National Guideline for Management of Stroke in Sri Lanka

Ministry of Health Sri Lanka

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NATIONAL GUIDELINE FOR MANAGEMENT OF STROKE IN SRI LANKA

Ministry of Health

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for development of the

National Guideline for Management of Stroke in Sri Lanka.

Ministry of Health

Message from the Honourable Minister of Health

I am delighted and feel honoured and privileged to send this message to the first ever National Guideline for the Management of stroke and TIA published by the Ministry of Health in collaboration with the relevant professional colleges and associations.

Disabilities caused by stroke not only impact the individual affected but also hamper the functioning of the family unit as well as the human workforce of our country. Our emphasis should be to prevent this disabling disease and to provide the most up to date care for the ones who were affected by stroke. I consider it is my utmost priority to ensure that the Sri Lankan Healthcare system is equipped with the necessary facilities and the skills to achieve that.

The guideline encompasses recommendations to administrators to organize the health system to deliver the standard care for stroke and to clinicians to facilitate optimum clinical management of stroke. Implementation of these guidelines island-wide would certainly establish the delivery of up to date treatment to all stroke patients across the board in Sri Lanka.

Once again, I extend my sincere gratitude to all the dedicated professionals who have contributed their expertise to the development of this Guideline. Their hard work and commitment to improving stroke care in Sri Lanka are commendable. Together, let us work towards a future where the impact of stroke and TIA is minimized, and to ensure that every individual receives the care they need to lead a healthy and fulfilling life.

Dr Ramesh Pathirana (M.P.)
Minister of Health

Message from the Secretary, Ministry of Health

The National Guideline for Management of Stroke being published by the Ministry of Health in collaboration with the Professional Colleges and Associations is a great leap forward in upgrading the management of strokes in Sri Lanka.

Stroke is a common and a life threatening or disabling non-communicable disorder which is considered a priority area by the Ministry of Health. It poses a significant health burden on our population requiring considerable amount of resources and skilled staff for optimum care. Comprehensive stroke care requires inter-ministerial and inter-professional collaboration to establish hospital and community based multidisciplinary services. The National Guideline for Management of Stroke will be a fundamental tool in establishing required coordination for stroke services in the hospitals of the Ministry of Health and in the community effectively.

Consistency of available services islandwide is imperative for a common disorder like stroke. Healthcare professionals in the multidisciplinary care teams in every corner of the Island requires proper training to achieve uniformity in providing optimum care. In this regard, it is hoped the planned National Stroke Centre Mulleriyawa (NSCM), while providing facilities for patients in the Western Province, would play a key role in coordinating and monitoring services between all provinces.

Providing facilities for optimum rehabilitation is an important aspect in comprehensive care for stroke patients. Moving forward with the rest of the world, Sri Lanka has already commenced training specialists on Medical Rehabilitation. Allocating these trained medical specialists along with nurses and allied health professionals to centers that provide stroke care services is crucial.

The Ministry of Health continues in its relentless efforts in improving healthcare services for all the people of Sri Lanka. I would like to extend my deepest appreciation to all the contributors that led to the development of this up to date Guideline. I am convinced that this will ensure that every patient receives the highest quality of care they deserve.

Warm regards,

Dr P G Maheepala
Secretary, Ministry of Health

Message from the Director General of Health Services

I am delighted that the Ministry of Health was able to prepare the National Guidelines for Management of Stroke as an activity of the National Steering Committee for Stroke chaired by me with the objective of streamlining stroke care in Sri Lanka. Stroke is a major non-communicable disease with high morbidity and mortality accounting for the 5th leading cause of hospital deaths in Sri Lanka. I am pleased to note that, as intended by the Steering Committee, the release of the National Guidelines will provide evidence-based recommendations and best practices for health care professionals involved in the management of stroke and TIAs.

Stroke is a common disorder that requires prompt and appropriate management to minimize associated morbidity and mortality. There has been a considerable growth in the knowledge on diagnosis and management of stroke over last several decades that has led to a significant improvement in the outcome of the stroke patients. This guideline has incorporated many of those latest research evidence with recommendations to organize the local health care system to practice them. It is the duty of all administrators and other healthcare professionals who are concerned on stroke care be acquainted with the National Guideline on Management of Stroke in Sri Lanka.

I encourage healthcare institutions to establish dedicated Stroke Units and to organize multidisciplinary teams to optimize the management of stroke patients. Collaborating among specialists including, internal medicine physicians, neurologists, emergency physicians, radiologists, rehabilitation specialists, nurses and allied health professionals is crucial for achieving the best outcome for our stroke patients.

Furthermore, along with primary prevention programmes, it is important to raise awareness about the signs and symptoms of stroke and TIA among the general population. Knowledge on timely diagnosis and on available facilities for time dependent treatment are crucial for successful implementation of services in healthcare institutions.

I wish to convey my sincere gratitude to all the professional colleges/associations and to the individuals who contributed with their expertise and time to achieve the publication of the Guideline a reality today. Their commitment is commendable.

Finally, I appeal to all healthcare professionals to familiarize themselves with the updated guidelines and to incorporate them into their clinical practice in order to deliver the benefits of new knowledge to all stroke patients in Sri Lanka.

Sincerely,

Dr Asela Gunawardana
Director General of Health Services

Message from the Deputy Director General (Medical Services) II

Doctors frequently encounter patients with stroke in their routine clinical practice. Over the last several decades, numerous scientific advances have occurred in management of stroke. The establishment of stroke units where patients after stroke receive coordinated rehabilitation from a well-trained multidisciplinary team of compassionate health care professionals is an important development in this regard. Stroke Unit care has been proven to be one of the most effective forms of treatment for better outcome following stroke. The goal of rehabilitation is to improve a person's quality of life by enhancing their post-stroke functioning and independence in activities of daily living.

Owing to shortage of resources, majority of stroke patients in Sri Lanka receive suboptimal care, as do in many other countries in the region. It has been difficult to establish coordinated interdisciplinary team-care even in environments where allied healthcare professionals, nurses and other essential personnel are accessible. The National Guideline for Management of Stroke in Sri Lanka will essentially support these centers to organize themselves better to provide an acceptable form of care for stroke patients in Sri Lanka.

I appreciate the contribution made by the PSSP Project by assisting the publication of "National Guideline for Management of Stroke in Sri Lanka". The guideline comprises chapters authored by a team of medical specialists, nurses and allied healthcare professionals who are involved in providing care to stroke patients in hospitals. There are clear diagrammatic explanations for the convenience of readers.

I would like to express my sincere appreciation to all those professional colleges/ associations and to the individuals who contributed with their expertise providing the necessary assistance in developing National Guideline for the management of stroke for the first time in Sri Lanka.

Dr G Wijesuriya
Deputy Director General (Medical Services) II

Message from the Director Medical Services

The National Guideline for Management of Stroke in Sri Lanka provides authoritative, evidence-based, practice guidance to improve the quality of care delivered to every patient who has suffered a stroke in Sri Lanka regardless of age, gender, type of stroke and location.

Numerous clinical problems may develop as a consequence of stroke. In addition to physical disability, there may be resentment and restricted involvement in activities due to impairment of cognitive, speech, swallowing and sphincter function. All those disabilities may affect social interactions of the patient. These disabilities of the stroke patient demand the expertise of multidisciplinary teams for rehabilitation. They include instructions for coping strategies as well. Every member of the multidisciplinary team that includes doctors, nurses and allied health professionals, may not be important for rehabilitation of each and every stroke patient. Thus, in instances where there could be shortage of certain categories of staff, exchange of roles become important particularly in resource poor settings.

I would like to convey my heartfelt gratitude to all the dedicated professionals who contributed their skills to the creation of this Guideline. Their dedication to improving stroke care in Sri Lanka is admirable.

Let us work together to create a future in which the impact of stroke and TIA is minimized and every individual receives the treatment they require to live a healthy and fulfilled life.

Dr Ayanthi Karunaratne
Director Medical Services

Guideline Development Committee

CONTRIBUTORS

Following professionals contributed with their time and expertise considerably above and beyond the usual call of duty to the development of this edition of the National Guideline on Management of Stroke. We acknowledge their contribution without reservations.

Editorial Board

Dr Padma S Gunaratne
MBBS (SL), MD (SL), FRCP (Edin, Glasg, Lond), FCCP, Hon FRACP, FAAN, FWSO
Consultant Neurologist & Chairperson, Expert Committee on Medical Rehabilitation
Sri Lanka Medical Association

Prof Thashi Chang
MBBS, MD, MRCP (UK), MRCP (UK) (Neurol), DPhil (Oxon), FCCP, FRCP (Lond)
Professor in Neurology
Department of Clinical Medicine, University of Colombo

Dr M Saamir Mohideen
MBBS, MD, MRCP (Neurology)
Consultant Neurologist
National Hospital of Sri Lanka

Prof Jithangi Wanigasuriya,
MBBS, MD, MPhil, FRCPCH
Professor in Paediatric Neurology
Department of Paediatrics, University of Colombo

Dr Sarath Gamini de Silva
MD (Col), FRCP (Lond), FRACP (Hony), FCCP
Consultant Physician

Advisory Board

Chairperson

Dr Padma Gunaratne
MBBS(SL), MD(SL), FRCP(Edin, Glasg, Lond), FCCP, Hon. FRACP, FAAN, FWSO
Consultant Neurologist

Ministry of Health

Co-Chair
Dr G Wijesuriya
DTCD, MSc (Med Admin), MSc (Food & Nutrition)
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Ministry of Health

Dr Lal Panapitiya
MBBS, MSc, MD (Medical Administration)
Consultant in Medical Administration and Health Management
Deputy Director General (Medical Services) I
Ministry of Health

Dr Champika Wickramasingha
MSc (Com Med), MD (Com Med),
Deputy Director General Non-Communicable Diseases
Ministry of Health

Dr Priyantha Athapattu
MBBS, MSc (Med Admin), UN-DIPPCA
Director Tertiary Care Services
Ministry of Health

Dr Samindi Samarakoon
MBBS, MSc (Com Med), MSc (Med Admin), MD (Med Admin), MBA
Director Non-Communicable Diseases
Ministry of Health

Dr Ayanthi Karunaaratne
MBBS, MSc (Disaster Management), MIPH, MHM, MSC (Med Admin)
MD (Med Admin)
Director (Medical Services), Ministry of Health

Dr Dewanee Ranaweera
MBBS (Col), MSc, MD (Com. Med.)
Specialist in Community Medicine, Director, Directorate of
Healthcare Quality and Safety, Ministry of Health

Dr Dilantha Dharmagunawardene
MBBS, MSc (Medical administration), MD (Medical Administration)
PG Certificate in Medical Education
Doctoral Researcher – School of Public Health and Social Work
Faculty of Health
Queensland University of Technology, Australia

Dr Gayantha Weediyawatta
MBBS, MSc (Biomedical Informatics), MD (Health Informatics)
Acting Consultant in Health Informatics
Medical Services Branch
Ministry of Health

Mrs M B C Samanmalie
RN, RM, BScN, MScN (Adelaide), MPM (SLIDA)
Director Nursing (Medical Services)
Ministry of Health

Sri Lanka Medical Association

Dr Padma S Gunaratne
MBBS (SL), MD (SL), FRCP (Edin, Glasg, Lond), FCCP, Hon FRACP, FAAN, FWSO
Consultant Neurologist & Chairperson, Expert Committee on Medical Rehabilitation, SLMA

Prof Saraji Wijesekara
MBBS, DCH, MD (Paediatrics), FRCPCH (UK)
Professor in Paediatric Neurology, University of Sri Jayawardanapura &
Consultant Paediatric Neurologist, Teaching Hospital Colombo South

Association of Sri Lankan Neurologists

Dr Pyara Rathnayaka
MBBS, MD (Paed)
Consultant Paediatric Neurologist, Lady Ridgeway Hospital for Children

Dr Darshana Sirisena
MBBS, MD (Col.)
Consultant Neurologist, National Hospital of Sri Lanka

Dr Arjuna Fernando
MBBS, MD (Med), MRCP
Consultant Neurologist, National Hospital of Sri Lanka

Dr Senaka Bandusena
MBBS, MD, FCCP
Consultant Neurologist, National Hospital of Sri Lanka

Dr Gamini Pathirana
MBBS, MD, FCCP, FAAN
Consultant Neurologist, National Hospital of Sri Lanka

Dr T Thivakaran
MBBS, MD (Colombo), FRCP (Lond), MRCP Neurology (UK), FCCP
Consultant Neurologist, National Hospital of Sri Lanka

Prof Ajini Arasalingam
MBBS (Col), MD (Col), MRCP (UK), FRCPE, FRCP (Lond), FCCP
Professor in Neurology, Faculty of Medicine, University of Jaffna

Dr Manjula Caldera
MBBS, MD, MRCP (UK), MRCP (Neuro)
Consultant Neurologist, Teaching Hospital, Anuradhapura

Dr M Saamir Mohideen
MBBS, MD, MRCP (Neurology)
Consultant Neurologist
National Hospital of Sri Lanka

Sri Lanka College of Internal Medicine

Dr Ganaka Senaratne
Consultant Physician in Internal Medicine, Karapitiya

Dr Shamitha Dasanayaka
MBBS, MD (Col), MRCP (UK), FRCP (lond), FRCP (Edin), FACP (USA), FCCP (Cey)
Consultant Physician in Internal Medicine
Colombo North Teaching Hospital, Ragama

Dr Anoja Rajapakse
MBBS, FCCP, FACP, FRCP, FRCPE
Consultant Physician, Private sector, Colombo

National Stroke Association of Sri Lanka

Dr Harsha Gunasekara
MBBS, MD, FRCP, FCCP
Consultant Neurologist
Sri Jayawardanapura General Hospital

