. Blood pressure medications were not optimised in 57.4% of the patients. Only 27.9% were prescribed statin therapy. Not all patients had documented ECG findings or discussion regarding anticoagulation. There was a 32.8% 3-month readmission rate. In 2012 several aspects of TIA guideline management were not done appropriately compared to the previous audit. The areas of improvement identified in this assessment include optimising antiplatelet therapy and blood pressure management, as well as timely carotid ultrasound for anterior circulation TIA. Further education and reiteration of guideline-based TIA management is recommended. A follow-up audit of the service is warranted.

Keywords: Inpatients, Secondary Prevention, Stroke, Transient ischaemic attack, Audit of Transient Ischaemic Attack (TIA) Inpatient Management

INTRODUCTION:

Transient ischaemic attack (TIA) is defined as "stroke symptoms and signs that resolve within 24 hours" [1]. After a TIA, there is a high risk of developing a stroke, up to 12% at 7 days and up to 20% at 90 days. Half of these strokes occur within the first 48 hours after TIA [2]. Unfortunately, up to 85% strokes following TIA are fatal or disabling [3].

The findings by Rothwell et al (EXPRESS study) demonstrated benefits of early assessment and treatment [4]. Rapid assessment clinics within 24 hours of TIA symptoms with immediate commencement of aspirin and statin with management of reversible risk factors reduced the 90-day risk of recurrent stroke from 10.3% to 2.1%. Urgency of assessment and intervention is appropriately emphasized in TIA management guidelines [1, 5]. However, translating these guidelines into action remains challenging for clinicians. A New Zealand National Acute Stroke Services audit in 2009 identified that only half of the district health boards have rapid access TIA clinics [6]. A similar survey done in Australia found variable access to rapid TIA clinics, causing delays in treatment [7].

In Hutt Hospital, TIA referrals are sent for urgent outpatient review or admitted by the on-call medical team. Patients with high risk TIAs are more likely to be admitted. The aim of this audit was to review management of TIA patients admitted to Hutt Hospital in 2012. A previous similar audit was done for the period January 2009 to June 2010, which serves as a comparison to review trends in TIA management.

METHODS:

This was a retrospective audit of the management of TIA patients admitted to Hutt Hospital between 1st January 2012 and 31st December 2012, in comparison to a similar audit carried out between January 2009 and June 2010. The patient list in 2012 was obtained through screening International Classification of Diseases (ICD) Codes of patients discharged with a primary diagnosis of TIA. Electronic records, including admission, discharge and follow-up clinic letters were reviewed. All patients were followed up in Outpatient Clinic by a stroke physician within 3 months of the admission.

Radiological images were not reviewed to rule out changes on diffusion weighted magnetic resonance imaging i.e. stroke rather than TIA, which may have been performed after discharge from hospital. For this audit, patient symptoms were confirmed as a true diagnosis of TIA if stated by the stroke physician on follow-up review, rather than discharge diagnosis. Patients with a change in diagnosis

or considered unlikely to have TIA were excluded from analysis.

Basic demographic information was collected. Clinical symptoms were classified into typical and atypical symptoms. Typical symptoms included dysphasia, unilateral weakness, unilateral altered sensation, visual symptoms and unsteadiness. Atypical symptoms included confusion, bilateral visual change, dizziness or lightheadedness, headache, amnesia and generalized weakness or sensory symptoms [8]. The affected cerebral circulation, whether cerebral imaging was done acutely and severity grade using ABCD2 score were identified. The following key interventions were assessed for management of TIA: optimising anti-platelet therapy, timely carotid dopplers (and timely surgery if appropriate), blood pressure management, statin therapy and anticoagulation in the setting of atrial fibrillation [8]. Length of stay and 30-day readmission rates was calculated.

RESULTS:

Patient Characteristics:

A total of 81 patients were admitted with a primary diagnosis of TIA in 2012. After discharge and review in TIA Outpatient Clinic, 20 (24.7%) patients were deemed unlikely to be TIA. The patients excluded were due to various reasons; four patients had migraines, three patients had non-specific unwellness with atypical symptoms, two had hypoglycaemia and the remainder had alternative diagnoses such as delirium, dementia, arrhythmia and angina. Thus 61 patients were selected for further analysis.

Of the 61 patients in 2012, 26 (42.6%) were male and 35 (57.4%) were female. The median age for all the patients was 74 years, with a range of 29 to 98 years. Table 1 shows the proportions of TIA mimics and basic patient demographics for the two study periods.

Table 2 summarises the presenting symptoms of these patients. There were 10 patients with two typical symptoms and three patients with two atypical symptoms. The most frequent typical symptom was unilateral weakness in 32 (52.5%), followed by dysphasia in 15 (24.6%) patients. The most frequent atypical symptoms were confusion, dizziness or lightheadedness and headache. There were 38 (62.3%) patients who did not have any atypical symptoms.

The ABCD2 score was not calculated or documented in 8 (13.1%) patients. A patient had ABCD2 Score 1, but admitted due to a history of ventricular arrhythmia. There were 47 (77.0%) patients with ABCD2 Scores four or greater. There were 46 (75.4%) patients with anterior circulation TIA, while 12 (19.7%) had posterior circulation TIA. In 3 (4.9%) patients, it was unclear which part of the cerebral circulation was affected from review of clinical records.

Table 1: Patients for analysis and baseline demographics for study periods 2009 to mid-2010 and 2012.

	2012	2009 to mid-2010
Primary diagnosis of TIA on discharge summary	81	108
Patients unlikely to have TIA after stroke physician review	20 (24.7%)	26 (24.1%)
Patients included in analysis	61 (75.3%)	82 (75.9%)
Median Age (Range) in years	74 (29 – 98)	71 (30 – 99)
Gender: Male	26 (42.6%)	38 (46.3%)
Gender: Female	35 (57.4%)	44 (53.7%)

Table 2: Presenting symptoms of patients admitted for TIA in 2012

Presenting Symptoms	**Number of patients (%)**
Typical Symptoms:	
Unilateral weakness	32 (52.5%)
Dysphasia	15 (24.6%)
Unilateral altered sensation	12 (19.7%)
Unsteadiness	9 (14.8%)
Visual symptoms	3 (4.9%)
Atypical Symptoms:	
Confusion	8 (12.9%)
Dizziness / lightheadedness	8 (12.9%)
Headache	8 (12.9%)
Generalised weakness / sensory disturbance	1 (1.6%)

Figures in table are cumulative, thus do not add up to 61 (100%)

Investigations and Management:

With regards to head imaging, 44 (72.1%) had an inpatient CT brain done, while 4 (6.6%) patients had Magnetic Resonance Imaging (MRI) brain performed. There were 7 (11.5%) patients who had both CT and MRI brain, while 6 (9.8%) had no head imaging done in hospital. Of these, three had recent CT brain done within a month prior to admission, hence imaging was not repeated. A patient had atypical symptoms and MRI brain was requested as outpatients. A patient with St Jude aortic valve replacement but sub-therapeutic warfarin was presumed as embolic phenomenon. The other patient had dementia with multiple comorbidities.

Table 3 shows the management of TIA in-patients with regards to antiplatelet therapy, carotid dopplers performed and timeliness of scan and surgery, hypertension and statin therapy for both study periods.

As shown in Table 3, 72.1% in 2012 had appropriate adjustments to antiplatelet therapy and 35 (57.4%) had carotid dopplers performed, compared to 58 (70.7%) in the earlier audit. One in five did not have a carotid Doppler; no reasons were documented. In the remaining 9 patients without carotid dopplers, the documented reasons for not performing the test were as follows: 3 had CT angiogram and 3 had recent ultrasounds which ruled out significant stenosis. There were two patients who were not surgical candidates; one with dementia, another had labile blood pressure. A patient had previous arterial thrombosis and required anticoagulation.

Of those who had carotid dopplers, 25 (71.4%) had their ultrasound scan done in less than three days and 7 (20%) patients between four and seven days. There were 4 (6.6%) patients referred for carotid endarterectomy, while 34 (55.7%) patients did not have clinically relevant carotid stenosis so were not referred.

There were 4 (6.6%) patients in 2012 referred for carotid endarterectomy, compared to 12 (14.6%) in 2009 to mid-2010. Two patients had delay in getting surgery. The first patient had dopplers in two days, but represented in ten days for symptomatic bradycardia. Surgery was performed 27 days after TIA.

The other patient did not have Dopplers done after TIA and represented with another cerebrovascular event in one and half months. Dopplers were performed on day 49, or 64 days after first TIA before undergoing carotid endarterectomy.

Table 3: Antiplatelet, carotid dopplers and surgery (if appropriate), hypertension and statin therapy

	2012	2009 to mid-2010
Antiplatelet therapy initiated or up-titrated		
Yes	44 (72.1%)	69 (84.1%)
No – reason documented	11 (18.0%)	13 (15.9%)
No – No reason documented	6 (9.8%)	0 (0%)
Carotid Doppler		
Done	35 (57.4%)	58 (70.7%)
Not Done – No reason documented	12 (19.7%)	11 (13.4%)
Not Done – Posterior Circulation	4 (6.6%)	3 (3.7%)
Not Done – Known Stenosis	1 (1.6%)	5 (6.1%)
Not Done – Other	9 (31.1%)	5 (6.1%)
Median time to Ultrasound Scan (Range) – days	1 (0 -35)	0 to 3 days*
Referred for carotid endarterectomy	4 (6.6%)	12 (14.6%)
Time to surgery	2 to 4 weeks	2 to 4 weeks*
Hypertension		
Yes	14 (22.6%)	33 (40.2%)
No – No reason documented	35 (57.4%)	41 (50.0%)
No – Postural hypotension	7 (11.5%)	3 (3.7%)
No – BP<120/70	4 (6.6%)	4 (4.9%)
No – Episode of hypotension	1 (1.6%)	1 (1.2%)
Statin therapy		
Started / up-titrated during admission	17 (27.9%)	34 (41.5%)
Continued statin therapy	34 (55.7%)	31 (37.8%)
No – Age >85 years	6 (9.8%)	3 (3.7%)
No – No reason documented	4 (6.6%)	14 (17.1%)

**For the period 2009 to mid-2010, duration was coded as ranges of days rather than exact number of days.*

A total of 14 (22.6%) patients had medications adjusted for hypertension in 2012, in comparison to 33 (40.2%) patients in the earlier study. Postural hypotension was identified in 7 (11.5%) in 2012 versus 3(3.7%) previously. Statin therapy was up-titrated in 17 (27.9%) in 2012, versus 34 (41.5%) previously.