Sri Lanka College of Cardiologists

Dr Gnanamoorthy Mayurathan
MBBS, MD, MRCP, FCCP, FESC
Consultant Cardiologist

Ceylon College of Physicians

Prof Arosha Dissanayake
MBBS, MD, FRCP, FRCPE, FRCPSG, FCCP
Professor in Medicine and Specialist Physician
Ceylon College of Physicians

Sri Lanka College of Emergency Physicians

Dr Senitha Liyanage
MBBS, (Colombo), MD (EM), MRCEM (UK), DCCM, DDM, CCA
Consultant Emergency Physician

Harendra Cooray
MBBS (AIIMS), MD, DCCM
Consultant Emergency Physician
National Hospital of Sri Lanka

College of Specialists in Rheumatology & Rehabilitation – Sri Lanka

Dr Gunendrika Kasthurirathne
MBBS, MD
Consultant in Rheumatology and Rehabilitation
National Hospital of Sri Lanka

Sri Lanka College of Radiologists

Dr Shantha Hettiarachchi
Consultant Radiologist

Interventional Radiologists

Dr Prasad De Silva
MBBS (Col), MD-Radiology (Col), AFIR. FSCR. FBCPS (Hon)
Consultant Interventional Radiologist & Head, Department of Radiology
National Hospital of Sri Lanka

The College of Medical Administrators of Sri Lanka

Dr Lal Panapitiya
MBBS, MSc, MD (Medical Administration)
Consultant in Medical Administration and Health Management
Deputy Director General (Medical Services) I
Ministry of Health

Sri Lanka College of Paediatricians

Prof Saraji Wijesekara
MBBS, DCH, MD (Paediatrics), FRCPCH (UK)
Professor in Paediatric Neurology, University of Sri Jayawardanapura &
Consultant Paediatric Neurologist, Teaching Hospital Colombo South

Suwa Seriya Foundation

Dr Sri Lal de Silva
MBBS, DCH, MD, FRCP
Chief Medical Officer, 1990 Suwa Seriya Pre-Hospital Care Foundation

Department of Social Services

Mr Chandana Ranaweera Arachchi
BSc.sp (Agri). MA (Sociology)
SLAS Class I, Director, Department of Social Services, Sri Lanka

Contributors

Dr Padma S Gunaratne
MBBS (SL), MD (SL), FRCP (Edin, Glasg, Lond), FCCP, Hon FRACP, FAAN, FWSO
Consultant Neurologist
Chairperson, Expert Committee on Medical Rehabilitation, SLMA

Dr Harsha Gunasekara,
MBBS, MD, FRCP, FCCP
Consultant Neurologist
Sri Jayawardanapura General Hospital

Prof Ajini Arasalingam
MBBS (Col), MD (Col), MRCP (UK), FRCPE, FRCP (Lond), FCCP,
Professor in Neurology
Faculty of Medicine, University of Jaffna

Dr Anoja Rajapakse
MBBS, FCCP, FACP, FRCP, FRCPE
Consultant Physician
Private sector, Colombo

Dr Dilantha Dharmagunawardene
MBBS, MSc (Medical administration), MD (Medical Administration), PG Certificate in Medical Education
Doctoral Researcher – School of Public Health and Social Work, Faculty of Health, Queensland University of Technology, Australia

Dr Dewanee Ranaweera
MBBS (Col), MSc, MD (Com.Med.)
Specialist in Community Medicine
Director, Directorate of Healthcare Quality and Safety, Ministry of Health

Dr Senaka Bandusena
MBBS, MD, FCCP
Consultant Neurologist, National Hospital of Sri Lanka

Dr Harendra Cooray
MBBS (AIIMS), MD, DCCM
Emergency Physician
National Hospital of Sri Lanka

Dr Manjula Caldera
MBBS, MD, MRCP (UK), MRCP (Neuro)
Consultant Neurologist
Teaching Hospital, Anuradhapura

Prof Saraji Wijesekara
MBBS, DCH, MD (Paediatrics), FRCPCH (UK)
Professor in Paediatric Neurology
University of Sri Jayawardanapura & Consultant Paediatric Neurologist, Teaching Hospital Colombo South

Dr T Thivakaran
MBBS, MD (Colombo), FRCP (Lond), MRCP Neurology (UK), FCCP
Consultant Neurologist
National Hospital of Sri Lanka

Dr Prasad De Silva
MBBS (Col), MD-Radiology (Col), AFIR. FSCR. FBCPS (Hon)
Consultant Interventional Radiologist & Head, Department of Radiology
National Hospital of Sri Lanka

Dr K M R Kannangara
MBBS, MD (Radiology)
Consultant Interventional Radiologist
Apeksha Hospital, Maharagama

Dr M I Siraj
MBBS, MSc (Med Admin), MD (Med Admin), MBA, PGD (Healthcare Quality and Patient Safety), MGD (Monitoring & Evaluation, Dip in Productivity
Acting Consultant in Medical Administration
Ministry of Health

Dr Roshan Fernando
MBBS, DIPPCA (SL)
Medical Officer, Office of the Deputy Director Medical Service (II)
Ministry of Health

Mr Iranga N Aluthge
MSc SM (Col), BSc (Hons) Physiotherapy, HDPT, Dip Ed.sc, CTHP, ACWS, CMT, CCRehab, FCSPSL, LMSLSP, RPHCPC (UK)
Principal, School of Physiotherapy and Occupational Therapy
National Hospital of Sri Lanka

Dr Nandana Welage
DipOT (SL), BScOT (SL), MScOT (HK), PhD (AUS)
Senior Lecturer / Occupational Therapist
Department of Disability Studies, Faculty of Medicine, University of Kelaniya

Ms Kithma Wasana J Dahanayake
HDOT (SL) BScOT (SL), DipES (SL)
Tutor in Occupational Therapy
School of Physiotherapy and Occupational Therapy, National Hospital of Sri Lanka

Mrs K Prabhani Dineshika
BSc SLT (Kelaniya), MSc Ling (Kelaniya)
Senior Speech and Language Therapist,
National Hospital of Sri Lanka

Mr Chandana Ranaweera Arachchi
BSc.sp (Agri). MA (Sociology)
SLAS Class I
Director, Department of Social Services, Sri Lanka

Mrs G Thushari Anuruddhika
BSc (Nursing) Hons (OUSL), Dip. in Nursing, Dip. in Teaching & Supervision
Supra Grade Nursing Officer
National Hospital of Sri Lanka

Coordinator of the Project

Dr Roshan Fernando
MBBS, DIPPCA (SL)
Medical Officer, Office of the Deputy Director Medical Service (II)
Ministry of Health

Abbreviations and Acronyms

AAC	–	Augmentative and alternative communication
ABCD2	–	Age, blood pressure, clinical features, duration, diabetes,
ACE	–	Angiotensin - converting enzyme
A&E	–	Accident and Emergency
AF	–	Atrial fibrillation
AFO	–	Ankle foot orthosis
AIA	–	Acute ischaemic attack
AIS	–	Acute ischaemic stroke
APLS	–	Anti phospholipid syndrome
APTT	–	Activated partial thromboplastin time
ARB	–	Angiotensin II receptor blocker
ASPECTS	–	Alberta stroke programme early CT score
AVM	–	Arterio - venous malformation
BP	–	Blood pressure
CADASIL	–	Cerebral autosomal dominant arteriopathy with sub - cortical infarcts and leukoencephalopathy
CAS	–	Carotid artery stenting
CBF	–	Cerebral blood flow
CBR	–	Community - based rehabilitation
CBV	–	Cerebral blood volume
CEA	–	Carotid end - arterectomy
CEBH	–	Colombo East Base Hospital
CN	–	Cranial nerves
CNS	–	Central nervous system
Cr	–	Creatinine
CRP	–	C - reactive protein
CPAP	–	Continuous positive airway pressure
CPSP	–	Central post stroke pain
CSF	–	Cerebro spinal fluid
CT	–	Computered tomography
CTA	–	Computerized tomography angiography
CTP	–	Computerized tomography perfusion
DALYs	–	Disability - adjusted life years
DGHS	–	Director general of health services
DHQS	–	Directorate for healthcare quality and safety

DOAC	–	Direct oral anticoagulants
DSA	–	Digital subtraction angiography
DVT	–	Deep vein thrombosis
DWI	–	Diffusion weighted imaging
EADL	–	Extended activities of daily living
ED	–	Emergency department
EF	–	Ejection fraction
EGG	–	Electroglottograph
EMT	–	Emergency medical technician
EPG	–	Electropalatograph
ETA	–	Estimated time of arrival
ETU	–	Emergency treatment unit
EVT	–	Endo - vascular therapy
FAST	–	Facial drooping, arm weakness, speech difficulties and time
FBS	–	Fasting blood sugar
FBC	–	Full blood count
FES	–	Falls efficacy scale
FFP	–	Fresh frozen plasma
FLAIR	–	Fluid - attenuated inversion recovery
FVL	–	Factor V Leiden
GCS	–	Glasgow coma scale
GLIM	–	Global leadership initiative on malnutrition
GLP	–	Glucagon like peptide
HCY	–	Homocystinuria
HDU	–	High dependency unit
HEB	–	Health education bureau
HS	–	Haemorrhagic stroke
IADL	–	Instrumental activities of daily living
ICA	–	Internal carotid artery
ICF	–	International classification of functioning
ICH	–	Intra cerebral haemorrhage
ICP	–	Intra cranial pressure
ICU	–	Intensive care unit
INR	–	International normalized ration
ISBRA	–	Identity, situation, background, assessment and request
IV	–	Intra venous

IVT	–	Intravenous thrombolysis
LDL	–	Low density lipoprotein
LFT	–	Liver function tests
LMWH	–	Low molecular weight heparin
Lp	–	Lipoprotein
LV	–	Left ventricular
MCA	–	Middle cerebral artery
MELAS	–	Mitochondrial encephalomyopathy, lactic acidosis, and stroke like episodes
MoH	–	Ministry of Health
MDT	–	Multidisciplinary team
MRA	–	Magnetic resonance angiography
MRI	–	Magnetic resonance imaging
MRS	–	Modified Rankin score
MT	–	Mechanical thrombectomy
MTT	–	Mean transit time
MTHFR	–	Methylenetetrahydrofolate reductase
MUAC	–	Mid upper arm circumference
NCCT	–	Non - contrast computered tomography
NHSL	–	National hospital of Sri Lanka
NIHSS	–	National institute of health stroke sale
NIMH	–	National institute of mental health
NSAID	–	Non - steroidal anti - inflammatory drugs
NSCM	–	National stroke centre Mulleriyawa
OPD	–	Outpatient department
OT	–	Operating theatre
PADL	–	Personal activities of daily living
Ped NIHSS	–	Paediatric national institute of health stroke scale
PCC	–	Prothrombin complex concentrate
PFO	–	Patent foramen ovale
POA	–	Period of amenorrhoea
PPH	–	Postpartum haemorrhage
PT	–	Prothrombin time
PWI	–	Perfusion weighted imaging
QMU	–	Quality management unit
RBS	–	Random blood sugar

rtPA	–	Recombinant tissue plasminogen activator
SAH	–	Subarachnoid haemorrhage
SALT	–	Speech and language therapy unit
SBP	–	Systolic blood pressure
SE	–	Serum electrolytes
SIRS	–	Systemic inflammatory response syndrome
SLMA	–	Sri Lanka Medical Association
SOP	–	Standard operating procedures
SWI	–	Susceptibility weighted imaging
TENS	–	Transcutaneous electrical nerve stimulation
TIA	–	Transient ischaemic attack
TnK	–	Tenecteplase
UH	–	Unfractionated heaprin
VKA	–	Vitamin K antagonists
WFNS	–	World Federation of Neurosurgical Societies
WHO	–	World Health Organization

Contents

Introduction to the Guideline

Stroke is a non-communicable disease which is the second leading cause of death worldwide. It is also the leading cause of disability in adults. The lifetime risk of developing a stroke in an individual has increased by 50% over the last 17 years and 1 in every 4 people is expected to have a stroke in their lifetime. There has been a 70% increase in the incidence of stroke, a 43% increase in deaths caused by stroke, a 102% increase in the prevalence of stroke and a 143% increase in Disability-adjusted life years (DALYs) following a stroke, in the three decades from 1990 to 2019. There is robust data to support that there are 10 stroke survivors for every 1000 people in the Sri Lankan community**.** Stroke is a catastrophe that attacks people leading to a 20% mortality within the first year after the index attack with 50% of survivors suffering significant morbidity. Thirty percent of stroke sufferers are between 20 – 60 years, the most productive period of their lives. This data provide ample evidence to support the need for health systems to prioritize stroke care and update health care professionals with knowledge and skills in the management of stroke.

Many advances have been made in stroke prevention, treatment, and rehabilitation over the past several decades. For instance, thrombolytic therapy can limit the extent of neurologic damage from a stroke and improve outcomes. However, this time-dependent treatment makes it essential to have proper organization of services and training of healthcare professionals for an effective thrombolytic programme in healthcare institutions. Furthermore, stroke unit care reduces death, disability, dependence and the duration of the hospital stay but the organization of services is complex and involves establishing stroke units under the care of teams of trained multidisciplinary professionals. Therefore, in order to establish a system with high efficiency and effectiveness, there needs to be organization of services in hospitals and in the community, and training of healthcare professionals. This comprehensive guideline provides guidance to the administrators and to the healthcare professionals in order to provide standard stroke care across the board for all stroke patients in Sri Lanka.

The goal of National Guideline for the Management of Stroke in Sri Lanka is to minimize brain injury by ensuring the practice of up-to-date care for acute stroke and maximize patient recovery by providing evidence-based rehabilitation along with long term care including measures of secondary prevention. The **Part I** provides guidance for organization of services and the **Part II** summarizes the clinical management of 3 types of strokes: (1) Ischemic Stroke and Transient Ischemic Attack; (2) Intracerebral Haemorrhage; and (3) Aneurysmal Subarachnoid Haemorrhage in adult and paediatric patients. Adopting the guidelines will undoubtedly improve stroke care immensely in Sri Lanka.