Hypertension medications were up-titrated in 14 (22.6%) compared to 33 (40.2%) in 2009 to mid-2010. Postural hypotension was identified in 7 (11.5%) compared to 3 (3.7%) previously. Statin therapy was appropriately introduced or adjusted in 27.9% of patients.

Anticoagulation was commenced in 4 (6.5%) patients. There were 44 (71.0%) patients with normal sinus rhythm so anticoagulation was not indicated. In 2 (3.2%) patients with atrial fibrillation, they were considered high falls risk; hence anticoagulation was not started due to risk of bleeding from possible fall injuries. A patient with TIA and atrial fibrillation (AF) was not commenced anticoagulation due to advanced dementia. There were five (8.1%) patients already on anticoagulation. In 4 (6.5%), ECG findings were not documented on electronic records. One patient had atrial fibrillation but it was unclear why anticoagulation was not considered.

Outcomes:

Median length of inpatient stay was one day, with a range of 0 to 13 days. There were five patients with length of stay 4 days or greater. One patient in hospital for 13 days had dementia, requiring complex discharge planning for residential care. There were two patients with unsteady gait and recurrent falls, requiring further assessment and rehabilitation for a week. There were two patients who had confusion and cognitive impairment, with safety concerns identified during multidisciplinary assessment, having lengths of stay four and six days respectively.

There were 20 (32.8%) patients readmitted within 3 months, of which 5 had further TIA and one patient sustaining a stroke, with an overall further cerebrovascular complication rate of 9.8%. In contrast, for the period 2009 to mid-2010, there were 20 (24.4%) readmissions within 3 months, with 8 (9.8%) being further TIA or stroke.

DISCUSSION:

This study reviewed management of TIA patients in 2012. Comparison was made to a similar study done for 2009 to mid-2010 to review trends in inpatient TIA management.

One in four patients was excluded after review by the stroke physician, who disagreed with the diagnosis of TIA. This is a high rate of inaccurate diagnoses, which may result in some patients having unnecessary tests and treatment for TIA. A study found that this

occurred in more than half of the referrals to TIA clinic [9], which may affect timely assessment and treatment of patients with actual TIAs.

The ABCD2 score was not completed in 13.1% patients. This information is crucial in triaging urgency of review. Guideline recommendations classify patients as high risk if: ABCD2 scores 4 or more, crescendo TIAs, atrial fibrillation and those on anticoagulation, as these patients should be seen urgently within 24 hours. If ABCD2 scores less than 4 or present more than one week after TIA symptoms, these are deemed low risk and require assessment and investigations within 7 days [1,5].

About 10% of the patients in 2012 did not have head imaging performed. New Zealand guidelines state 'all people with TIA should have brain imaging', with the caveat that 'patients with severe comorbidities may not be appropriate for scanning if the results would not change management' [1,5]. MRI with diffusion weighted imaging is the modality of choice, with the ability to pick up ischaemia or infarction in some patients. The low uptake of MRI in 18% reflects access to scans, with most patients having CT brain instead.

Antiplatelet therapy is important for secondary prevention of TIA. Aspirin naïve patients should be loaded with 300mg, followed up 75 to 150mg daily. If there are already on aspirin, dipyridamole may be added, or changed to clopidogrel alone [1,5]. Almost 10% did not have their antiplatelet regimen adjusted after TIA.

Carotid imaging should be considered for anterior circulation TIA. A consensus document published after identifying delays in carotid ultrasound and carotid endarterectomy (if warranted) recommend carotid dopplers if there was anterior circulation TIA with corresponding anterior circulation symptoms and the patient was a reasonable surgical candidate. This should be done within 24 hours if ABCD2 score was greater than 3, crescendo TIA or ongoing non-disabling stroke symptoms; otherwise it should be done within 7 days [10]. Ultrasound carotids were not performed in almost 20% of patients. The proportion of patients who had carotid dopplers performed reduced from 70% in 2009 to 57% in 2012. Of those done, about 90% were performed within one week, which was similar between the two periods.

Only 6.6% were referred for carotid endarterectomy. This may reflect the lower rate of carotid imaging performed in 2012. Surgery should preferably be done within 2 weeks, or within 48 – 72 hours for crescendo TIA or high grade stenosis [1,5]. If it is more than 2 weeks since symptom onset and ipsilateral stenosis of 70 – 99%, carotid endarterectomy should be triaged within 4 weeks [10]. Two patients had a delay to carotid endarterectomy; one was appropriate as symptomatic bradycardia

required treatment which may otherwise increase surgical risk. Unfortunately, the other patient did not have a timely carotid ultrasound, and represented to hospital with a stroke before having the scan and subsequent carotid endarterectomy. This case illustrates the importance of identifying embolic sources, which if untreated could result in devastating strokes.

With regards to hypertension, treatment is recommended unless there are contraindications. While the absolute target blood pressure is uncertain, guidelines advise benefit with a reduction of 10/5 mm Hg, with normal blood pressure assumed to be less than 120/80 [1,5]. Only 23% of TIA patients had blood pressure medications adjusted in 2012, compared to 40.2% for the earlier period. However, there was increased identification of orthostatic hypotension (from 3.7% to 11.5% in 2012). Awareness should be raised regarding the importance of hypertension management in TIA patients, and routine checks for orthostatic hypotension with up-titration of treatment.

Statins should be introduced or up-titrated after TIA to a target low density lipoprotein (LDL) cholesterol below 2.5; with caution advised for elderly or frail patients [1,5]. A meta-analysis identified an association between statin therapy at stroke onset and improved outcome in terms of functional independence and survival [11]. While there is evidence of benefit with statin from trial data, further consensus on treating older, frail patients are required [12].

In this study, statin therapy was not adjusted in 6.6% patients. 55.7% were already on a statin when presenting with TIA, suggesting improved adherence to cardiovascular guidelines. The proportion of those not on statin aged above 85 years increased from 3.7% to 9.8%. However, the age distributions between both periods are similar. A more cautious approach may have been adopted over time, including monitoring for postural hypotension.

Finally, anticoagulation is recommended for patients with TIA in the setting of atrial fibrillation, unless there are contraindications [1,5]. An audit completed in Northland, New Zealand identified poor utility of warfarin in 42%, with 10% of those on warfarin prior to stroke having sub-therapeutic international normalised ratio (INR) levels. The authors urged clinicians to consider anticoagulation in these patients, with the need to thoroughly monitor INR [13]. In this study, four patients did not have their ECG findings recorded electronically to decide whether anticoagulation was appropriate. This may hinder primary care doctors from considering anticoagulation as well.

In terms of outcomes, 32.8% were readmitted within 3 months, mostly due to non-neurological events. 10% were readmitted with further cerebrovascular events. A study looking

at 30-day readmission rates identified a 10% readmission rate; mostly due to other medical reasons [14]. It is unclear why there is a higher rate of readmission in our group, which may be an area of further review.

There were several limitations of this study. It was a retrospective review of clinical notes. Analysis was limited to TIA patients admitted to hospital; other high risk TIAs who were not admitted may have been excluded.

CONCLUSIONS:

The main findings are as follows: there was large proportion of patients with atypical symptoms or stroke mimics. There was also a high risk of readmission within 3 months. Areas of improvement include adjustment in antiplatelet therapy, blood pressure management and timely carotid ultrasound for anterior circulation TIA. The need for improvement in TIA management is ongoing, which was also illustrated in a Canterbury Initiative TIA audit [15].

Comparison of two different periods shows trends or changes in quality of patient management. It was interesting to identify some reduction in guideline-based management of TIA patients. Further education and reiteration of TIA management is required, and a further audit is warranted to ensure appropriate management of these patients.

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ASSESSMENT OF RUBRICS FOR HEALTH SCIENCE EDUCATION AT THE SCHOOL OF MEDICINE AND HEALTH SCIENCES, UNIVERSITY OF PAPUA NEW GUINEA

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ABSTRACT

This study carried out at the University of Papua New Guinea investigates undergraduate medical imaging science (MIS) students' perceptions of the usefulness of individualised feedback using a rubric. In the first semester of 2017, 15 fourth year students in the research proposal design course were assigned to an assessment rubric, which comprised a detailed description of how their work was to be graded. Students were instructed to submit an initial draft of their writing. Electronic feedback was then provided to support the revision process. The benefits of the rubric and feedback were evaluated at the end of the semester using a paper-based survey, which provided participating students with the opportunity to critically reflect on the learning experience. The majority (93.3%) of the students were satisfied that the feedback on their draft proposal assisted their understanding on research methodology concepts which informed their progress with respect to achieving the assessment learning outcomes. This study has demonstrated that the use of a rubric as a formative assessment tool has had a positive impact on students' learning experience. Reflection on the results of this study will lead to further refinement of the existing rubric and the development of others.

Keywords: assessment rubrics, formative assessment, summative assessment, effective feedback mechanism, medical imaging, Papua New Guinea

INTRODUCTION:

Effective Feedback Mechanisms in Higher Education:

Feedback in higher education is an important aspect of enhancing student learning, and utilises various strategies; to improve academic performance and achievement. The traditional form of feedback typically comprises written comments [1]. However, McCarthy [1] highlighted several problems associated with written feedback that are widely recognised in

higher education literature including the focus on mechanical aspects of the submission rather than concentrating on the core of the work; vague and inconsistency in the quality and quantity of feedback across markers, which should be managed by a moderation process. With universities moving to electronic marking as opposed to traditional handwritten feedback, issues with illegibility of written feedback has largely been negated.

In response to the problems associated with written feedback, McCarthy [1] outlined two main alternatives applicable to both summative and formative assessments. These are the use of audio and video feedback. Both audio feedback, as well as, other video-based learning techniques, has been demonstrated to have been successfully incorporated into teaching and learning in higher education [1]. McCarthy [1] noted advantages of using both the audio feedback and video feedback including both files providing a permanent record, which can be stored on a USB (Universal Serial Bus) flash drive or if written printed out and reviewed at the students' convenience.

Feedback can potentially be found in every aspect of a well-designed curriculum: through self-reflection in lectures, group discussions in tutorials, guided readings, interaction with staff, and assessment [2]. It is well-known that assessment is important to student learning in higher education, and that feedback is a significant aspect of the assessment process in terms of elevating student performance and achievement [1-3]. Giving timely and effective feedback has been widely supported and recognised in higher education [1-4]. There are many advantages in giving fast, effective feedback to students to improve their learning in terms of both the formative (performance) and summative (achievement) assessment tasks. There are seven key conditions necessary for assessment to support student learning, which relate to feedback. Feedback must be given often enough, and in enough detail, to be truly formative; should focus on students' performance, not their characteristics; must be timely enough for students to have time to use it to improve their learning; should be appropriate in terms of what the assessment is actually designed to achieve; should relate to students' understanding of what they are supposed to be doing; must actually be received by the student; and should be acted upon by the student [2, 3]. Of these conditions, ensuring action by the student is usually out of the control of the academics.

Students should also make use of the feedback process to enhance their learning, rather than expecting the academic to provide all the answers. Brown and Race [4] highlighted four key strategies that can help students to make use of feedback. Of these four, the two most important include giving students marks only when they have tried working problems out

themselves thus, making use of feedback given on their work; and getting students to make judgments on their work, by filling in a short self-assessment questionnaire before they submit the work [4].

These authors [4] identified seven key approaches that can save staff time when assessing, however these tend to involve additional time and skill in the design process. Three of these are applicable to a small cohort of students and require prompt and efficient feedback to individual students, rather than inform a large cohort of students. They include the use of assignment return sheets, showing how marks link to learning outcomes, and enabling students to indicate the extent to which criteria have been achieved by completing the Likert scales. The scale ranging from “fully met” through “partly met” to “not yet met” and so on. This may also include the importance of providing model answers which demonstrate good answers, and explaining why they are good; and to incorporate elements of self and peer review, particularly formatively, so that students can measure the quality of work by applying criteria to each other’s and their own work [4].

Feedback can be of two types: formative and summative which are essentially based on the same concept. According to Naylor et al. [2] formative feedback is constructive and used to improve learning (and teaching); occurs during learning so students are able to act on it and is not punitive, and enables students to advance their understanding through making mistakes then learning to correct or avoid them. Summative feedback is the final judgment on student achievement [2].

While there are good feedback practices promoted by higher education worldwide to enhance student learning (and teaching), it is also important to recognise the obstacles of feedback that may hinder students’ learning. For example, students should be provided with clear assessment criteria to guide their work (and therefore their learning); assessment criteria should be carefully designed to guide student learning and ensure they are being accurately assessed on how well they have mastered those learning outcomes [2, 5].

Other obstacles of feedback that academics should be aware of in higher education include the decrease in the level of motivation to learn by students’ due to sole focus on their final grades; students are strategic workers and if a piece of work is not assessed, they are often reluctant to engage it. By definition, formative results should never be a part of the final grade. If they do, they are not formative. As such, academics should be cautious about over-representing formative results in the final grade [2]. It is very important for teachers in higher education to minimise the obstacles of feedback in higher education, while incorporating good feedback practices in their curriculum to enhance student learning.

Significance of Assessment Rubrics in Higher Education:

Students in higher education can improve in a summative assessment task when provided with three main resources: a detailed, well-structured marking rubric (criteria); feedback through comments from both academics and their peers; and through the students' own self-reflection and self-assessment [1, 4, 6]. The role of formative assessment using rubrics, needs careful design and planning to ensure that: key learning outcomes are addressed; engagement in the tasks prompts the kind of learning most desired; the task is timed to ensure that there is an opportunity for students to benefit from the comments they receive; and that there is time within the semester to put their learning into practice in subsequent activities [6]. This important information in a formative assessment is best integrated into a well-structured rubric so that students can use it to enhance their performance as independent learners, rather than depending solely on their lecturers' comments.

Summative assessment task in higher education leads to the final grading to determine the overall success of the student. Summative assessment refers to "grades or marks that are collected and weighted within and across course units to provide an account of a learner's overall performance in a program of study" [6]. Summative assessments are given to students at the end of a set time period, or at the end of the semester, to assess what has been learned and how well it was learned [1]. It can be utilised as assessment for learning if it is structured properly. McCarthy [1] noted the importance of rubrics used for summative assessment to determine a student's overall achievement. Rubrics include a set of standards, expectations or criteria, which can be provided to students before they start working on the assessment task so that they are aware of the key criteria and their subsequent weighting. Rubrics are also utilised by academics during the marking and feedback stages, leading to an objective final grade, by following the same criteria students used to complete the project [1].

Therefore, the three key components that should be included in a well-structured rubric as part of both formative and summative assessment include: the criteria; level of performance; and descriptor [7, 8]. Of the three key components, the level of performance determines the score, final grade or mark that reflects the summative assessment.

Formative Assessment Using Rubrics to Support Improved Learning:

The use of standard rubrics as a formative assessment tool has been widely used in higher education to enhance student learning and achievement. Lipnevich et al. [8] focus on the three feedback conditions using the exemplar and /or the rubric as a form of data collection to determine student performance in

their learning experience. They also pointed out the importance of providing effective formative feedback to improve undergraduate student writing performance. Another study by Strangman and Knowles [9] revealed significant improvements in three of the five learning outcomes before and after implementation of the new lesson evaluated using a grading rubric. Osterbur et al. [10] focused on student recall of electronic and handwritten feedback as a form of formative assessment. They noted that student consumption and recall of feedback are necessary preconditions of successful formative assessment. They also found that students who preferred or received handwritten feedback recalled more feedback (quantity), as compared to those who received electronic feedback with more accurate (quality) recall comments. Therefore, there is great value in a formative assessment using rubrics to support improved learning.

Our present study assesses the use of rubric and formative assessment of students in Medical Imaging Science (MIS) in University of Papua New Guinea (UPNG).

Research Problem and Aim of Study:

Currently there is no published study of the MIS program in UPNG that has examined potential benefits of using marking rubrics as a form of feedback for assessment of students. Therefore, to address this and other issues, a rubric was designed and implemented as a formative assessment tool to achieve the learning outcome of the Research Proposal Design course. The final year MIS students used the formative assessment rubric as a form of feedback strategy to enhance their research proposal writing skills. Thus, the major objective of this research was to investigate students' perceptions of the usefulness of individualised feedback using a detailed marking rubric.

METHODOLOGY:

This study was carried out in the discipline of Medical Imaging Science in the SMHS UPNG. All the fourth year students registered for the "Research Proposal Design" course during semester one in 2017 academic year were eligible to participate in this research study. All the students consented to participate. As part of the course requirements, students were asked to write a research proposal demonstrating their basic understanding of research methodologies used to conduct research in the field of diagnostic radiography. Prior to the assignment, a lecture was delivered on research methods and proposal writing stages. Information provided in the assignment guidelines included a list of criteria delineated in an instructional rubric for the assignment, with detailed description of five performance levels [8].

Students were assigned to only one feedback condition: *Rubric*, in which students received a

detailed description of how their work would be graded, broken down by different levels of performance [7, 8]. Upon receiving feedback, each student was encouraged to use the materials to revise and resubmit their write up.

As part of the procedure for the course, the students were told to submit their first draft of their writing on a specified date, and then course materials would be hand delivered to them to support the revision process. They were also given a specific date to submit their second draft. The mark allocated for the proposal was based on their revised submission. The score on the final proposal accounted for 10% of their overall grade in the course. Finally, the students were asked to provide written feedback through a survey on their perceptions of the benefit of the rubric. Participation in the survey was voluntary and all responses were anonymous.

Data collection and analysis:

Analysis of the results of the survey was by descriptive statistics [11] and thematic analysis [12, 13]. The responses of the participants' were also analysed using both quantitative and qualitative methods as part of mixed method approach [11] where both closed-ended and open-ended questions were asked.

Ethical considerations:

Ethical approval was granted by James Cook University Research Ethics Committee; approval number H7065.

RESULTS:

Of the 15 students enrolled in the Research Proposal Design course in semester one 2017 academic session, 11 (73.3%) were male and 4 (26.7%) were female students. The age range of all the students was 20-24 years. The survey response rate was 100%.

Rubric helpful in preparation for proposal writing task:

Eight students (53.3%) "Strongly agree" and five (33.3%) "Agree" that the rubric was helpful in their preparation for the proposal writing task (Figure 1).

Content and course learning outcome (CLO):

The majority (80.0%) of the students "Agree" that the content covered in the rubric supported the attainment of the CLO, with one student (6.6%) "Strongly agree" (Figure 2).

Feedback using rubric and student progress:

Eight students (53.3%) "Strongly agree" that feedback on their research proposal drafts using the rubric provided them with information about their progress with respect to achieving the CLO. Six students (40.0%) had slightly different perception and "Agree". One student (6.7%) "Strongly disagree" opposed the notion of feedback using rubric in enhancing research proposal writing skills (Figure 3).

Student consultation times and reviewing of assessment drafts using the rubric:

Four students (26.7%) strongly agree and six students (40.0%) agree with the time dedicated during individual consultation in using the rubric to review their proposal drafts. A small number of students (13.3%) indicated that the consultation times and the review of assessment drafts using the rubric was not sufficient, while another two students (13.3%) were uncertain with their responses neither agreeing nor disagreeing. Only one student (6.7%) indicated a negative perception towards consultation times and reviewing of assessment drafts using the rubric (Figure 4).