Editor's preface

"The National Guidelines for Management of Stroke in Sri Lanka" is the first ever national stroke guideline developed by the Ministry of Health under the supervision of the National Steering Committee for Stroke chaired by the Director General of Health Services (DGHS). This activity was supported by the Expert Committee on Medical Rehabilitation of the Sri Lanka Medical Association (SLMA), Association of Sri Lankan Neurologists, College of Medical Administrators of Sri Lanka, National Stroke Association of Sri Lanka, Sri Lanka College of Internal Medicine, Ceylon College of Physicians, Sri Lanka College of Emergency Physicians, College of Specialists in Rheumatology and Rehabilitation – Sri Lanka, Sri Lanka College of Radiologists, Interventional Radiologists, Sri Lanka College of Cardiology, Sri Lanka College of Paediatricians, Suwa Seriya Foundation and the Department of Social Services. The Guideline will be circulated among all stakeholders of stroke care in Sri Lanka and made accessible online at http://www.health.gov.lk/.

This Guideline is developed based on the fifth edition of the National Clinical Guideline (2016) for Stroke of the Intercollegiate Stroke Working Party of the Royal College of Physicians of London in the United Kingdom and National Clinical Guideline for Stroke for United Kingdom and Ireland (2023 Edition). It has been adapted to suit the local setting with a view to establish standardised stroke care in Sri Lanka. Although this document was primarily aimed at the development of stroke care services in government hospitals, we feel it should be useful for other sectors as well. There have been many advances in the management of stroke globally over the last three decades, but some of these have not been widely practised in Sri Lanka. The intention of developing this guideline is to set minimum standards of stroke care in Sri Lanka based on international guidelines and to ensure that they are uniformly adhered to throughout the country.

The published guideline consists of two parts, **part I** on the organization of services and **Part II** on the clinical management of stroke. There are many recommended time dependent interventions for acute stroke management. The long-term rehabilitation of stroke involves care delivered in stroke units by multidisciplinary teams. Effective implementation of these therapeutic interventions requires considerable reorganisation of the present structure of stroke care including accident and emergency (A&E) services and establishing stroke units in hospitals. The guideline committee has attempted to provide recommendations for reorganisation of stroke care services in order to incorporate up to date clinical practices in stroke management, in **Part I** of the guideline. **Part I** would be an essential reference for administrators with an interest in improving stroke care services in the country.

The guideline committee considered it important to include a chapter on the National Stroke Centre, Mulleriyawa (NSCM) which is an ongoing project of the Ministry of Health (MoH), in **Part I** of the document. Whilst providing up to date services for stroke patients in the Western Province, NSCM is planned to operate as the coordinating centre for all other provinces with facilities for training to ensure uniformity of services Islandwide.

NSCM would be facilitating the training of healthcare professionals on stroke care and monitoring the quality of the service provided.

Guidelines for clinical management of transient ischaemic attacks, acute stroke, secondary prevention, rehabilitation of stroke and paediatric stroke are addressed in **Part II** of the document. This section of the guideline would be an invaluable document for all healthcare providers including professionals and trainees of medical, nursing and allied healthcare specialities. Use of the guidelines by caregivers would improve their understanding of the management practices facilitating recovery of stroke patients.

There was a core group that decided on essential contents for the guideline. The same group reviewed all submissions for publication. Authors contributed by submitting up to date articles. There was a writing committee that finalized the document. The untiring commitment of members of all these committees made it possible to release this comprehensive document for stroke in Sri Lanka. I am very much indebted to all members of these committees.

The DGHS is acknowledged for his commitment to improving stroke care in Sri Lanka by initiating a National Steering Committee for Stroke and supporting the development of this guideline.

Dr Padma S Gunaratne
MBBS (SL), MD (SL), FRCP (Edin, Glasg, Lond), FCCP, Hon FRACP, FAAN, FWSO
Chairperson of the committee for development of
National Guideline for Management of Stroke in Sri Lanka
Consultant Neurologist and the Chairperson
Expert Committee on Medical Rehabilitation of the Sri Lanka Medical Association

How to use this Guideline

This guideline has been developed for healthcare professionals providing stroke care in Sri Lanka. However, it has useful information for patients and public to understand what to expect and how to manage a situation when a family members have had a stroke.

The clinician remains responsible for interpreting recommendations considering the specific clinical circumstances at hand, and whether new evidence might exist that could alter the recommendation of this guideline.

This book is in two parts, with part I describing the organisational structure for stroke care in government hospitals and part II describing clinical management of stroke and transient ischaemic attacks (TIA).

It is emphasised that these guidelines do not provide legal duties or provide legal entitlements but have been developed with the intention of improving stroke care in Sri Lanka. It is further emphasized that establishing services at hospitals will be done stepwise and the objective is to establish services described in the guideline to a maximum possible level given the resource limitations in the country.

Scope

The National Guideline for the Management of Stroke encompasses information pertinent to organisation of stroke services in government hospitals and the clinical management of stroke and TIA, in Sri Lanka.

Recommendations for organising services in different levels of hospitals in the Ministry of Health (MoH) include:

- National operational structure and care model for both acute stroke and for rehabilitation.
- Service organisation at hospitals mainly in Accident & Emergency Unit, the Department of Radiology and the Stroke Unit.
- Establishing the National Stroke Centre, Mulleriyawa.
- Human resources, equipment and medications required to establish stroke care.
- Services of the Department of Social Services.
- Maintaining information system for stroke services.
- Clinical quality indicators for monitoring and the guideline for improvement of quality of care.
- Capacity building of human resources to improve stroke services in hospitals of the MoH and recommendations to administrators of stroke services.
- Strategic objectives for development of stroke services in Sri Lanka.

The section on the clinical management of stroke and TIA addresses:

- Clinical management of stroke and TIA.
- Recovery and rehabilitation.
- Long-term care and secondary prevention.
- Stroke in paediatric age group.

The guideline discusses immediate management of subarachnoid haemorrhage (SAH) carried out at the admitting hospital but does not include surgical or neuroradiological interventions for SAH.

There is a section on the management of stroke in the paediatric age group in this guideline.

The guideline does not include:

- Primary prevention of stroke.
- Detailed recommendations on neurosurgical techniques.
- Detailed recommendations for neuroradiological techniques.
- General healthcare in detail apart from specific conditions related to stroke.

Aim of the Guideline

The aim of the guideline is to guide clinical practises in stroke care with the latest and best available evidence, and thereby to improve the quality of care for all people affected by stroke in Sri Lanka, irrespective of age, gender, type of stroke or location of the patient. The guideline would facilitate adoption of evidence-based stroke care to clinical practice.

After implementation of this Guideline, audit cycles of the quality of care relative to the recommendations in this Guideline will help to improve the standard of stroke care by guiding policy and the provision of infrastructure and facilities for stroke services in Sri Lanka.

This guideline would be useful for :

- All administrators who are interested in establishing organized stroke services in institutions under their purview.
- Clinicians who provide services for stroke patients.
- Students of medical, nursing and allied health sciences.
- People with stroke, their caregivers, relatives and friends.

Definitions

Stroke is defined as a clinical syndrome, of presumed vascular origin, typified by rapidly developing signs of focal or global disturbance of cerebral functions lasting more than 24 hours or leading to death.

Transient Ischemic Attack (TIA) is defined as a transient episode of neurological dysfunction caused by focal brain, spinal cord or retinal ischemia, without acute infarction.

Subarachnoid haemorrhage (SAH) is a haemorrhage from cerebral blood vessel, aneurysms or vascular malformations into the subarachnoid space.

Stroke unit is an organized in-hospital facility that is devoted to care for patients with stroke. It is staffed by a multidisciplinary team with special knowledge in stroke care, providing coordinated interdisciplinary services.

Part 1

ORGANIZATION OF STROKE SERVICES

1. Introduction

The National guidelines for management of stroke in Sri Lanka supports organisation of infrastructure for stroke care in the hospitals of the MoH and implementation of best practices in the management of stroke. Organisation of stroke care services involves the establishment of services from a population perspective so that the stroke population receives the highest quality of stroke care possible. The quality of care for stroke will depend primarily on the service structures and processes available locally. If clinical teams do not have sufficient knowledge and skills, and are not consistent in their clinical practice, many patients will receive sub-optimal care.

The organisation of stroke services should facilitate the delivery of the best treatment at the optimal time. The services begin from the community where the patient develops the stroke and an informant calls the ambulance services immediately. The staff of the ambulance should possess reasonable knowledge and skills in diagnosis and management of stroke. After an initial assessment, they should transfer the patient directly to a hospital with facilities for hyper-acute stroke care within the shortest possible time. Patients who reach a primary health care facility on their own also should be immediately transferred to a secondary or tertiary care hospital with facilities for specialized management of stroke.

The administrators of secondary and tertiary care hospitals should organize Accident and Emergency (A&E) treatment units of the hospital to provide effective hyper-acute stroke services within the optimum time for all stroke patients presenting to the hospital. After a brief evaluation using the standard protocol placed in the A&E, the patient should be transferred urgently to the radiology department for an urgent non-contrast CT of the brain. All patients eligible for intravenous thrombolytics should receive it at the earliest time within 4.5 hours from stroke symptom onset. All thrombolysed patients should be monitored in ICU/ HDU closely for 24 hours. Stroke patients with respiratory distress or hemodynamically unstable states should receive intensive care treatment. Twenty-four hours after thrombolysis or when the patient is hemodynamically stable, he/ she should be transferred to the Stroke Unit for further management and rehabilitation. Patients who are not eligible to receive thrombolysis should be admitted to the stroke unit directly for further management. In the absence of a vacant bed in the Stroke Unit, patients should be admitted to either the neurology ward or general medicine ward for further management.

While many will be discharged from the Stroke Unit or ward, some will be sent to a long-term rehabilitation facility when long term institutional care is required.

Based on this pathway of stroke care, structural organisation should take place in pre-hospital settings, A&E/ HDU/ ICU, stroke units and follow up for discharge patients from hospitals. The support of family/ caregivers is essential to organize post-discharge care for patients.

2. The national operational structure for stroke care

The policies of the Ministry of Health (MoH) on the national operational structure for stroke care are listed below.

- The MoH would promote the development of stroke care incorporating Stroke Units managed by neurologists or specialist general physicians when a neurologist is not available, A&Es managed by emergency physicians or specialist general physicians when an emergency physician is not available and, access to rehabilitation hospitals and Suwa Seriya ambulance services.
- All hospitals with CT imaging facilities and a specialist general physician/ neurologist should have an "Acute Stroke Care Pathway" for management of hyperacute strokes. A graphical description of the pathway should be placed visible to all staff in the OPD and A&E. All acute strokes should be cared in accordance to the pathway irrespective of whether patients receive thrombolysis or not.
- Health care professionals of the 1990 Suwa Seriya ambulance services should be trained to diagnose stroke based on the acronym FAST (**F**acial drooping, **A**rm weakness, **S**peech difficulties and **T**ime) and transfer the patient immediately to the closest hospital with an acute stroke care pathway. They should be authorized to bypass all other smaller hospitals when transferring the patient for hyper-acute stroke care unless another lifesaving issue arises.
- The capacity of the Stroke Unit in hospitals should be determined by the space available, prevalence of stroke in the local community and the extent of the catchment area of the hospital. It is recommended to have a stroke unit in every hospital up to Base Hospital B and above.
    - Establishment of stroke unit care can be a stepwise process where the facilities are introduced at a basic level and later developed as resources and expertise become available.
    - A 10-20 bed (5-10 male and 5-10 female beds) Stroke Unit at every District General Hospital and Base Hospital B and above is recommended. 20 % of these beds should be acute stroke/ HDU beds. Patients could be treated in the stroke unit approximately for 10 – 21 days.
    - A 100 bed (50 male and 50 female beds) stroke unit at Provincial hospitals and above (National/ Teaching/ Provincial General Hospital) for acute stroke and for long term rehabilitation is recommended. Twenty percent of these beds should be acute stroke/ HDU beds.
- Comprehensive stroke centres with interventional radiologists should be made available at hospitals above the level of Provincial General Hospitals (e.g.: National Stroke Centre at Mulleriyawa, National Hospitals, Teaching Hospitals) and these centres should provide comprehensive stroke services including thrombectomies.
- The National Stroke Centre, Mulleriyawa (NSCM) would function as a tertiary care stroke centre providing all forms of stroke care for the Western Province. NSCM will

serve as a model and monitor stroke care of the rest of the country.

- The geographic location of hospitals with acute stroke care and stroke units should be made accessible online to the public, Suwa Seriya ambulance personnel and to the staff of the primary health care facilities to enable the admission of patients with acute stroke to appropriate hospitals without delay.
- Public education programmes should be conducted on early recognition of a stroke using the acronym FAST.