Feedback and final grading assisted students' understanding to perform better:

All but one of the students reported that feedback and final grading assisted their understanding to perform better. Six students (40.0%) strongly agreed that feedback and grading of their final research project proposal assisted their understanding of key concepts to perform better in future proposal writing tasks with eight students (53.3%) who provided a positive response and agreed (Figure 5).

Key advantages of the rubric and future resources to support students' learning in this course:

Other advantages of the rubric as well as future resources that might support students' learning in this course were highlighted as the main two themes by the students. They suggested that the logical arrangement of each of the contents, level of assessment, weightings and the learning outcome in the rubric enabled them to focus and improve in their proposal writing task: *"The different content described for each part of the proposal within the rubric was very useful. This helped me to better improve my proposal writing" (Student 1).* "*The most useful aspects of the marking rubric are the detail content and the weightings of the rubric itself. These provide clear understanding as to how we are marked and which areas we need to improve on" (Student 2).* "*The marking rubric is useful because it helps me to achieve the learning outcome in line with the content so that I could satisfactorily complete my work" (Student 3). "The aspects that were most useful was having a wide range of areas under each level of assessment where the student can see where he/she can do much better by including many information under certain topics" (Student 4).*

When discussing effective feedback mechanism, students appreciated that the academic's feedback and highlighted areas in the rubric were given on time and assisted students to understand key concepts in writing research proposal: *"Feedback on my proposal drafts assisted my understanding of key concepts in research proposal writing" (Student 5).* "*The highlighted areas with description of what to write really help me to complete my proposal" (Student 6). "The timely feedback from the proposal using the rubric was useful to help me improve in future written tasks"*

(Student 7). "The other thing is the area that we need to improve on are also highlighted this is truly helpful" (Student 8).

Students were also given the opportunity to provide suggestions for future resources that might support their learning in this course. Few students stated that some exemplars of proposals and rubrics should be provided to them: *"Provide past proposals and rubrics to students to better assist him/her to improve in their writing tasks" (Student 9). "Provide an example on how to use a rubric using past exemplars" (Student 10). "This is my first time to use a rubric, therefore I suggest past proposals should be provided with the rubric and explained earlier on how to use them" (Student 11).*

Some students suggested that different sections of the research proposal, marking rubric and basic research writing skills should be taught in class apart from the Research Proposal Design course: *"It is recommended that the coordinator should go through the marking rubric in class and explain as some students do not really understand the content of the paper instead of just giving it to students for reading" (Student 12). "We need to at least have few sessions on basic research writing and rubrics more to give us a good foundation of writing research following a standard way" (Student 13). "For more understanding, each rubric item should be given one at a time for each week as for more understanding of what is required for that specific component" (Student 14).*

Figure 1: Helpfulness of rubric in preparation for proposal writing task

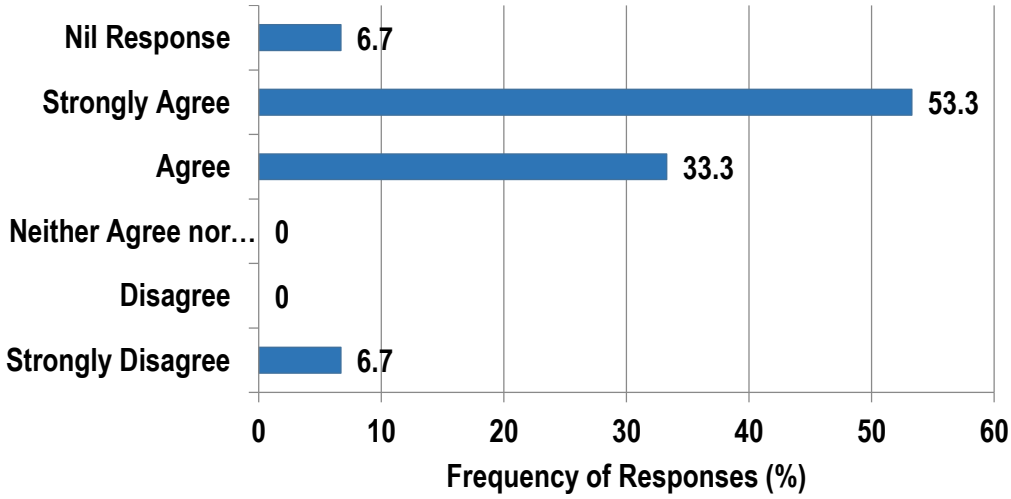


Figure 2: The rubric content supported the course learning outcomes

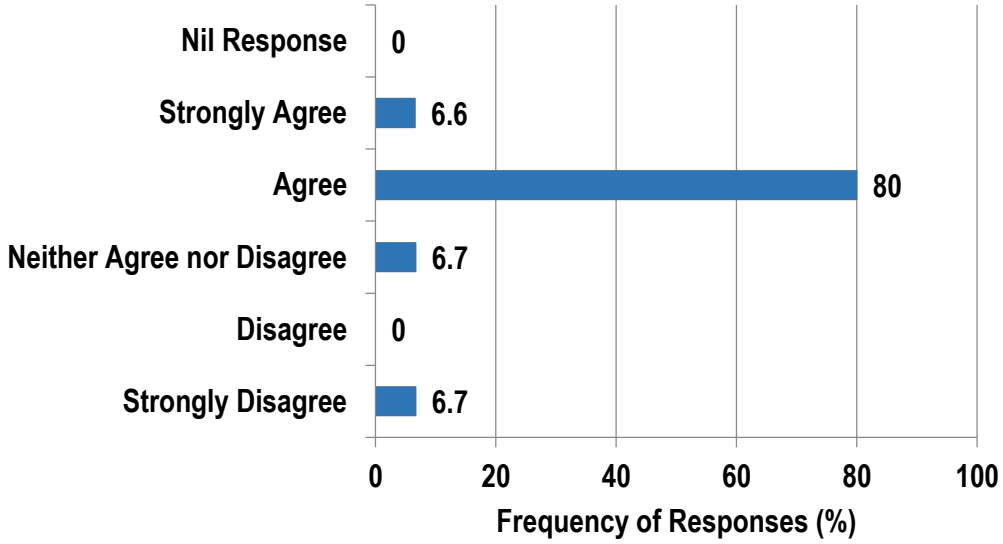


Figure 3: Feedback using rubric and supported students' progress

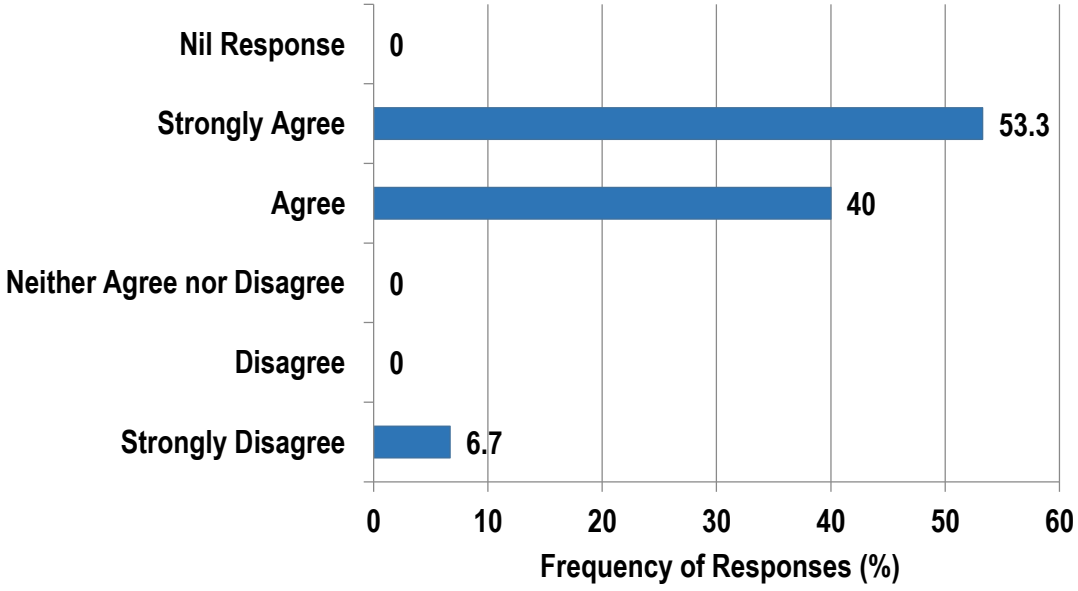


Figure 4: Student satisfaction with length of consultation times and reviewing of assessment drafts using the rubric

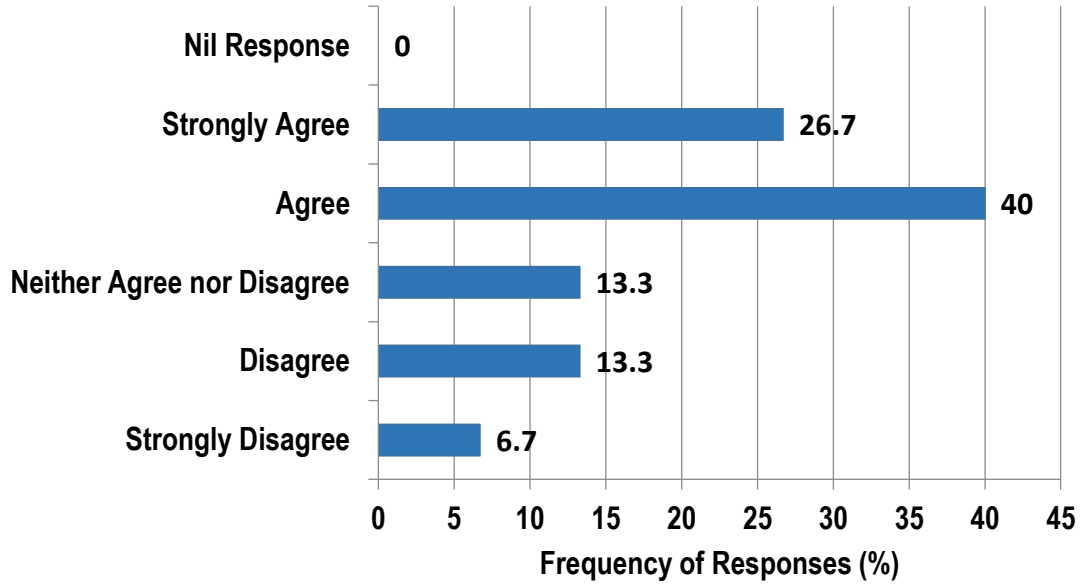
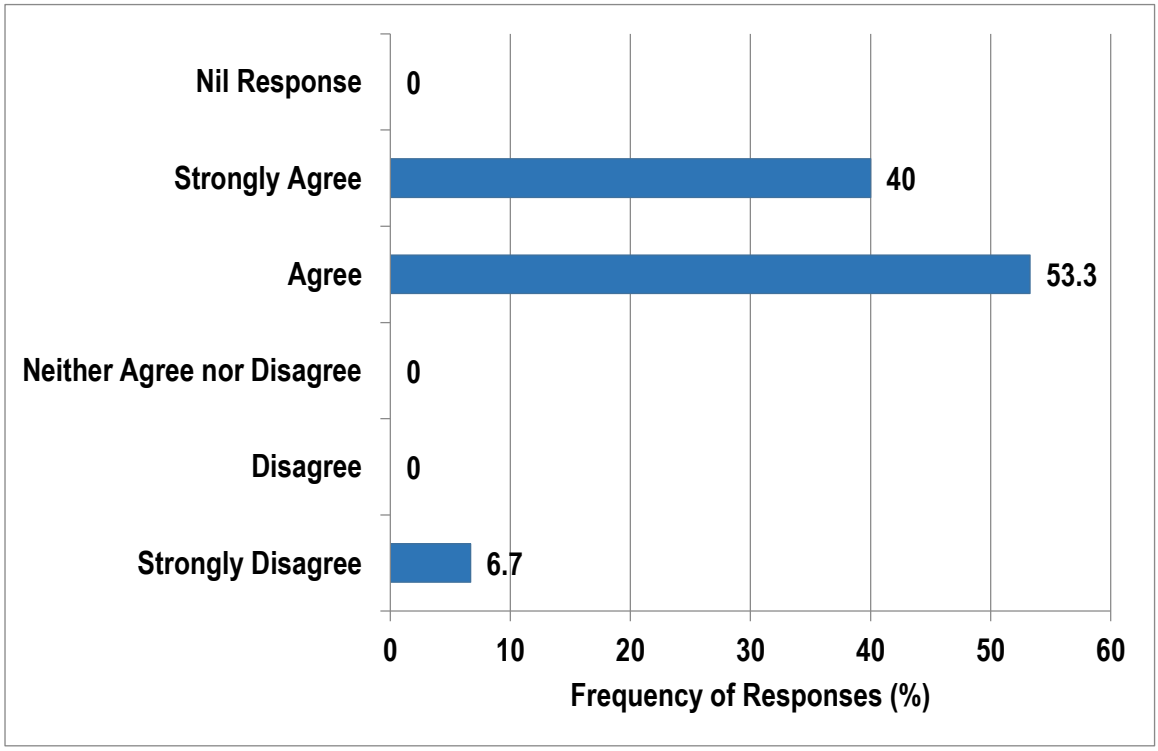


Figure 5: Feedback and final grading assisted student's understanding to perform better



DISCUSSION:

Rubric helpful in preparation for proposal writing task:

The majority (86.6%) of the students found the rubric to be very helpful in their preparation for the proposal writing task. The findings in this study are supported by a study by McCarthy [1] on students' learning experiences using three different feedback mechanisms and their assessment criteria. Any form of feedback mechanism should always be provided with an assessment rubric to assist students' understanding in preparation for any written task, and to further support students' in enhancing their learning in the specific assessment task.

Content and course learning outcome (CLO):

In terms of the alignment between the content and CLO, majority (80.0%) of the students responded positively that the content in the rubric supported the attainment of the CLO. This response is supported by Brown & Race [4] who noted seven key approaches that can save staff time when assessing, but tend to involve additional time and skill in the design process. One of these key approaches addresses the use of assignment return sheets with criteria, demonstrating the alignment between marks, content and learning outcome [4]. In support of Brown and Race's [4] statement, the researcher aligned the content in the rubric criteria and CLO in reference with the UPNG Course Handbook [14].

Furthermore, the strong alignment between the content and the CLOs in the rubric reflects a constructivist approach in terms of emphasising student-centered, active learning strategies through project work, research-based learning, problem- and enquiry-based learning methods [15, 16]; and the integration of graduate attributes in terms of communication skills and critical thinking skills [17, 18]. Students were able to clearly link the content and the learning outcome with their marks, which provided a positive learning experience for them as a result.

Feedback using rubric and student progress:

The majority (93.3%) of the students were satisfied that feedback on their proposal drafts using the rubric provided them with information about their progress with respect to achieving CLOs. This positive response reflects the effectiveness of formative feedback by the academic to enhance students' learning as evidenced through higher education elsewhere [1-4, 8, 10]. Furthermore, students were provided timely feedback twice in a semester using the rubric for formative (draft revision) and summative (final grade) assessments. This approach in providing timely feedback using the rubric when the student needed it appears to have had positive impact on their experience.

Student consultation times and reviewing of assessment drafts using the rubric:

Students had varied reactions towards individual consultation times with the academic and the review of their assessment drafts using the rubric. Although, 66.7% of the students appreciated the time dedicated during individual consultation in using the rubric to review their proposal drafts, the others provided a negative response towards the consultation times.

Considering this response, the varying time frames associated with delivering timely feedback during individual consultation may not be applicable to these few students due to the teaching workload of staff [15, 19] and the students' enrolment in other courses within the program. Furthermore, some students may themselves have responded late to feedback from both the staff, and through their own self-reflection and self-assessment using the rubric [6]. Late responses to feedback by students may have a negative impact on their experience. However, it should be noted that the proposal writing task in the rubric was timed to ensure that there was an opportunity for students to benefit from the comments they receive; and that there was time within the semester to put their learning into practice in subsequent activities [1-4, 6].

Feedback and final grading assisted students' understanding to perform better:

At the end of the semester, most of the students were satisfied that feedback and final grading assisted their understanding to perform better. This final assessment process integrated summative assessments which were given to students at the end of a set time period, or at the end of the semester, to assess what has been learned and how well it was learned [1]. With respect to the assessment task being considered, the 93.3% of the students indicated that feedback and grading of their final research project proposal assisted their understanding of key concepts to perform better in future proposal writing tasks. This positive response reflects the commitment of staff towards utilising the assessment rubric during the marking and feedback stages, by following the same criteria students used to complete the project, leading to an objective final grade [1, 18].

Key advantages of the rubric and future resources to support students' learning in this course:

The key advantages of rubric use were related to the detailed format of the rubric in terms of the constructive alignment between the criteria, level of assessment, marks, CLOs, and the logical arrangement of each section and category of the proposal's subtitles, which enabled students to focus and improve in their proposal writing tasks. The positive response to the use of rubric reflects authentic assessment to promote student learning [4, 6, 9, 15, 20]. In

addition, a final key advantage related to timely feedback [1-4, 6] in terms of staff feedback, marks and highlighted areas, which assisted students' understanding of key concepts in research proposal writing tasks. The results of this study highlight significant advantages of rubric use and indicated that the detailed constructive alignment of content, CLO and grading in the assessment rubric, along with its timely delivery of feedback, can have a positive impact on students' experience within a course and their subsequent development as learners [1, 15].

Some students also suggested that past exemplars of proposals and rubrics should be provided in the future. This response is supported by Lipnevich et al. [8] who reported on the use of exemplars and detailed rubrics as formative assessment. Their results demonstrated that students who were provided with both rubrics and exemplars showed significant improvement in their writing performance. Considering this response, the authors aim to provide model answers which demonstrate good answers, and explain why they are good for the students [4]. It should also be noted that students were taught the concepts of proposal writing in class but were not formally instructed on the use of rubrics. Although, instructions were given to the students at the time of this study regarding the use of rubrics, they were not taught on how to use the different elements in a rubric meticulously as it was a new learning assessment criteria tool; both for them as student and the researcher. Reflection on these assessment tasks over time and engaging further with the literature around marking tools/schemas will lead to the refinement of the existing rubric and the development of others.

CONCLUSION:

This study has demonstrated that the use of a rubric as a formative assessment tool has had a positive impact on MIS students' learning experience. In particular, the detailed format of the assessment rubric and the successful achievement of the learning outcomes with timely feedback have allowed students to have a positive learning experience in terms of improving their proposal writing task. In addition, most of the students were satisfied that feedback and final grading at the end of the semester assisted their understanding to perform better in this course.

Despite these positive learning experiences, the students had varied reactions towards consultation times with the staff in reviewing of their assessment drafts using the rubric. These varied reactions from the students may be due to other factors such as teaching workload of staff and the students' enrolment in other courses within the program, which are beyond the staff and the students' control.

Furthermore, although students emphasised the importance of using past exemplars of

proposals and rubrics, a comparative study in future could evaluate the effectiveness on students' performance by comparing those receiving rubrics and exemplars before working on their assignment to those who receive rubrics and exemplars after submitting revised versions of their draft. Reflection on the results of this study will lead to further refinement of the existing rubric and the development of others.