3. Patient care model

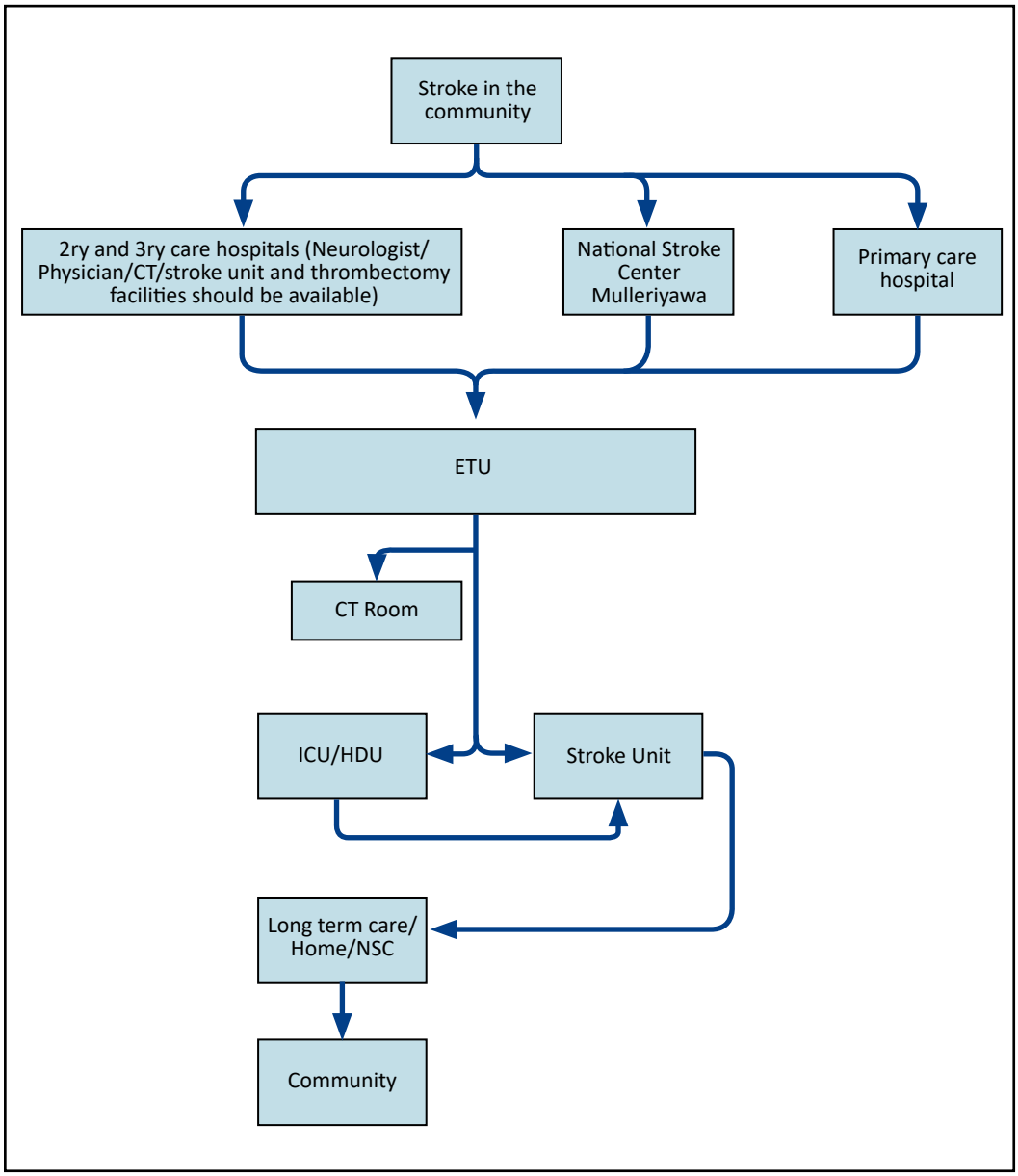


Figure 3.1 Patient care model

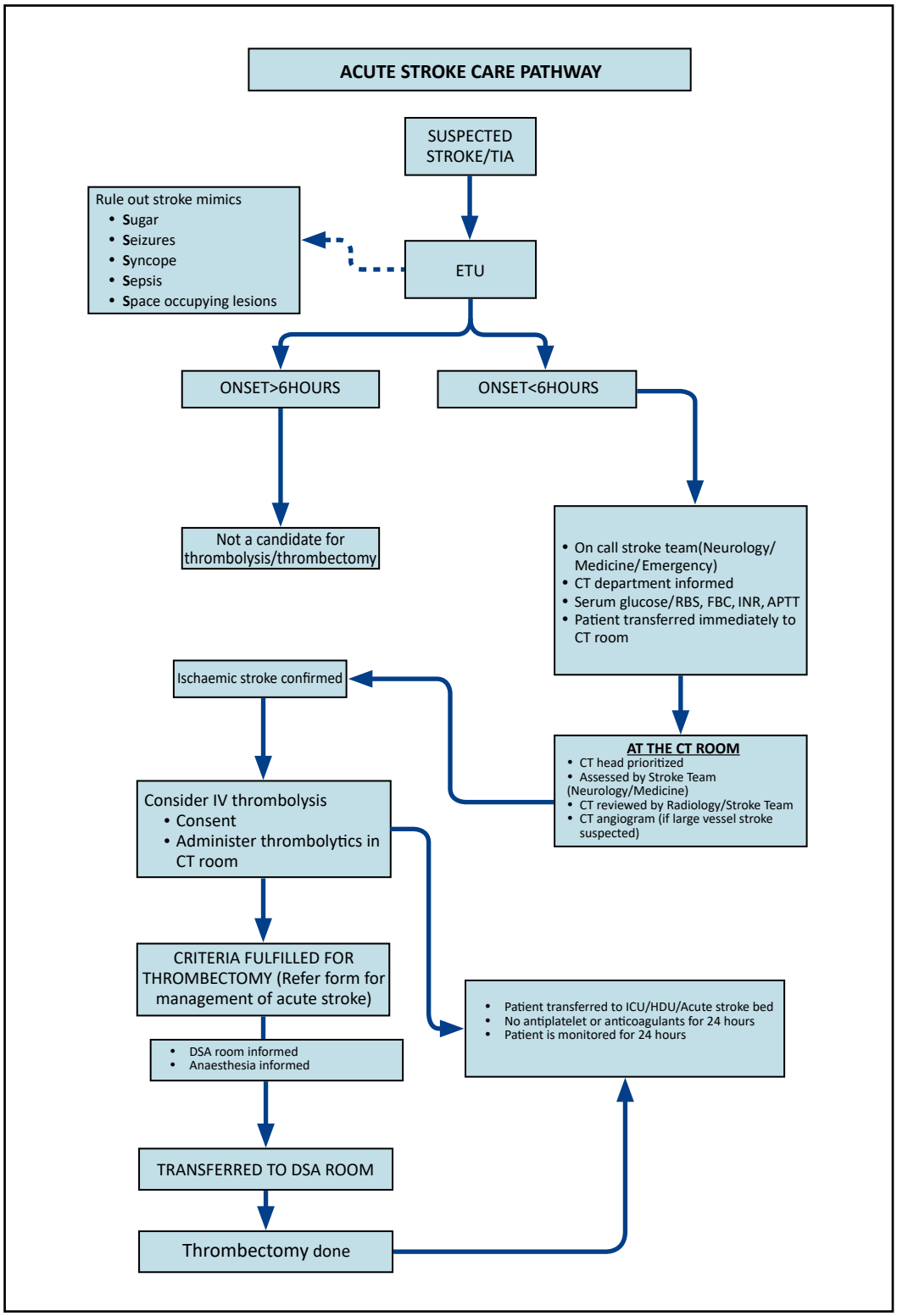


Figure 3.2 Acute strokecare pathway

4. Accident and Emergency Treatment Unit and ICU/ HDU services for stroke

A diagnosis of stroke is presumed based on a history of acute onset of neurological symptoms. It is recommended that a pre-arrival booking at Accident & Emergency Treatment Unit (A&E) is made for such patients suspected to have an acute stroke. The booking will be made by the person who diagnose/ suspect a stroke, who most often would be the health care personnel of the Suwa Seriya ambulance service. Whenever possible, an observer of the patient's acute illness who could assist in establishing the time of onset of the stroke should accompany the patient to the A&E.

Once the patient has arrived at the A&E, the patient will be triaged based on the triage system recommended in the "Guidelines for Accident and Emergency Care Services in Government Hospitals in Sri Lanka". The triage medical officer will perform a brief focused assessment not taking more than 5 minutes and assign the patient to the triage acuity category 2 (orange) for acute stroke symptoms within the last 24 hours and category 4 (green) for symptoms more than 24 hours.

Triage categories

TRIAGE CATEGORY	SEVERITY	ACUITY (Maximum waiting time)
Category 1 Immediate (Resuscitation)	Life threatening	Immediate
Category 2 Emergency	Imminently Life threatening	10 minutes
Category 3 Urgent	Potentially Life threatening	20 minutes
Category 4 Semi urgent (standard)	Potentially serious	30 minutes

Table 4.1

- **Details to be documented in the assessment by the triage officer:**
  - Patient demographics
  - Date and time of the assessment
  - Chief presenting complaint(s)
  - Relevant past medical/ surgical history
  - Relevant vital parameters
  - Triage category
  - Name and signature of the triage officer

- **Indications for admission of stroke patients to the A&E**
  - All suspected acute strokes within 24 hours of symptom onset.
  - All stroke patients with impaired vital parameters, evidence of raised intracranial pressure or deteriorating health status.
  - All TIAs.
  - All suspected SAH.
- **Process of care in A&E**
  - The A&E should have an acute stroke care pathway graphically displayed in a visible location **(Figure 3.1 & Figure 3.2).**
  - The designated "Acute Stroke Form" (**Annexure 1**) should be completed and the acute stroke care pathway activated. The time of onset of symptoms and the time of arrival to the hospital must be documented in the form. The essential inclusion and exclusion criteria for thrombolysis should be checked in the form. The attending medical officer should inform the department of radiology and the on-call stroke team, and immediately transfer the patient for the CT scan of the brain.
  - The patient should be haemodynamically stabilized, capillary blood sugar shoud be checked and blood should be sent for random plasma glucose, platelet count and INR prior to transferring the patient for the CT Brain.
  - The medical officer of the A&E or the medical ward/ neurology ward should continue with the management based on the agreed acute stroke care pathway of the hospital.
  - At the Department of Radiology, the patient should be given priority over other patients to undergo the brain scan without delay. A CT angiogram of intracranial vessels may be performed simultaneously if indicated.
  - The CT scan should be interpreted by the consultant physician/ neurologist/ radiologist within 20 minutes of completing the scan.
  - After evaluating for inclusion and exclusion criteria, all eligible consenting patients should receive IV thrombolytics at the Radiology Department itself.
  - Thrombolysis should be commenced within 4.5 hours from the onset of stroke symptoms.
  - Consider extending thrombolysis window from 4.5 to 9 hours in patients with wake-up stroke or with unknown onset time, upon demonstrating imaging evidence of MRI DWI-FLAIR mismatch or CT/ MRI core-perfusion mismatch.
  - The door to needle time should be less than 60 minutes.
  - All thrombolysed patients should be monitored in the ICU/ HDU for 24 hours **(Annexure 2).**
  - A repeat non-contrast CT scan of the brain should be done in all patients 24 hours after thrombolysis.

- **Indications for admission of stroke patients to ICU/ HDU**
  - Patients who received IV thrombolytics.
  - Patients who are haemodynamically unstable.
  - Patients who need intravenous medicines to optimize BP control (E.g. in cerebral haemorrhage & to lower BP for thrombolysis **(Annexure 1).**
  - Following neurosurgery for stroke (craniectomy or craniotomy).
- **Protocols for care at ICU**
  - Blood pressure optimization before thrombolysis **(Annexure 1).**
  - Post-thrombolysis monitoring **(Annexure 2).**
  - Management of cerebral haemorrhage following thrombolysis **(Annexure 1).**

5. Service organization at the Department of Radiology

A well-organized system with effective interdisciplinary coordination, up to date technology and human resource with expertise are integral in providing an efficient service by the Department of Radiology.

- All staff at the Department of Radiology should be made aware of the need for the highest priority for imaging in acute stroke. Their response to a stroke call from A&E must be prompt to ensure that there is no delay in acute stroke imaging.
- The scans should be made available immediately to the radiologist and neurologist/ physician to be reviewed within 20 minutes of completing the imaging.
- In patients in whom a decision is made to administer thrombolytics, administration of the thrombolytic agent should commence in the Department of Radiology itself.
- Based on acute stroke care pathway of the hospital and the status of the patient, he/ she could be transferred to ICU/ HDU/ acute stroke ward for close monitoring.

6. Organizing stroke unit services in hospitals

A stroke unit is a specialized, geographically defined hospital unit dedicated to the management of stroke patients and staffed by a multidisciplinary stroke team. Scientific evidence has shown that stroke units reduce mortality and improve independent living of patients afflicted with stroke.

- Stroke units in hospitals of MoH should accommodate both acute stroke and stroke for rehabilitation. It is recommended to allocate 20-25% of beds in the stroke unit for management of acute stroke.
- The neurologist should be the consultant in-charge of the stroke unit providing 24 x 7 cover. Where there is no neurologist available, it is advisable to appoint the consultant physician in internal medicine with an interest in stroke care to be the consultant in-charge of the stroke unit.
- The stroke unit should be served by a multidisciplinary team consisting of professionals from medical, nursing, physiotherapy, occupational therapy, speech and language therapy, nutrition, psychology, and social services.
- Patients should be moved to the stroke unit as soon as possible, ideally within first 5 days of onest of stroke.
- Acute stroke services should provide specialist and multidisciplinary care for diagnosis, hyper-acute and acute treatments, normalization of homeostasis, early rehabilitation, prevention of complications and secondary prevention.
- All patients with stroke who are admitted to hospital and who require rehabilitation should be treated in a stroke unit.
- When selecting nursing staff for stroke units, preference should be given to those trained in the management of patients with the hyperacute and acute stroke, neurological, general medical and rehabilitation conditions.
- Appointing physiotherapists, occupational therapists, and speech therapists exclusively to the stroke unit is encouraged but it is more important to have rehabilitation staff with knowledge, skills and interest in stroke care.
- Acute stroke services should have immediate access to diagnostic, imaging, and cardiology services.
- There should be written data collection forms **(Annexure 3)**, management protocols and care pathways/ algorithms for emergency stroke treatments, acute imaging, neurological and physiological monitoring, swallowing assessment, hydration and nutrition, vascular surgical referrals, catheterization, rehabilitation, end-of-life care, secondary prevention, prevention and management of complications, communication with people with stroke and their family/ care-givers and discharge planning.
- Acute stroke services should have protocols and pathways for the monitoring,

referral, and transfer of patients to regional neurosurgical centers for decompressive hemicraniectomy, surgical management of intra cranial hemorrhage and the management of symptomatic hydrocephalus including external ventricular drain insertion.