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OFF-HOUR / ON-HOUR DELIVERY OUTCOMES IN LAUTECH TEACHING HOSPITAL OSOGBO, A THREE YEAR RETROSPECTIVE CASE REVIEW

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Running Title: Off and on hour delivery outcomes

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ABSTRACT

At the time of delivery, care is focused on risk surveillance and intervention if indicated; ready availability of experienced professionals and supportive facilities cannot be over emphasized and cannot be represented at hospitals on a 24-hour / 7-day basis. This study aim to determine the relationship between off-hours delivery and pregnancy outcome compared with on-hour delivery and pregnancy outcome for subgroups of hospital birth in Lautech Teaching Hospital in Osogbo in Southwestern Nigeria. This retrospective study audited medical records of 310 patients who delivered during this period from 28 weeks and above, between the periods of January 1, 2008 to December 31, 2010. Data was analyzed using the SPSS software version 23.0. Results shows that 69.0% were booked, a diagnosis of normal labour was made in 213 (68.7%) of patient while 133 (42.9%) of patient had emergency caesarean section while 65% delivered during the off-hour period. The deliveries were attended by different cadre of health workers. Among the 202 babies delivered during the off-hour, 155 (63.8%) had Apgar score of 7 and above at 1 minute of life as compare to 88 (30.5%) seen among the 108 on-hour deliveries. There was significant statistical relationship between time of delivery, and perinatal morbidity and mortality ($p = 0.043$) while there was no significant statistical relationship between time of delivery and maternal outcome ($p = 0.552$). We concluded that more deliveries occur during off-hours and were associated with an increased risk of perinatal morbidity and / or mortality, suggesting a need to reappraise our practice, and the facilities being deployed into use most especially during off-hour periods

Keywords: Time of delivery; off hours/on-hour periods; delivery outcomes; Nigeria

INTRODUCTION

Socially the most desirable pregnancy outcome to the general population is a live baby and mother pair, radiating joy and smiles to all. Pregnancy risk factors are all the aspects that endanger the life of the mother and the baby [1]. The major negative pregnancy outcomes include neonatal mortality, low birth weight, still births and even the death of the mother due to difficulties during deliveries [1,2]. At present a considerable amount of literature has been published about the relationship between hospital admissions that occur in the evening, at night or during weekend (off-hour) and morbidity and mortality [3]. In obstetrics and neonatal care, studies have focused on the time of birth or admission to a neonatal intensive care unit (NICU) [4,5]. These studies have demonstrated a higher risk of adverse outcomes among infants born or admitted during off-hours as compared to office-hours leading to questions about the quality of care provided during off- hours [3-6].

At the time of delivery, care is focused on risk surveillance and intervention if indicated, including assisted delivery and neonatal intensive care, this requires the ready availability of experienced professionals and supportive facilities [6]. However high-care facilities and multiple expert competence cannot be represented at hospitals on a 24-hour / 7-day basis, while the majority of the non- scheduled deliveries occur around the clock, with a biphasic pattern including a peak occurring under natural conditions in early morning [6,7] (off-hour). Heterogeneity with respect to personnel coverage around the clock is the rule rather than exception for most clinical care [6].

Studies have shown moderate to strong associations between patient outcomes and organizational features, both with regard to volume of care and care that is day time dependent, such as physician staffing and the immediate availability of anesthetic services [8-12]. In maternal and perinatal care, this evidence is not unequivocal as different studies have demonstrated that high risk fetus have better outcomes in high volume hospitals [13] whereas controversy exist in the case of low and moderate risk fetus[14-16].

Little is known about the interaction between fixed and time dependent organizational characteristics [6]. The time of delivery may be regarded as an indirect expression of organizational vulnerability, as condition may be more suboptimal during the evening and night (off-hour)[6]. Indeed studies have suggested that perinatal outcomes are compromised during the weekend and at night [17-20].

The scope of this study expanded from delivery related perinatal mortality (0.97% total; 66.7% off-hour) to delivery related perinatal outcome including low Apgar score at 1 and 5 minutes after birth, admission into special care baby

unit (SCBU) (8.3% total; 88.5% off-hour) and maternal morbidity to enhance the sensitivity of the analysis. The expression of the risk as a number rather than odd ratio may give a better indication of the impact of the off-hour effect on the health care and the potential gains of possible improvement in obstetrics and perinatal care in hospital settings. Thus this study aim to determine the relationship between off-hours delivery and pregnancy outcome compared with on-hour delivery and pregnancy outcome for subgroups of hospital birth in Lautech Teaching Hospital in Osogbo in Southwestern Nigeria.

SUBJECTS AND METHODS

The study area was Ladoke Akintola University of Technology Teaching Hospital Osogbo commenced operation in 2000. It is a 300 bedded tertiary hospital located in the semi-urban state capital of Osun State, Southwestern Nigeria. The maternity unit of the hospital is well equipped, and managed by experienced appropriate health care workers. This was a retrospective study that audited medical records of women with deliveries.

The study population was selected from medical records of all patients who delivered during this period from 28 weeks and above, between the periods of January 1, 2008 to December 31, 2010 were reviewed. This excludes schedule deliveries, intrauterine fetal death, births before arrival and fetus with congenital defects that are not compatible with life. All the cases of deliveries within the stated period that met the selection criteria were reviewed.

A validated checklist constructed after a review of patients case-notes and review of relevant literatures was prepared. On-hour was regarded as official working hours; 8am to 4pm on Mondays to Fridays. Off-hour refers to official call duty hour; 4pm to 8am on Mondays to Fridays and weekends. Maternal socio-demographic factors, pregnancy and labour characteristics, maternal and perinatal outcome were obtained. Trained resident doctors were employed in data synthesis from case-notes

The data obtained were fed into SPSS software version 23.0. Categorical variables were summarized using number and percentages and multivariate analysis was done, a level of significance put at less than 5%.

RESULTS

There were 1399 deliveries during the period of evaluation, 502 (35.9%) met the inclusion criteria and 310 (22.2%) were analyzable. Majority (87.4%; 271/310) of the pregnant women falls between the age of 25 – 34 year, 99% (307/310) of them were married while 24.2% (75/310) were unemployed. A total of 96.1% (298/310) of these patients have at least secondary education and the study population was predominantly of Yoruba ethnicity- as shown in Table 1.

Table 2 shows that majority of these patients (69%) were booked, 28% were un-booked

while 3.0% were registered. Majority of the patient 174 (56.1%) were multiparous, 71(78.9%) out of the 90 un-booked patient were referred from secondary health care facilities and 279 (90.0%) of the patient delivered at term. Diagnosis of normal labour was made in 213 (68.7%) of patient, 240 (77.4%) of the newborn had birth weight between 2.5kg – 3.4kg, 133 (42.9%) patient had emergency caesarean section. In addition, 65% delivered during the off-hour while 35% delivered during the on-hour period. The deliveries were attended by different cadre of health workers as shown in Figure 1.

Table 3 shows that majority of the newborn 243 (78.4%) had Apgar score of 7 and above at one minute of life, with resuscitation this increased to 299 (96.5%) newborn at 5 minute. Three newborns out of the eleven that had Apgar score of less than 7 at 5 minute had perinatal death. Seventeen patients (5.5%) had postpartum hemorrhage, 9 (2.9%) of which had blood transfusion while majority of the patient 245 (79%) had packed cell volume of 30% and above. More babies delivered during the off-hour 155 (63.8%) had Apgar score of 7 and above at 1 minute of life as compare to 88 (30.5%) seen during On-hour, similar trend was observed in babies with low Apgar score at 1 minute of life. Off-hour deliveries account for 2 (66.7%) of perinatal mortality and 23 (88.5%) of SCBU admission observed in the study; there was significant statistical relationship between time of delivery, perinatal morbidity and mortality ($p < 0.05$). Ten (58.8%) of the 17 patients that had postpartum haemorrhage delivered during off-hour period while 4 (44.4%) of the 9 patients that had transfusion delivered during off-hour, there was no significant statistical relationship between time of delivery and maternal outcome ($p > 0.05$) according to Table 4

Twenty eight (71.8%) of babies with low Apgar score at 1 minute that were delivered by booked mothers were nursed by their mother side, there was significant statistical relationship between booking status and low Apgar score at 1 minute ($p< 0.05$). Fourteen (70%) of the babies whom mothers were referred from secondary health facility and had low Apgar score at 1 minute were admitted into SCBU, there was significant statistical relationship between referral status and low Apgar score at 1 minute ($p < 0.05$). Thirteen (65%) babies delivered by senior registrar who had low Apgar score at 1 minute were nursed by mother side according to Table 5.

Table 1: Socio-demographic distribution (No. of patient = 310)

Variable	Frequency (%)
Age in years	
15-24	18(5.8)
25-34	271(87.4)
35-44	21(6.8)
Marital status	
Married	307(99.0)
Single	3(1.0)
Occupation	
Unemployed	75(24.2)
Employed	235(75.8)
Educational Status	
Post-secondary	211(68.0)
Secondary	87(28.1)
Primary	12(3.9)
Tribe	
Yoruba	288(92.9)
Others	22(7.1)
Religion	
Christianity	197(63.5)
Islam	113(36.5)

Table 2: Obstetrics and Labour history (No. of patient = 310)

Variable	Frequency (%)
Booking status	
Booked	214(69.0)
Un-booked	87(28.0)
Registered	9(3.0)
Parity	
Primipara	136(43.9)
Multipara	174(56.1)
Un-booked; referral status	
Secondary Health Care	71(78.9)
Others	19(21.1)
Estimated Gestational Age	
Pre term	24(7.7)
Term	279(90.0)
Post term	7(2.3)
Diagnosis at presentation	
Normal labour/Uncomplicated labour	213(68.7)
Abnormal/complicated labour	75(24.2)
Maternal Co-morbidity	22(7.1)
Birth Weight	
1.5kg-2.4kg	34(11.0)
2.5kg-3.4kg	240(77.4)
3.5kg-4.1kg	33(10.6)
>4.1kg	3(1.0)
Mode of delivery	
Spontaneous Vaginal Delivery	173(55.8)
Instrumental Vaginal Delivery	4(1.3)
Emergency Caesarean Section	133(42,9)
Time of delivery	
Off-hour	202(65.0)
On-hour	108(35.0)