- The interdisciplinary team should assess patients within 48 hours of admission to the stroke unit and formulate a comprehensive individualized management plan which reflects the severity of the stroke and the needs and goals of the stroke patient.
- Clinicians should use standardized and valid assessment tools to evaluate the patient's stroke-related impairments and functional status such as NIHSS **(Annexure 1)** and modified Rankin Scale **(Table 6.1).**

Scale	Status of the patient
0	No Symptoms
1	No significant disability. Able to carry out all usual activities, despite some symptoms
2	Slight disability. Able to look after own affairs without assistance, but unable to carry out all previous activities
3	Moderate disability. Requires some help but able to walk unassisted
4	Moderately severe disability. Unable to attend to own bodily needs without assistance, and unable to walk unassisted
5	Severe disability. Requires constant nursing care and attention, bedridden and incontinent
6	Dead

Table 6.1 Modified Rankin Scale

- Stroke unit teams should conduct at least one formal interdisciplinary stroke meeting per week to discuss the progress and problems, rehabilitation goals and discharge arrangements for patients in the unit. Shared decision-making and goal-setting involving treating teams, patient, and care-givers is an integral part of stroke care delivery.
- When necessary, stroke patients should be offered services of the Department of Social Services via the social service officer for adaptations and relevant funding that help to improve their quality of life.
- The stroke team should provide information, advice, and support to patients and their family/ care-givers and should conduct educational programs for all categories of health staff and care-givers.
- There should be a support service for patients with mild and moderately-severe strokes to be discharged early from hospital and managed at home. Those patients should be offered care by a multidisciplinary team and the care offered must be on par with the care given for in-patients.

- Patients with moderate or severe strokes who are rehabilitation-ready and have not significantly improved by 21 days, should be given an opportunity to participate in in-patient stroke rehabilitation at a Rehabilitation Hospital.
- There should be clinic services for follow-up of stroke patients after discharge from hospital. Make use of the check list available for post-stroke follow up of patients **(Annexure 4).**
- Stroke units should participate in national and local audits by entering data to the National Stroke Registry and collaborate with quality improvement programs. Data collection form is available with the Guideline **(Annexure 3).**

Rehabilitation of stroke

- The environment of the stroke unit should be designed to facilitate effective rehabilitation by enabling patients to practice their activities regularly and enabling therapists to incorporate practicing of functional skills gained in therapy into the patient's daily routine.
- Rehabilitation typically should begin 24 – 48 hours after the stroke onset.
- Frequent short sessions of treatment should be the predominant pattern in the first 14 days after stroke onset. Patients should perform a cumulative duration of 45 minutes of each appropriate therapy every day, at a frequency that enables them to reach their rehabilitation goals, and for as long as they are willing and capable of participating and showing measurable benefit of treatment.
- Health care staff should support patients with stroke to practice their activities as guided by a qualified therapist.

Psychological support

- Services for people with stroke should include psychological support appropriate to the needs of the stroke patient as a part of the multidisciplinary care.
- Services should provide training to the health care staff to recognise and manage psychological problems associated with strokes.
- Appropriate methods should be used to screen for psychological problems in patients with aphasia and cognitive impairment.

Care-givers

- The extent to which care-givers/ family members are involved in decision-making, planning and delivery of care should be based on the patient's preference.
- The primary care giver of the patient should be offered information on the nature, consequences, and prognosis of the patient's stroke, what to do in the event of a further stroke, how to provide care and support, and advice on secondary prevention including the need for lifestyle changes.
- Prior to being discharged from hospital, the patient and the care-giver should be

offered a discussion on follow up care with the therapists and the care-giver should be informed on how to seek help if problems arise.

Self-management

- Services should support activities of patient groups such as the 'Stroke Support Organization for Sri Lankans' and should offer self-management support aimed at providing the requisite knowledge and skills to manage life after stroke.

Stroke services for younger adults

- Twenty five percent of strokes occur in young adults below the age of 60 years. The rehabilitation needs of this group of patients are likely to differ from those of older individuals. It is necessary to tailor services to address the needs of this group of patients such as returning to their occupation, recreational activities, coping with growing up children, etc.

End-of-life (palliative) care

- Services providing stroke care should also offer end-of-life care including palliative care for patients dying of stroke.
- Staff caring for people dying of stroke should be trained in the principles and practice of end-of-life care including the recognition of people who are approaching the end of life.
- Decisions to withhold or withdraw life-prolonging treatments after stroke including artificial nutrition and hydration should be taken in the best interest of the patient and whenever possible should take into consideration expressed wishes of the patient.
- End-of-life care for stroke patients should include an explicit decision not to impose burdensome restrictions that may exacerbate suffering. In some instances, continuing oral feeding despite the risk of aspiration may be considered humane after discussion and agreement between the caring team and family.
- Stroke patients with limited life expectancies, and their families, where appropriate, should be offered advanced care planning.

Facilities needed to establish a Stroke Unit

- Dedicated beds in a geographically defined area within a ward.
- A meeting room to conduct multidisciplinary stroke team meetings.
- Services of a physiotherapy unit.
- Services of an occupational therapy unit.
- Services of a speech and language therapy unit.
- A confidential room for counsellor/ psychologist's sessions.
- Services of a Social Service Officer.

Criteria for admission to a Stroke Unit

- All recent strokes with moderate to severe disability and with a general condition satisfactory to undergo rehabilitation.
- Transient ischemic attacks with high risk for stroke.

Standard human resources recommended for a Stroke Unit with 20 beds of which 20% is allocated for acute stroke

Medical officer/ consultant physician/ neurologist	2 - 4
Nurses	20
Physiotherapists	2
Occupational therapists	2
Speech and language therapists	1
Counsellor/ psychologist	1
Social service officer	1
Clinical nutritionist	1
Attendants	4
Labourers	5

- Standard list of equipment for a physiotherapy unit serving a 20 bed stroke unit **(Annexure 5).**
- Standard list of equipment for an occupational therapy unit serving a stroke unit with 20 beds **(Annexure 5).**
- Standard list of equipment for a speech and language therapy unit serving a stroke unit with 20 beds **(Annexure 5).**

Standard list of medicine needed for stroke services

- List of medicine needed in the emergency trolley **(Annexure 6).**
- List of medicine needed for the Stroke Unit **(Annexure 7).**

7. The National Stroke Centre, Mulleriyawa

The National Stroke Centre, Mulleriyawa (NSCM) is a unique centre, located at the Colombo East Base Hospital in Mulleriyawa, established as a prototype of stroke care for all other stroke centres in the country. NSCM is designed to offer state-of-the art, guideline-based treatment for stroke. It offers comprehensive stroke care ranging from acute stroke care to long-term management including stroke rehabilitation. The NSCM will offer both thrombolytic and endovascular therapies for hyper-acute strokes. Neurosurgical services will be available within 30 minutes of the NSCM via transfer to the neurosurgical unit at the National Hospital of Sri Lanka.

The NSCM will function as a fully-fledged rehabilitation hospital for stroke patients, will conduct out-patient clinics for secondary prevention of stroke/ TIA and stroke care training programmes for health care workers. The Centre will ease the burden of stroke services in the Western Province by accepting transfers from other hospitals for long term rehabilitation.

The NSCM will establish networking with other stroke units at Provincial and District levels. This would enable data collection, monitoring outcomes and assisting problem solving at other stroke units. Consistency of stroke care delivered at every level of care will be facilitated by networking between units. In addition, the NSCM will develop educational programmes and material that could be used by other stroke units and for public awareness programmes.

The NSCM will house the National Stroke Association of Sri Lanka and promote conducting social services towards promoting prevention strategies and optimum treatment for strokes. It will also promote activities of the Stroke Support Organization for Sri Lankans.

- **Infrastructure of the NSCM**
  - Acute stroke ward (50 beds in each male and female ward)
  - Intensive care unit (6 beds)
  - High dependency unit (10 beds in each male and female unit)
  - Long-term rehabilitation ward (50 beds in each male and female ward)
  - Paying ward (8 beds in each male and female ward)
  - Physiotherapy unit
  - Occupational therapy unit
  - Speech and language therapy unit
  - Prosthetic and orthotic unit
  - Out-patient department
  - Auditorium (seating capacity 190)
  - Quarters for on-call registrars and consultants (3 for consultants in neurology and interventional radiology & 3 for senior registrars in neurology and radiology)
  - Office space

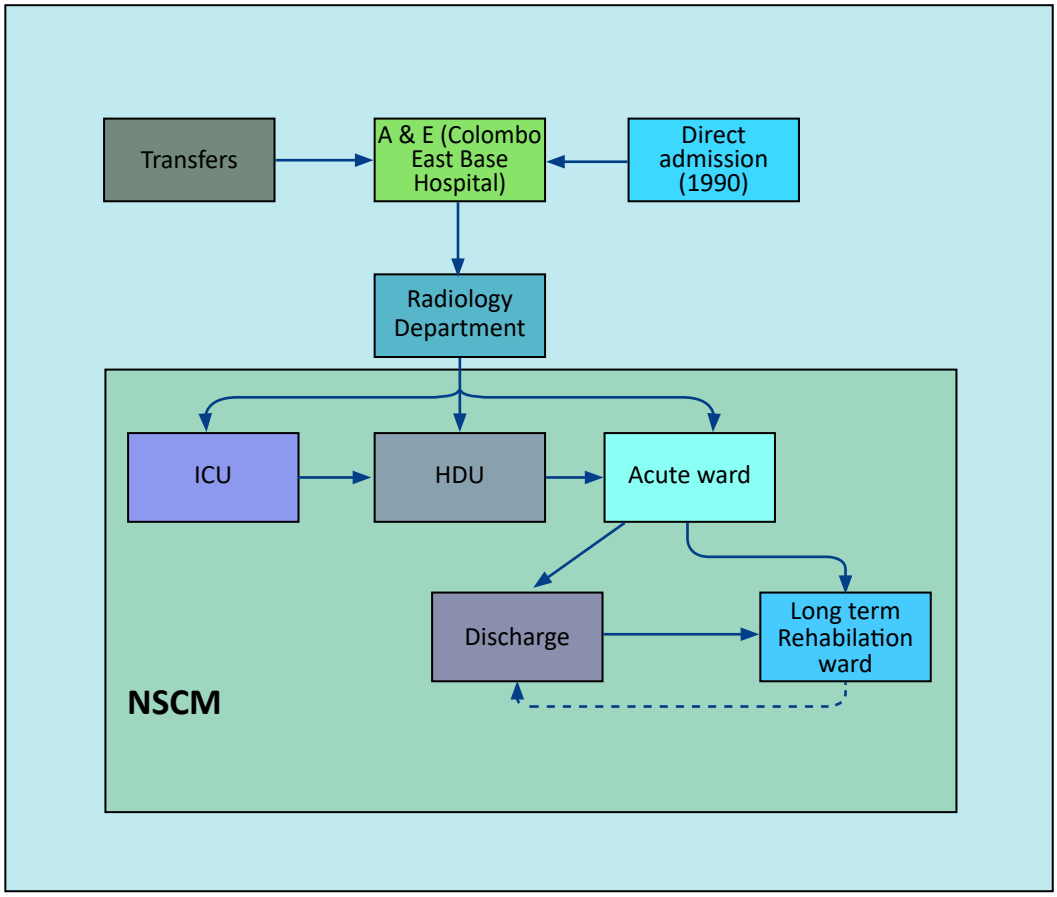


Figure 7.1 Pathway for admissions to NSCM

- **Building plan (Annexures 8)**

Table 7.1 Human resource requirement for the NSCM

Discipline	Category	Number	Allocation
Medical Professionals	Consultant neurologists	01	Acute stroke ward and its HDU (male)
		01	Acute stroke ward and its HDU (female)
	Consultants in rehabilitation medicine	01	Rehabilitation ward and paying ward (male)
		01	Rehabilitation ward and paying ward (female)
	Consultant neurosurgeons	Cover up from NHSL	
	Consultant anaesthetists	Cover up from Colombo East Base Hospital (CEBH)	
	Consultant intensivists	01	ICU
	Other required specialties	Cover up from nearby secondary and tertiary care hospitals (e.g., CEBH/ NIMH/ NHSL etc.).	
	Medical officers	08	Neurology ICU
		08	Acute stroke ward and its HDU (male)
		08	Acute stroke ward and its HDU (female)
		06	Rehabilitation ward and paying ward (male)
		06	Rehabilitation ward and paying ward (female)

Discipline	Category	Number	Allocation
Nursing staff	Nursing sisters	01	Neurology ICU
		01	Acute stroke ward and its HDU (male)
		01	Acute stroke ward and its HDU (female)
		01	Rehabilitation ward and paying ward (male)
		01	Rehabilitation ward and paying ward (female)
		01	OPD
	Nursing Officers	18	Neurology ICU
		20	Acute stroke ward (male)
		18	Acute stroke ward (female)
		17	Rehabilitation ward (male)
		17	Rehabilitation ward (female)
		08	HDU (male)
		08	HDU (female)
		04	Paying ward (male)
		04	Paying ward (female)
		03	OPD
Allied health professionals	Physiotherapist	02	Neurology ICU
		03	Acute stroke ward (male)
		03	Acute stroke ward (female)
		05	Rehabilitation ward (male)
		05	Rehabilitation ward (female)
		01	HDU (male)
		01	HDU (female)
		01	Paying ward (male)
		01	Paying ward (female)
		08	OPD

Discipline	Category	Number	Allocation
	Occupational therapist		
		02	Acute stroke ward (male)
		02	Acute stroke ward (female)
		03	Rehabilitation ward (male)
		03	Rehabilitation ward (female)
		01	Paying wards (male and female)
		04	OPD
	Speech therapist		
		02	Acute stroke ward and its HDU (male)
		02	Acute stroke ward and its HDU (female)
		02	Rehabilitation ward and paying ward (male)
		02	Rehabilitation ward and paying ward (female)
		04	OPD
	Orthotics and prosthetics	03	
Support staff	Minor staff	05	Neurology ICU
		10	Acute stroke ward and its HDU (male)
		10	Acute stroke ward and its HDU (female)
		08	Rehabilitation ward and paying ward (male)
		08	Rehabilitation ward and paying ward (female)
		04	OPD
		03	Physiotherapy Unit
		02	OT Unit
		01	SALT Unit
		01	Auditorium
			Orthotic and prosthetic Unit

- **List of equipment at the NSCM (Annexure 9)**
  - Equipment for the ICU
  - Equipment for the HDU
  - Equipment for the acute stroke ward
  - Equipment for the rehabilitation ward
  - Equipment for the physiotherapy unit
  - Machinery and equipment for the prosthetic and orthotic unit
  - Equipment for the occupational therapy unit
  - Equipment for the speech and language therapy unit

8. Medicines that should be available at stroke services

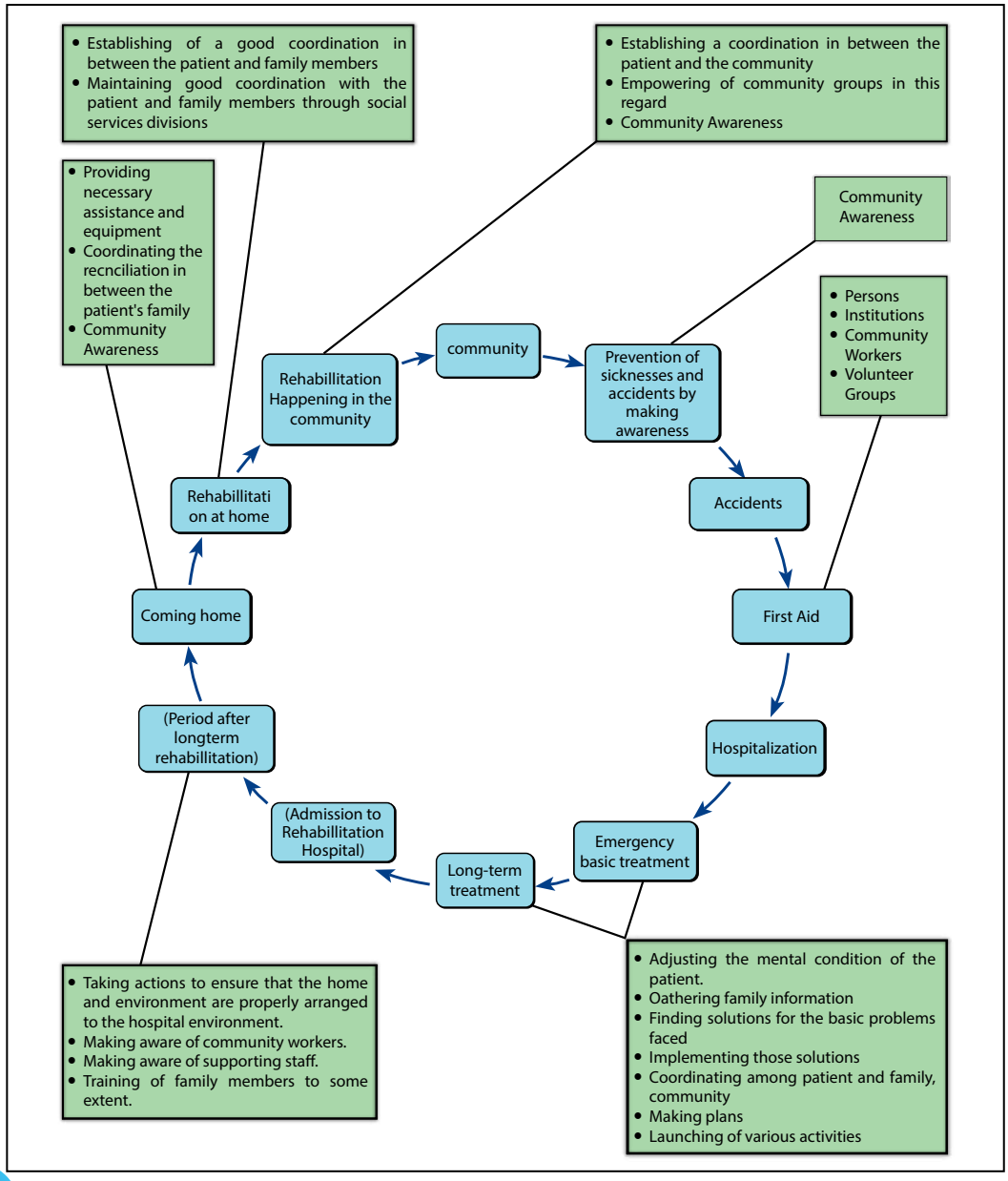
Pharmacotherapy becomes important during acute management, secondary prevention, rehabilitation and for management of other coexisting conditions in stroke patients. Intravenous alteplase and Tenecteplase are the primary therapeutic agents used globally for recanalization of the occluded vessel in ischemic stroke. Therapeutic agents for control of hypertension, diabetes mellitus, hyperlipidaemia, and antiplatelet medicines are indicated as measures for secondary prevention of strokes. There are many other medications that are used for symptom control, for complications and for the management of other coexisting conditions.

- **Standard list of medicines needed for stroke services**
    - List of medicines that should be available in the emergency trolley during hyperacute management of stroke **(Annexure 6).**
    - List of medicines needed for the stroke unit and the out-patient department (**Annexure 7**).

9. Social services for stroke patients

The department of Social Services serves differently abled individuals through the "National program for community-based rehabilitation (CBR programs) of persons with disabilities". The primary duty of the Social Service Officers employed by the Department of Social Services is to facilitate the wellbeing of the less privileged differently - abled people in the community. The same officers extend their services to stroke patients warded in hospitals and living in the community.

Fig 9.1 Welfare cycle



The welfare cycle provides a clear outline of the functioning of services provided by the Department of Social Services where persons with disabilities including stroke survivors are given priority.

In stroke rehabilitation, social interventions begin in the acute phase in hospitals and continue throughout the process of rehabilitation in the community. Social services and interventions play a pivotal and vital role in helping stroke survivors to integrate into the society. Furthermore, social services support the family of the stroke survivors by providing financial aid, basic supportive equipment to facilitate their activities, vocational training, and job opportunities to enhance their ability to cope and support the patient.

There should be a social service officer appointed by the Department of Social Services to all stroke units in Sri Lanka. The social service officer should be a regular member of the MDT and they should actively take part in regular MDT meetings held at the stroke unit.

Types of assistance provided by the department of social service

- Assistance for renovation of the home to suit the needs of the patient (commode toilet facility, railing for steps, access facilities etc.).
- Basic support equipment (air mattress, wheelchair, walking aids etc.).
- Assistance to develop access facilities.
- Financial assistance for travelling expenses required to attend to hospital clinics.
- Counselling family members to face a new situation.
- Assisting in improving the socio-economic status of the family by providing educational facilities, vocational training, securing employment, compensation (if any) etc.
- Other services as deemed necessary by the assessing officer.

Social service officers primarily function by coordinating with the following individuals/ institutions

- Stroke survivor.
- Hospital staff.
- Patient's family members, care-givers, friends, rural community groups and organizations.
- Other field officers from the Divisional Secretariat.
- Government and non-governmental organizations, donors and other welfare societies.

10. Information system for stroke services

An information system for stroke services should be developed from the established Sri Lanka Stroke Clinical Registry (SLSCR). This is essential to upgrade stroke care in Sri Lanka. The SLSCR should be a web-based registry that enables health care professionals to enter data of stroke patients in real time at the point of care. A national registry would provide key data needed for policy decisions and improving stroke care in the country.

- **Objectives of the National Stroke Registry:**
  - To learn the burden caused by stroke to Sri Lanka.
  - To document the quality (structure, processes, and outcome) of stroke services in Sri Lanka.
  - To construct a database which can be used for future adjustment of stroke services (early interventions and rehabilitation services).
  - To guide educational programmes.
  - To adjust and establish algorithms for clinical decision making and to analyse predictors of outcome.
  - To document changes in diagnostic and therapeutic strategies over time.
- The SLSCR should be governed by the Unit for Non-communicable Diseases under the supervision of the National Steering Committee for Stroke chaired by the Director General, MoH.
- The data collection form **(Annexure 3)** for the SLSCR would include data on epidemiology, management of acute stroke and rehabilitation, risk factors, secondary prevention and outcome. The data will be entered to the registry by staff nurses and medical officers employed in stroke units.
- A newsletter formulated by the Non-communicable Diseases Unit, MoH quarterly based on data of the Stroke Registry should be shared amongst all the stake holders.
- The MoH should assure the confidentiality and safety of data collected.
- The data analysis should provide following indicators by province.
  - Number of TIAs and stroke presented to the A&Es of hospitals of the MoH.
  - Percentage of stroke presented within 3 hours of symptom onset.
  - Number/ percentage thrombolysed.
  - Proportion of cerebral haemorrhages following thrombolysis.
  - Number/ percentage provided thrombectomy.
  - Number treated at stroke units.
  - Proportion of patients who received swallowing assessment within 24 hours of admission.
  - Number of deaths after admission.
  - Number referred to/ received long term rehabilitation at a rehabilitation facility and discharged home.

- Level of disability on discharge and at 3 months based on the modified Rankin Scale (**Table 6.1**).
- Proportion readmitted for stroke related issues within the three months following a stroke.
- Patient's/ guardian's satisfaction of services.

11. Guideline to improve the quality of care in stroke units

Quality of care is the degree to which the health services for individuals and populations increase the likelihood of desired health outcomes and the extent to which the services are consistent with current professional knowledge.

The national quality assurance programme in Sri Lanka consists of the Directorate of Healthcare Quality and Safety (DHQS) as the focal point and Quality Management Units (QMU) established in hospitals above the level of base hospitals. DHQS has introduced several quality and safety interventions such as development of the national policy on healthcare quality and safety and the national action plan on medication safety, and the implementation of an incident reporting system. Stroke units should comply with these interventions as appropriate in collaboration with the staff of the hospital QMUs.

Key elements of healthcare quality includes effectiveness, safety, people-centeredness, timeliness, equity, efficiency and integration. Similar to other health services, stroke services should be delivered based on these key quality elements. Accordingly, stroke services should develop a culture of continuous quality improvement.

Table 11.1 Application of key quality elements to Stroke Unit

Domain	Application to the Stroke Unit
Safety - Minimizes harm, including preventable injuries and medical errors	The stroke unit is a high-risk environment vulnerable for complications with devastating disabilities, developed acutely and there is a need for rapid decision-making with incomplete information and limited resources. Hence, careful attention should be paid to ensure patient safety. Some of the quality interventions useful in ensuring patient safety include incident reporting and learning from incidents, clinical audits and implementation of activities of the national medication safety guidelines.
Effectiveness- Healthcare is based on scientific knowledge and evidence-based guidelines	Care provided to patients in the stroke unit may be limited by factors such as deficiencies in pre-hospital care, unavailability of trained specialists and lack of access to patient's prior medical records. This guideline developed based on current scientific evidence, should be adhered to best possible, when managing patients and maintaining the unit. Similarly, Standard Operating Procedures (SOPs) should be developed as and when appropriate.

Patient-centeredness: Providing care that is respectful of and responsive to individual patient preferences, needs and values	Over-crowding, shortage of general facilities such as sanitation and water, and emphasis on visibility and monitoring rather than privacy may negatively affect the patient-centred care given in the stroke unit. Patient satisfaction/experience surveys and getting patients' suggestions by placing suggestion boxes or online feedback portals should be encouraged in collaboration with the QMU. Appropriate action to improve the care according to the patients' feedback should be taken with the support of hospital administration.
Timeliness- Keeping delays in providing and receiving services to a minimum.	Long waiting times may occur in stroke units due to the high demand for services. Measures should be taken to reduce patient waiting times with the support of the hospital QMU (Patent waiting time is one of the indicators monitored by DHQS).
Efficiency – Avoids waste including waste of equipment, supplies and energy.	Sometimes stroke units may have to provide care for some minor complaints which can be managed in primary care settings, thus, compromising efficiency. Similarly, there can be other wastages such as improper utilization of equipment. Audits should be conducted to assess and improve such situations.
Equity- Providing services as per the requirement	The service provided by the stroke unit should be as per the requirement of individual patients and it should not be unduly affected by personal factors of the patient such as gender or socioeconomic status. Prioritization should be based purely on medical merit.
Integration- The care received across facilities and providers is coordinated	A patient with a stroke may require care across many facilities. Providers, both within the hospital (different units such as radiology or laboratory) and outside the hospital (primary healthcare units or social workers) should be involved in the management of the patient. The staff of the stroke unit should coordinate with these different facilities and providers by giving information and a plan of management to patients requiring such services.

It is vital to look at the stroke unit from a systems point of view when implementing a quality improvement programme. Systems model in diagnosis and treatment include structures (trained personnel, supplies, equipment, clean facility etc.), processes (admission, history taking & examination, performing lab tests etc.) and outcomes (patient treated according to standards, satisfied patient, improved health status etc.).

Performance data should be collected on a regular basis on all stroke presentations to the A&E and the Stroke Unit, analysed and disseminated.

Stoke units should be nationally standardized so that the comparison could be made by provinces and districts. Measures should be taken to evaluate the performance of the individual stroke unit within the system, as well as that of the system as a whole and be sensitive to the interdependence among the different components of the system.