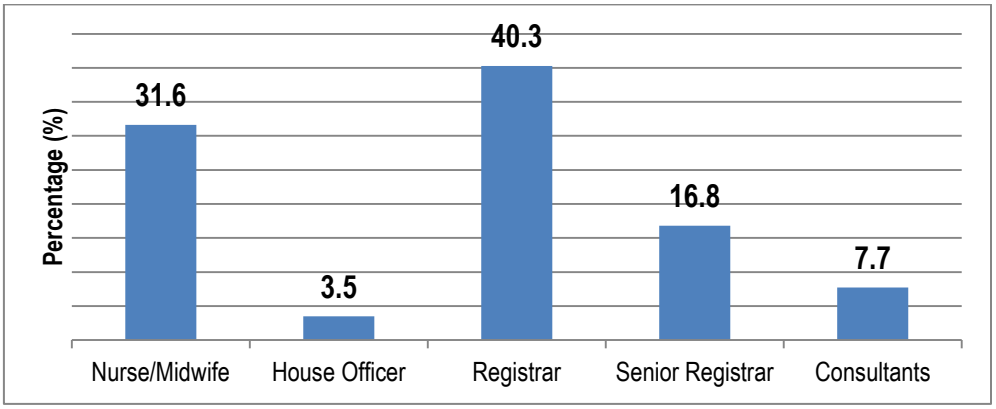

Figure 1: Accoucher

Table 3: Fetal and Maternal outcome (No. of patient =310)

Variable	Frequency (n)
Apgar score at 1minute	
<4	8(2.6)
4-6	59(19.0)
7 and above	243(78.4)
Apgar score at 5minutes	
<4	3(1.0)
4-6	8(2.6)
7 and above	299(96.5)
Outcome of Apgar score of < 7 at 1min	
Perinatal mortality	3(4.5)
SCBU admission	26(39.4)
Nursed by mothers sides	38(56.1)
Post partum hemorrhage	
Yes	17(5.5)
No	293(94.5)
Maternal Packed cell volume	
30 and above	245(79.0)
26-29	50(16.1)
25 and below	15(4.8)
Maternal Blood Transfusion	
Yes	9(2.9)
No	301(97.1)

Note: SCBU mean Special Care Baby Unit.

Table 4: Time of delivery with Fetal and Maternal outcome

VARIABLES	Time of delivery		Chi-square	P-value
	On-hour N (%)	Off-hour N (%)		
APGAR score at 1min				
<4	1(12.5%)	7(87.5%)		
4-6	18(30.5%)	41(69.5%)	2.445	0.295
7 and above	88(36.2%)	155(63.8%)		
APGAR score at 5mins				
<4	1(33.3%)	2(66.7%)		
4-6	1(12.5%)	7(87.5%)	1.765	0.414
7 and above	105(35.1%)	194(64.9%)		
Outcome of APGAR score of < 7 at 1min				
Perinatal mortality	1(33.3%)	2(66.7%)		
SCBU admission	3(11.5%)	23(88.5%)		
Nursed by mothers side	15(40.5%)	22(59.5%)	6.297	0.043*
Post partum hemorrhage				
Yes	7(41.2%)	10(58.8%)	0.353	0.552
No	100(34.1%)	193(65.9%)		
Maternal Packed cell volume				
30 and above	83(33.9%)	162(66.1%)		
26-29	18(36.0%)	32(64.0%)	0.292	0.864
25 and below	6(40.0%)	9(60.0%)		
Maternal Blood Transfusion				
Yes	5(55.6%)	4(44.4%)	1.815	0.178
No	102(33.9%)	199(66.1%)		

Note: SCBU mean Special Care Baby Unit.

Table 5: Fetal outcome with booking status, referral status and accoucher

	Low Apgar score at 1 minute			Chi-square	P-value
	Perinatal mortality (%)	SCBU admission (%)	Nursed by mother-side (%)		
Booking Status					
Booked	2(5.1%)	9(23.1%)	28(71.8%)		
Registered	0(0.0%)	0(0.0%)	1(100.0%)	12.624	0.013*
Un-booked	1(3.8%)	17(65.4%)	8(30.8%)		
Referral status					
Primary Health Care	0(0.0%)	2(50.0%)	2(50.0%)		
Secondary Health Care	0(0.0%)	14(70.0%)	6(30.0%)	13.382	0.010*
Not referred	1(50.0%)	1(50.0%)	0(0.0%)		
Accoucher					
Nurse/Midwife	1(12.5%)	0(0.0%)	7(87.5%)		
House Officer	0(0.0%)	0(0.0%)	2(100.0%)		
Registrar	2(6.1%)	17(51.5%)	14(42.4%)	12.007	0.151
Senior Registrar	0(0.0%)	7(35.0%)	13(65.0%)		
Consultants	0(0.0%)	2(66.7%)	1(33.3%)		

DISCUSSION

Birth in the hospital during off-hour accounts for about two-thirds of all deliveries in the present study, this was higher than the 50% reported for a similar study; suggesting an increased adverse perinatal outcome of hospital delivery at night [6].

Off-hour delivery was associated with an increased risk of perinatal morbidity and/or mortality as against on-hour delivery; 66.7% vs. 33.3% and 88.5% vs. 11.5% for perinatal mortality and SCBU admissions respectively; this was statistically significant ($p<0.05$). The findings in this study is similar to, but more pronounced than those of retrospective studies based on data from the Netherlands perinatal registry[3,6], the latter study found 1.7% and 0.19% increase in adverse outcome and perinatal mortality respectively. Among the infants with poor Apgar score at 1 minute in this study, very few suffered perinatal mortality; this is in agreement with 5% reported in effect of hospital delivery during off-hour on perinatal outcome [3], and 5.5% reported in another study from Pakistan [21]. The risk of perinatal morbidity were concentrated in the un-booked subgroup which accounts for about one third of the SCBU admission ($p<0.05$), a study from south eastern Nigeria [22] had shown increase risk in birth asphyxia in un-booked patient (80%) compared to booked patient (20%). Out of the 17 SCBU admissions in this subgroup, majority were referred from secondary health facilities amounting to 70% of SCBU admission in the un-booked category, this might probably be due to the extent of intervention before referral. There was significant statistical relationship between perinatal morbidity and referral status ($p<0.05$). However two thirds of perinatal mortality recorded was seen in booked patient.

Few (5.5%) of the patient in this study had postpartum hemorrhage which is just below the worldwide prevalence rate of 6%[23], half of these patients delivered during the off-hour and about 3% of them had blood transfusion, which is about ten times the overall blood transfusion rate for primary postpartum hemorrhage in another study; a tertiary care hospital review of transfusion for primary post-partum haemorrhage, [24] though the finding in our study was not statistically significant ($p > 0.05$). It was however noted that about half in the on-hour group had blood transfusion due to post-partum hemorrhage as against about two-fifth in the off-hour group.

Sixty seven babies have low Apgar score (< 7) at 1 minute accounting for about one fifth of all deliveries; about half of these babies were delivered by registrar; there was no significant statistical relationship between fetal outcome and cadre of accoucher at the delivery. The category of accoucher present at the delivery of these babies with low Apgar score at 1 minute probably reflects the preparedness for possible

poor perinatal outcome in this category of babies.

CONCLUSION

More deliveries occur during off-hours and were associated with an increased risk of perinatal morbidity and / or mortality. There is need to reappraise our practice, the facilities being deployed into use during off-hour period, and appropriate measures taken to reduce the risk of mortality and morbidity in this group of patients.

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ASSESSMENT TOOLS FOR PAIN SEVERITY IN THE ELDERLY: A REVIEW

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ABSTRACT:
Pain is a common complaint among older people, which may be associated with poor outcomes. This review covers the four main types of tools available to assess pain severity, namely the Numeric Rating Scale (NRS), Visual Analogue Scale (VAS), Pictorial Pain Scale (PPS), and Verbal Descriptor Scale (VDS). These tools have been shown to be valid and acceptable for use in older people. While these tools have good validity, studies suggest that older people prefer VDS and NRS. The NRS has good psychometric properties and has the ability to illustrate different levels of scale, so would probably be the first choice for use in suitable patients. For those with mild-moderate cognitive impairment, VDS and PPS may be preferable. Patients with severe cognitive deficits will require other approaches to assessment, particularly observational methods.

Keywords: Aged, Pain Measurement, Symptom Assessment, Visual Analog Scale

INTRODUCTION:

Pain is a common presenting complaint, causing people to seek medical attention [1]. After the age of 60 years, the incidence of pain increases more than two-fold, with the pain frequency increasing every ten years [2, 3]. Pain in older people is often underestimated or unrecognised, resulting in inadequate treatment. Although factors such as communication difficulty or cognitive impairment may limit self-reporting, older people are less able to express their pain experiences verbally or in sufficient detail [2, 4, 5]. When older people are asked directly about pain symptoms, they are also less likely to report pain [6]. Pain is associated with suffering and deterioration in function, depression, increased risk of hospital admission and poor quality of life [7, 8]. Thus, it is important for clinicians to develop practical skills and have suitable and appropriate tools to assess pain in older people as the initial step towards effective pain management [9, 10].

A clinician must first determine the person's ability to read, hear and understand instructions for completing the tool before selecting the

appropriate pain measurement scale. It is also important to correct sensory losses, for example, with hearing aids or corrective lenses prior to administering the tools. Adaptation of tools may be required for those with more advanced cognitive impairment. For individuals with special needs, clinicians may need to match or combine several tools to adapt and meet the older person's capabilities [11].

This review covers pain severity assessment tools, focusing on preferred tools for use in older people. The specialised aspect of pain assessment in advanced dementia is outside the scope of this review.