12. Clinical quality indicators and monitoring

Clinical quality indicators assess health structures, processes, and outcomes. They can be rate- or mean-based, providing a quantitative basis for quality improvement or sentinel, identifying incidents of care that trigger further investigation. The Sri Lanka Stroke Clinical Registry is a multidisciplinary audit tool that could be used to assess the quality of the process of stroke care. There is evidence to support better outcome with comprehensive and early processes of stroke specific measurements such as assessment for swallowing and aspiration risk, early detection and management of infection, maintenance of hydration and nutrition, early mobilization, clear goals for function and communication with patients and their families.

A set of care quality indicators for stroke management are given in the **table 12.1.**

Table 12.1 Control indicators

Definition	Calculation	Reference Standard
Neurologist availability	On-site or on-call neurologist to take responsibility of the patient after the admission (Yes/ No)	100%
Nurse ratio	Total number of nurses at the Stroke Unit/ total number of beds	1:2
Stroke care protocol	Existence of the stroke care protocol (Yes/ No)	100%
First stroke event	Total number of patients admitted due to a first stroke event/ total number of strokes admitted in the same period x 100	79 – 83%
ICU admission	Total number of stroke patients admitted to the ICU/ total number of stroke patients admitted to the same Centre x 100	1 – 3 %

Definition	Calculation	Reference Standard
Adequacy of stroke unit facilities for admissions and treatment	Total number of stroke patients admitted to the Stroke Unit/ total number of stroke patients meeting criteria for admission to the same hospital in the same period x 100. The following criteria have been specified. • Age > 18 years • Symptom onset to hospital door < 3 h; < 4.5h; < 6 h • Baseline situation: modified Rankin Scale score ≧ 2 • Focal neurological signs at the time of diagnosis: (presence of any of the following symptoms suggestive of stroke): 1. Numbness, weakness or sudden paralysis of the face arm leg on one side of the body. 2. Sudden confusion. 3. Difficulty speaking or understanding. 4. Sudden loss of vision in one or both eyes. 5. Intense, sudden-onset headache with no apparent cause, accompanied by vomiting. 6. Difficulty speaking, loss of balance or coordination.	93 – 100%
Type of treatment at discharge	Total number of patients admitted due to cardioembolic stroke who are following treatment with direct oral anticoagulant or vit K antagonists	22 – 28%

Table 12.2 Process Indicators

Definition	Calculation	Reference standard
Onset-to-door time	Time from onset to arrival at hospital	100 min
Door-to-needle time	Time from arrival at hospital to the commencement of IV thrombolytics	60 min
Onset-to-needle time	Time from symptom onset to the commencement of the IV thrombolytics	160 min
Door-to-CT scan time	Time from arrival to the hospital to the first diagnostic imaging assessment	20 min

12.3 Outcome indicators

Definition	Calculation	Reference Standard
Patients treated with IV thrombolysis	Total number of stroke patients treated with IV thrombolysis/ total number of stroke patients admitted to the same hospital during the same period x 100	15%
Patients treated with mechanical thrombectomy	Total number treated with mechanical thrombectomy/ total number of stroke patients admitted to the same hospital for the same period x 100	8 – 10 %
Mortality	Total number of deaths during admission/ total number of stroke patients admitted to the same hospital during the same period x 100	7%
Complications during treatment	Total number of stroke patients treated with rtPA developing symptomatic complications after thrombolysis/ total number of stroke patients treated with rtPA and admitted to the same centre during the same period x 100	4%
Adverse events during treatment	Total number of stroke patients developing symptomatic haemorrhagic transformation during IV thrombolysis/ total number of stroke patients treated in the same centre during the same period x 100	3%
Adverse effects due to nosocomial infection	Total number of stroke patients requiring treatment due to infection of any cause during admission/ total number of stroke patients treated in the same unit during the same period x 100	18%
Adverse events during treatment	Total number of stroke patients presenting pulmonary embolism/ total number of stroke patients treated in the same centre during the same period	1%
Rehabilitation	Total number assessed for rehabilitation during the first 48 hrs. after admission/ total number treated in the same centre during the same period x 100	80%
Health education	Total number admitted for least one day who were informed verbally or in writing about self-care and treatment precautions before discharge/ total number treated in the same centre during the same period x 100	95%

Definition	Calculation	Reference Standard
Disability	Total number of stroke patients with mRS ≧2 at discharge/ total number of strokes treated in the same centre during the same period x 100	<40%
Use of resources	Mean stay. (Stay is defined as stay in the stroke unit over one night or 24 hrs.)	7 – 21 days
Satisfaction	Total number with a score ≧ 5 on a satisfaction scale/ total number of stroke patients treated in the same stroke unit during the same period x 100	80%

13. Capacity building for human resources for stroke care

Capacity building for human resources is essential for development of stroke care in Sri Lanka. Human resources needed for multidisciplinary team care would include doctors, nurses, physiotherapists, occupational therapists, speech and language therapists and psychologists/ counsellors. Capacity building for human resources in all three segments of stroke care, namely for health care professionals working in the ambulances, staff at A&E and for the staff at stroke unit for long-term rehabilitation needs to be addressed.

- It has been recommended for neurologists to be in-charge of all stroke units as stroke is a neurological disorder with devastating consequences. Eventually, there should be specialists trained and board certified in stroke to give care for complicated stroke patients.
- The Postgraduate Institute of Medicine has already commenced board certifying specialists in Medical Rehabilitation. They could be posted to rehabilitation hospitals, Provincial stroke units and to the NSCM.
- Modules of training programmes could be developed and conducted by the NSCM. The academic modules could be shared with all other Provincial stroke centres, which could conduct activities in liaison with Stroke Units for capacity building of human resources for stroke care in the respective province. There should be training programmes for doctors, nurses, speech, physio, and occupational therapists and for care-givers.
- All stroke units should conduct stroke care-giver educational and training programs.
- There should be training programmes for Suwa Seriya staff organized by the stroke centres.
- Academic material for public education should be developed and they should be made available at all health care service centres. They could be developed by the Health Education Bureau of the MoH.
- The National Stroke Association of Sri Lanka and Stroke Support Organization for Sri Lankans will be housed in the NSCM to facilitate conducting social activities that are important for the development of stroke care in Sri Lanka.
- The Stroke Support Organization for Sri Lankans that consist of a membership of stroke patients could conduct activities promoting management and prevention of stroke in the community.

14. Strategic objectives for implementation of the guideline

This chapter brings together key recommendations to guide those responsible for administering the entire pathway of stroke care, other than primary prevention. This section will explore recommendations in following key domains.

1. **Domain 1 - Facilitating the delivery of comprehensive clinical care for stroke patients**

   People with stroke present to health services with a broad range of problems covering all illness domains. Given the higher mortality and morbidity associated with stroke, it is vital to have an organized service that can respond in a timely and effective way to the unique needs of individual stroke patients.

   Established stroke services should ensure that the services include the whole stroke pathway form acute care, stroke unit care, long-term rehabilitation, secondary prevention, early supported discharge, community rehabilitation, systematic follow-up, palliative care and long-term support.

   At least 25% of stroke are recurrences and 22% of people who suffered a stroke develops another vascular event over next 5 years. Therefore, administrators will need to ensure that the secondary prevention services are effective and prompt.

   Strategy 1A - Ensuring effective prehospital services to increase the proportion of stroke patients who benefit from the thrombolytic programmes established in hospitals.

   Structure of stroke services
   - Establishing and promoting public education on recognition of stroke.
   - Establishing effective network and communication system with pre-hospital care ambulance services and established centres of stroke care to ensure timely transport of stroke patients.

   Emergency ambulance services
   - Ambulance services, including call handlers, should be commissioned to respond to every suspected acute stroke as a medical emergency.
   - There should be professional training programme to ensure that the emergency personnel can recognise a stroke or TIA and respond as it is stated in the guideline.

   Strategy 1B - Ensuring effective hyperacute stroke care by strengthening A&E units and establishing thrombolytic and thrombectomy pathways with urgent neuroimaging and intervention facilities for acute stroke patients.

Structure of stroke services

- Stroke services at A&E should ensure that, people with suspected acute stroke or TIA are diagnosed and treated urgently.
- There has to be a pathway established for thrombolysis and thrombectomy as stated in the guideline.
- Partnership working may also be required within the MoH, between administrators of different levels of health care institutions in situations such as hyperacute stroke care and interventional services such as endovascular therapy in tertiary care settings.

Acute stroke services

- Hospitals should commission acute stroke services in accordance with the recommendations in this guideline to provide:
    - Required urgent attention to all acute stroke patients.
    - Urgent brain imaging for patients with suspected acute stroke.
    - Treatment with IV thrombolytics for patients with acute ischaemic stroke.
    - Endovascular services for patients with acute ischaemic stroke and large vessel disease.
    - Neurosurgical and interventional radiology services for patients with subarachnoid haemorrhage.
    - Neurosurgical services for intracerebral haemorrhage, malignant cerebral oedema and hydrocephalus.
    - In-ward treatment facility with monitoring for acute stroke.
    - Vascular surgery service for patients admitted with TIA and carotid artery stenosis.

Strategy 1C – Ensuring availability of stroke unit care for all acute and subacute stroke patients whose medical condition warrant coordinated multidisciplinary team care as an essential component in the management leading to reduction in complications, disability and dependency and improvement in survival.

Structure of stroke services

- Ensure availability of Stroke Units as specified in the guideline for management of both acute, subacute and chronic stroke patients.
- Stroke service should strengthen facilities for the care by multidisciplinary team members, particularly nursing, physiotherapy, occupational therapy and speech and language therapy, for all admitted patients with stroke.

Stroke Unit services

- Stroke services should ensure that people with acute and subacute stroke receive optimal and coordinated medical, nursing, physio, occupational & speech therapy, emotional support, social support, and family/ care-giver support in Stroke Units. The team should meet once in every week for stroke case discussions for management decisions.

- Delivery of appropriate multidisciplinary care according to the established protocols, from the early onset of the stroke, after appropriate need identification.

Strategy 1D - Ensuring comprehensive long-term rehabilitation and palliative care for patients left with severe disabilities and in need of long-term care.

Structure of services

- Ensure availability of long-term rehabilitation facilities as specified in the guideline to all stroke patients treated at every level of hospitals and left with severe disabilities necessitating in-hospital long-term rehabilitation.

Rehabilitation services

- Stroke services should ensure that, people left with persistent disabilities following stroke receive the long-term rehabilitation and follow-up by a rehabilitation specialist at a long-term rehabilitation centre as specified in the guideline and MDT therapy based on the need.
- Administrators should ensure that there are, protocols that enable assessment and provision of equipment, aids and structural adaptations for people with disabilities after stroke.
- Stroke services should ensure that care givers are adequately trained by conducting regular care giver training programmes to support care givers of patients with long term disabilities.
- Stroke services should ensure that palliative care services are available for their patients.

Strategy 1E - Ensuring Comprehensive after care for stroke patients leaving in-hospital care

Structure of stroke services

- Formulating the regulatory framework and providing the guidance for effective coordination between acute care centres and settings providing, secondary prevention services and long-term out-patient rehabilitation services. i.e., Rehabilitation hospitals, primary care hospitals, medical officers of health and field level staff including public health nursing officers and community based rehabilitation programms.

In-hospital stroke services

- Establishing a referral / back-referral system and communication system with stakeholders of acute care settings and post-hospital care settings.
- Implementing multidisciplinary case conferences for discharging and follow-up stroke patients, depending on the multidisciplinary care needs.
- Stroke services should ensure that, people dying with stroke receive end-of-life (palliative) care from the stroke service.

Secondary prevention services

- Administrators should commission services for secondary stroke prevention in accordance with the recommendations in this guideline.
    - Provide people with stroke or TIA with information and advice on treatments and lifestyle changes to reduce their risk of recurrent stroke.
    - Ensure long term follow-up and support with continuity of measures of secondary prevention.
- Administrators should support the lifestyle modification for stroke prevention.
    - Providing smoking cessation services.
    - Promoting people with disabilities to participate in exercises.
    - Promoting healthy eating.
    - Discouraging use of alcohol.

Strategy 1F - Developing protocols for care to ensure uniformity of care throughout the country.

Structure of stroke services

- Developing and regular updating of protocols aligned with the updated evidence-based practices through a clinical expert committee and multidisciplinary team.
- Dissemination of the contents of the updated protocols through effective means of group communications, printed materials, circulars and academic workshops and sessions.

Acute stroke and Stroke Unit services

- Formulation of protocols for acute and subacute care of stroke patients, based on updated evidence-based guidelines and adapted to the local setting.

Secondary prevention services

- Administrators should ensure that there are, protocols to guide health care providers and social services that would enable seamless and safe community integration of the patient and implementation of secondary prevention strategies.

2. Domain 2 - Capacity building for health staff who are involved in management of stroke patients

The commissioning of a well-led, appropriately trained and skilled workforce providing holistic and compassionate care to patients and their families is the primary objective of organizing stroke services in hospitals of the MoH.

Strategy 2A - Promoting stroke as a specialty by itself and conducting academic programmes for all grades of health care professionals in Sri Lanka.

Structure of stroke services

- The MoH should ensure that the Postgraduate Institute of Medicine recognizes

Stroke as a speciality by itself and board certify competent stroke physicians to provide care for stroke patients.

- MoH should ensure that the Postgraduate Institute of Medicine conducts Diploma Programmes on Stroke for grade medical officers leading them to grade promotions.
- MoH should ensure that the Post Basic School of Nursing conducts Diploma courses on Stroke for nurses.
- Universities should be promoted to conduct Diploma courses on Stroke for the benefit of allied health professionals.
- MoH should organize certificate courses for nurses, allied health professionals and minor staff on important components of stroke care.

Strategy 2B - Improving the capacity of relevant staff by conducting workshops to enhance skills development in stroke care among health care professionals.