Self-reporting is generally accepted as the most accurate and reliable approach for pain intensity assessment. The Numeric Rating Scale (NRS), Visual Analogue Scale (VAS), Pictorial Pain Scale (PPS), and Verbal Descriptor Scale (VDS) have been shown to be valid and acceptable for use in older people, including those with mild to moderate cognitive impairment [2-3, 11].

Numeric Rating Scale (NRS):

The NRS involves asking a patient to rate their pain from 0 to 10, with 0 indicating no pain and 10 being extreme pain. This can be administered in a verbal or written form. The verbal approach requires speech and abstract thought, while the written version requires vision and use of hands to categorise pain severity. The NRS has been shown to be a reliable and valid tool among older people [12-15]. Among 267 acute inpatients aged between 16 and 91 years, NRS was the preferred tool by about 35% of the elderly [16]. A study of 175 older and younger people comparing five NRS pain scales for sensitivity found that a 21-point scale was the most sensitive to measuring changes in pain severity and preferred by many older people [12]. However, a significant portion of older people, including those without cognitive impairment, have some difficulty responding to this scale [14, 17]. Thus, for practical reasons, the 10-point scale is recommended. In addition, although the NRS can be oriented either vertically or horizontally, a vertical presentation is often preferred by older people [18].

Visual Analogue Scale (VAS):

The VAS consists of a 10-cm line, labelled on the left side as 'No pain' and 'Most intense pain' on the right side [18, 19]. The VAS has relevant psychomotor properties for older people. It is relatively easy to use, but requires abstract thought, sensory, motor and perceptual abilities. The VAS has been shown to have a higher failure rate than the other tools when used among older people [12, 13].

A study using experimental pain stimuli in 89 older and 86 young people showed that failure to use VAS correctly was related to educational level, cognitive impairment and motor abilities [20]. It was also shown that the VAS was the least preferred tool for quantifying pain severity in older people [16]. Similar to the NRS, a

vertical presentation of the 10-cm line was preferred to the horizontal presentation [11].

Pictorial Pain Scales (PPS):

Pictorial pain scales were initially developed for use in children to assess pain severity. The two main types are FACES Pain Scale (FPS) [21] and Wong-Baker Pain Scale [22], which consists of a series of progressively distressed facial expressions. The patient chooses the face that represents or closely represents the severity and intensity of their current pain. Psychometric evaluations of the FPS suggest that it is a valid and reliable tool to assess pain intensity in cognitively intact and mild to moderate cognitively impaired older people [23]. Preliminary evaluations of FPS comparing cognitively intact and impaired older people suggest that it measures a broader pain construct, including affective and sensory components [24, 25].

Although there is limited evaluation among a larger sample of cognitively impaired older people, it remains the preferred tool for use in older people with limited education, low literacy levels and dyslexia. In addition, it was the most preferred tool for pain assessment by up to 53% of older people surveyed, compared to the other tools [16].

Verbal Descriptor Scale (VDS):

The VDS consists of a series of phrases representing different levels of pain intensity, ranging from no pain, mild pain, moderate pain, severe pain, extreme pain and the most intense pain. It has good reliability and validity in older people [13]. This is suitable for articulate patients because it is easier for patients to interpret or express their pain and pain intensity in verbal terms. The VDS is the most preferred scale among pain intensity scales evaluated with older adults. In a study evaluating 89 older people, 100% were able to complete the scale, with a completion rate of 73% when used among cognitively impaired adults [12, 13]. Another form of the VDS is the Present Pain Inventory (PPI), which uses broader adjectives to describe pain such as discomfort, distressing, none, mild, horrible and excruciating. The PPI was shown to be feasible for use in older people, including mild to moderate cognitive impairment, with 65% completion rate, and good validity [26-28]. However, there were several difficulties noted by researchers using the PPI compared with a descriptor scale with simpler adjectives [29].

Another variation of VDS is the Pain Thermometer (PT) that illustrates a vertical scale with adjectives describing pain along the scale. Studies indicate that many older adults prefer PT to the VAS or to the NRS, with PT showed good psychometric properties in persons with cognitive impairment [12, 15].

CONCLUSION:

There are several assessment tools for self-reporting pain severity, which are appropriate for use in older people, depending on their

cognitive, verbal, auditory, motor abilities and educational level. Clinicians should identify an assessment tool or combination of tools that patients can use consistently during each assessment. While these tools have good validity, studies suggest that older people prefer VDS and NRS. The NRS has good psychometric properties and has the ability to illustrate different levels of scale, so would be the first choice for use in suitable patients. For those with mild-moderate cognitive impairment, VDS and PPS may be preferable. Patients with severe cognitive deficits will require other approaches to assessment, particularly observational methods.

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LETTER TO THE EDITOR

TYPHOID FEVER DIAGNOSIS IN DEVELOPING COUNTRIES: THE WIDAL TEST DILEMMA

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Dear Editor,

We would like to draw the attention of the scientific and clinical service community to the situation in the developing countries as regards the proper diagnosis of typhoid fever, and the implications on treatment and possible antibiotic resistance.

The State of Things

Typhoid fever is a systemic infection resulting from the invasion of the gastrointestinal tract by *Salmonella enterica*, serovar typhi, transmitted feco-orally. It is of global health significance, as about 11 to 21 million people are infected annually with 128,000 to 161,000 annual mortality worldwide [1]. It is particularly of concern to people living in developing countries; such as in Africa, the Americas, South-East Asia and the Western Pacific, where poverty, poor hygiene and lack of clean water continue to drive the infection[1,2]. The diagnosis of typhoid fever requires clinical and microbiological evidence. Symptoms though non-specific, include prolonged high-grade fever, abdominal pain, fatigue, headache, nausea, and constipation or diarrhoea. The gold standard for establishing the diagnosis of typhoid fever is isolating the organism from blood, stool, urine and aspirated bile via culture, typically after a week of infection. These cultures often take between 3-7 days for results to be made available [3].

The Widal test is a serologic test which is over a century old, and is based on the principle of agglutination (antigen-antibody reaction), developed to detect *Salmonella typhi* flagellar (H) and lipopolysaccharide (O) antigens in sera of infected individuals[4]. This test still holds sway in many parts of the world where

resources are limited and the endemicity of typhoid fever is high, and it is often the only test available for diagnosing the infection in these places [5]. This is because of the low cost, availability and low requirement for expertise of the Widal test when compared with some other tests. It is however known that several other illnesses which may share symptomatology with typhoid fever, have been shown to offer cross-reactivity on the Widal test especially in typhoid endemic areas, such as non-typhoidal salmonella infections, malaria, dengue fever, miliary tuberculosis, endocarditis, chronic liver disease and brucellosis [4]. Lack of standardization of the antigens used in the test, repeated exposure to *Salmonella spp.* over time, previous typhoid fever immunization, difficulty in establishing a steady-state baseline titre for the population are factors that contribute to the poor sensitivity and specificity of the test. A single Widal test may have some diagnostic relevance in an unvaccinated or unexposed patient in a non-endemic region, but its usefulness is questionable in typhoid endemic regions where repeated exposure to the organism would likely stimulate higher baseline antibody levels [6]. Studies have also shown that individuals with culture-positive typhoid fever may fail to show the expected reaction on Widal test, implying that a negative Widal test does not necessarily rule out typhoid infection [4]. Schroeder, in a study established that the Widal test is non-specific, poorly standardized, confusing and difficult to interpret [7]. Over-diagnosis and poor antibiotic stewardship are the resultant effects of continued use of this test. In this era of established resistance of *S. typhi* to former first line drugs such as ampicillin, chloramphenicol and sulfamethoxazole-trimethoprim, in addition to rising resistance to quinolones and third generation cephalosporins (the current first- and second-line medications)[8,9], is continued use of this test really beneficial to the patient and the community on the long run?

The way forward

The following are strategies that could be implemented by stake-holders in resource-poor settings for better diagnosis and management of typhoid fever.

- Widal test should only be considered useful in endemic regions if patients have four-fold or more increases in O or H agglutinin titres in serum specimens obtained 2 to 3 weeks [4].
- Establishment of a steady state or baseline titre at the community level, though tasking, will help set a reference point for interpreting results. This will increase suspicion of an actual typhoid infection [4].
- Standardization and maintenance of the antigens used can improve the value of the Widal test. Studies have shown however that irrespective of the composition and standardization of the antigens used, isolation of aetiologic agent will always be superior [10].

- Close communication between the managing physician and the laboratory should exist, as technique variation in individual laboratories may affect the Widal titres and thus the expected antibody titre rise may not be seen even in bacteriologically confirmed patients [4].
- It must be stressed that the role of Widal test is to increase the suspicion for typhoid fever, not to confirm it. Its diagnostic use should be limited to situations where no other confirmatory test is available.
- Rapid diagnostic tests with high specificity and sensitivity should be explored [11]. Research and development breakthroughs in this area would not only reduce diagnostic delays, but will reduce the overall cost and logistics required in diagnosing typhoid fever.
- Newer techniques such as co-agglutination have been found to be highly sensitive for diagnosing typhoid fever, and can be adopted for screening purposes. Polymerase chain reaction is highly specific and can be used for diagnosing typhoid fever in patients who are culture negative [12].
- In the absence of rapid kits, investments should be made by stakeholders (from health policy makers to hospital administrators) to provide needed infrastructure and personnel for accurate microbiological diagnoses to be made.

CONCLUSION

There is need for countries where the use of Widal test is prevalent, to explore and invest in alternative means of rapidly and accurately diagnosing typhoid fever, as this would have a positive effect on the war against antimicrobial resistance. If the Widal test must be used, it should be used to increase the suspicion of typhoid fever, especially when a four-fold rise in titre has been demonstrated in paired samples taken two weeks apart. Baseline titres should be established locally, to serve as a reference point when interpreting results.

CONFLICT OF INTEREST

There are no conflicts of interest to declare

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AIMS AND SCOPE:

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Book:

Gillett JE. The health of women in Papua New Guinea. PNGIMR: Kristen Press, 1991

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