Structure of stroke services

- Administrators should ensure that all those caring for people with stroke have the knowledge, skills and attitudes to provide safe, compassionate and effective care, especially for vulnerable patients with restricted mobility, sensory loss, impaired communication, cognition and neuropsychological problems.
- Implementation of a system of regular updating of competencies for all health staff involved in stroke care (including those who are involved in secondary prevention and long-term care), through regular need identification and through training programs according to the identified needs, combined with training evaluations. It is important to ensure participation of multidisciplinary teams for these capacity development activities.

In-hospital stroke services

- Conducting regular training programmes on stroke care to all levels of health care professionals involved in the management of acute, subacute and long-term care of stroke and to care givers/ relatives.

3. Domain 3 - Monitoring and evaluation of stroke care services

Strategy 3A - Development and defining the standards of stroke care for each level of care in hospitals of the MoH as stated in the guideline.

Structure of stroke services

- Establishing a system of development and updating of standards of stroke care aligned with the protocol development (strategy 1F) based on updated evidence-based practices through a clinical expert committee and multidisciplinary team.
- Dissemination of the standards and expected level of performance to all health sector stakeholders involving stroke care at each level of healthcare, preferably through a password protected, web-based platform to ensure wider access.

Strategy 3B - Promoting the establishment of an electronic National Stroke Registry and sharing of information among all stakeholders, thereby establishing a system for monitoring the implementation of guidelines on stroke care.

Structure of stroke services

- Administrators should ensure that the stroke services they commission participate in national audits.
- Administrators should ensure that stroke services are monitored and evaluated regularly in terms of the process of care, including the patient experience and patient-centred outcomes.

4. Domain 4 - Ensuring patient-centred care for stroke patients and families

Services must always be designed with appropriate consideration given to the needs of people with stroke and their family/ care-givers.

Strategy 4A - Enhancement of patients' and public satisfaction by establishing standard stroke care accessible to all citizens in Sri Lanka.

Structure of stroke services

- Administrators should ensure that there is sufficient information on services available from the MoH, provided to people with stroke and their family/ care-givers, in order to ensure timely access.
- Establishing a system for assessing patient satisfaction and experience (either web-based or paper-based combined preferably with a Hotline and this hotline can be used for the provision of information).
- Facilitating and establishing appropriate mechanisms for recognizing care-giver needs and address these needs, including end-of-life care, advanced care planning and palliative care.

In-hospital stroke services

- Assigning an officer within the stroke units for the provision of regular and updated information on clinical condition of patients for families/ care givers. The same officer, can act as a provider of information on discharge and follow-up, referrals for the multidisciplinary team and other levels of healthcare.
- Administrator officials in health and social care should ensure that care givers of people with stroke
    - are able to access the advice, support and help they need.
    - are provided with equipment and appropriate training to enable them to care for a person with stroke.

Long term services

- Administrator officials
    - should promote practical and emotional support needed for stroke patients living with disabilities.
    - should ensure long-term social support and support for leisure activities.
- Implementing appropriate mechanisms for recognizing care-giver stress and helping the care-givers through feasible and recognized approaches such as networking with patient support groups and organiztions, peer groups etc.

Strategy 4B - Enhancement of public awareness and successful utilization of established stroke services including empowerment of the public on prevention of stroke.

Structure of stroke services

- Administrators should ensure that there is sufficient information on services available from the MoH for primary and secondary prevention, diagnosis and management strategies, provided to public at large and patients with stroke and their family/ care-givers.
- Establishing a system for information provision, either web-based or paper-based combined preferably with a Hotline.
- Administrators should commission a public education programme to ensure that the public personal can recognise a stroke or TIA and respond appropriately.

5. Domain 5 - Enhancing inter-sectoral collaboration for stroke care

Strategy 5A - Ensuring close collaboration between public health and curative sector of the MoH and also with other sectors such as Ministry of Social Empowerment to deliver comprehensive and integrated services for people with stroke, to meet their complex and long-term needs.

Structure of stroke services

- Establishing a coordinating mechanism with different sectors at national level and regional/ institutional level, to facilitate the provision of service needs of stroke patients. These can be in the form of case conferences at the regional/ institutional level, where officials from other sectors are invited for the healthcare setting. At the national level, there may be a coordinating mechanisms and policy level dialogue between secretaries of ministries to facilitate the regional/ institutional level coordinating activities.

Long term services

- Administrators should commission stroke rehabilitation services in accordance with the recommendations in this guideline to provide:- a rehabilitation service capable of meeting not only the specific health but also social and vocational needs of people with stroke.

6. Domain 6 - Promoting research on stroke care to generate evidence-based practices

There is abundance of research evidence that has significantly influenced the outcome of stroke as well as recurrences, over last several decades. The eventual strategic objective of developing guidelines is to streamline stroke care by incorporating new knowledge into practice to reduce the mortality, disability and dependency caused by stroke.

Strategy 6A - Promoting and conducting research on stroke in Sri Lanka for implementation of evidence-based findings.

Structure of stroke services

- Identification of research priorities in relation to stroke care in Sri Lanka, and disseminate them among academia, professional colleges and post graduate trainees.
- Facilitation of conduction of research in stroke care, by establishing research grants and formulation of expert groups for advices, guidance and facilitation at the Stroke Unit levels.
- Dissemination of research findings through publications, conferences and workshops and ensure these findings are translated in to clinical practice.

15. Stakeholder engagement in achleving Strategic objectives

The Guideline recommends strategic objectives for development of stroke care in Sri Lanka for next 5 years. Responsible stakeholders for implementation of the activities for identified strategies under six domains, are stated in the **Table 15.1.** Apart from Ministry of Health, Post Graduate Institute of Medicine and the University Grant Commission are recognized for training of professionals and the Department of Social Services for rehabilitation of disabled patients. The guideline encourages activities conducted by Professional Organizations/ Associations and other Non-governmental organizations in achieving its objectives.

Table 15.1

Domain	Strategy	Key Area	Activities	Responsibility
1. Domain 1 – Facilitating the delivery of comprehensive clinical care for stroke patients.	**Strategy 1A**- Ensuring effective prehospital services to increase the proportion of stroke patients who benefit from the thrombolytic programmes established in hospitals.	Structure of the stroke services	1. Establishing and promoting public education on recognition of stroke. 2. Establishing effective network and communication system with pre-hospital care ambulance services and established centres of stroke care to ensure timely transport of stroke patients. 3. Develop clinical guideline and patient management pathways to prevent delays in thrombolysis and other interventions.	DDG – MS II, PHS II, NCD **Director (Health Education Bureau),** Professional Colleges and Associations. **Additional Secretary - Medical Services and Public Health services** DDG – MS I, II, ,NCD, Planning ,Professional Colleges and Associations, Suwa Seriya Foundation. DDG – MS I, MS II, NCD Professional Colleges and Associations, Suwa Seriya Foundation, Heads of Institutions and Medical Specialists.
		Emergency ambulance services	1. To develop and building capacities of the Ambulance services, including call handlers. 2. Develop a patient transport manual and guideline for prehospital, hospital to stroke centre and discharge from hospital covering state and private sector services. 3. Conduct technical capacity building programs for prehospital ambulance staff and hospital transport teams.	**Additional Secretary Medical Services and Public Health service,** DDG – MS 1, MS II, NCD, ET&R, Planning, Director – Training, Professional Colleges and associations, Suwa Seriya Foundation, Heads of Institutions and Medical Specialists.

Domain	Strategy	Key Area	Activities	Responsibility
	Strategy 1B - Ensuring effective hyperacute stroke care by strengthening A&E units and establishing thrombolytic and thrombectomy pathways with urgent neuroimaging and intervention facilities for acute stroke patients.	Structure of stroke care	1. Stroke services at A&E should ensure that people with suspected acute stroke or TIA are diagnosed and treated urgently. 2. There has to be pathway established for thrombolysis and thrombectomy as stated in the guideline. 3. Partnership working may also be required within the MoH, between administrators of different levels of health care institutions in situations such as hyperacute stroke care and interventional services such as endovascular therapy in tertiary care settings, and neurosurgery facilities for SAH and ICH.	**DDG – MS I, II, NCD, MSD, Director (Tertiary Care Services),** Provincial and District Directors of Health Services, Heads of Institutions, Professional Colleges and associations, Medical Specialists.

Domain	Strategy	Key Area	Activities	Responsibility
		Acute stroke services	1. Hospitals should commission acute stroke services in accordance with the recommendations in this guideline to provide: • Required urgent attention to all acute stroke patients. • Urgent brain imaging for patients with suspected acute stroke. • Treatment with IV thrombolytics for patients with acute ischemic stroke. • Endovascular services for patients with acute ischemic stroke and large vessel disease. • Neurosurgical and interventional radiology services for patients with subarachnoid haemorrhage. • Neurosurgical services for intracerebral haemorrhage, malignant cerebral oedema and hydrocephalus. • In-ward treatment facility with monitoring for acute stroke. • Vascular surgery service for patients admitted with TIA and carotid artery stenosis.	DDGMSII, DDG MS I, DDG MSD, Director (Tertiary Care Services), Provincial and District Directors of Health Services, Heads of Institutions, Professional Colleges and Associations, Medical Specialists.

Domain	Strategy	Key Area	Activities	Responsibility
	Strategy 1C – Ensuring availability of stroke unit care for all acute and subacute stroke patients whose medical condition warrant coordinated multidisciplinary team care as an essential component in the management leading to reduction in complications, disability and dependency and improvement in survival.	Structure of stroke services	1. Ensure availability of Stroke Units with adequate number of beds at all hospitals above District General and Base Hospital B as specified in the guideline for management of both acute, subacute and chronic stroke patients. 2. Stroke service should strengthen facilities for the care by multidisciplinary team members, particularly for nursing, physiotherapy, occupational therapy and speech and language therapy, for all admitted patients with stroke. 3. Ensure availability of beds in Stroke Units as per Guideline; recommends 10-20 bedded stroke care units at every District and Base hospital B above, and approximately 100 bedded (50 beds in each male and female ward) stroke unit at every provincial acute and long term rehabilitation units.	**DDG – MS I, II, MSD, NCD,** Planning Director (Tertiary Care Services), Provincial and District Directors of Health Services, Heads of Institutions, Professional Colleges and Associations, Medical Specialists and Director, Allied Health.

Domain	Strategy	Key Area	Activities	Responsibility
		Stroke Unit services	1. Stroke services should ensure that people with acute and subacute stroke receive optimal and coordinated medical, nursing, physio, occupational & speech therapy, emotional support, social support, and family / care-giver support in Stroke Units. The team should meet once in every week for stroke case discussions for management decisions. 2. Delivery of appropriate multidisciplinary care according to the established protocols, from the early onset of the stroke, after appropriate need identification. 3. All stroke units should contribute to the National Stroke Registry. 4. Conducting training programmes for care givers of stroke patients with long term disabilities.	**DDG – MS I, II, ET&R,** Director (Tertiary Care Services), Director (Training), Provincial and District Directors of Health Services, Heads of Institutions, Professional Colleges and Associations, Medical Specialists, Director – Nursing (Medical Services), Director (Nursing Education), Nursing and Allied Health Professional Associations and Universities, Principals of Nursing and Allied Health Training Schools.
	Strategy 1D – Ensuring comprehensive long-term rehabilitation and palliative care for patients left with severe disabilities and in need of long-term care.	Structure of services	1. Ensure availability of long-term rehabilitation facilities as specified in the guideline to all stroke patients treated at every level of hospitals and left with severe disabilities necessitating in-hospital long-term rehabilitation.	DDG – MS I, II, PHS II, Director (Tertiary Care Services), **Director (Youth, Elderly, Disabled),** Provincial and District Directors of Health Services, Heads of Institutions, Professional Colleges and Associations, Medical Specialists, Allied Health Professional Associations.

Domain	Strategy	Key Area	Activities	Responsibility
		Rehabilitation Services	1. Stroke services should ensure that, people with stroke, who are left with persistent disabilities receive the long-term rehabilitation and follow-up under the care of a rehabilitation specialist at a long-term rehabilitation centre as specified in the guideline and MDT therapy based on the need. 2. Administrators should ensure that there are, protocols that enable assessment and provision of equipment, aids and structural adaptations for people with disabilities after stroke. 3. Stroke services should ensure that care givers are adequately trained by conducting regular care giver training programmes to support care givers of patients with long term disabilities. 4. Stroke services should ensure that palliative care services are available for their patients. 5. Stroke services should ensure that the needed social services and leisure activities are made available for stroke patients.	DDG – MS I, II, NCD, PHS II, Planning, Director (Tertiary Care Services), Director (Youth, Elderly, Disabled), Director NCD, Provincial and District Directors of Health Services, Heads of Institutions, Professional Colleges and Associations, Medical Specialists, Allied Health Professional Associations, Department of Social Services.

Domain	Strategy	Key Area	Activities	Responsibility
	Strategy 1E – Ensuring Comprehensive after care for stroke patients leaving in-hospital care.	Structure of stroke services	1. Formulating the regulatory framework and providing the guidance for effective coordination between acute care centres and settings providing, secondary prevention services and long-term out-patient rehabilitation services. i.e., Rehabilitation Hospitals, Primary care hospitals (Divisional Hospitals), Medical Officers of Health and field level staff including Public Health Nursing Officers and community-based rehabilitation programmes as per guidelines. 2. Ensure a service capable of delivering rehabilitation in out-patient and community settings in liaison with in-patient services. 3. Ensure provision of services for routine post-discharge follow-up of stroke patients. 4. Ensure primary and secondary care services are accessible for the convenience of disabled people. 5. Ensure practical and emotional support needed for stroke patients living with disabilities. 6. Ensure long-term social support and support for leisure activities.	DDG – MS I, II, PHS II, Planning, Director (Tertiary Care Services), Director (Medical Services), **Director (Primary Care Services),** Director (Youth, Elderly, Disabled), Provincial and District Directors of Health Services, Heads of Institutions, Professional Colleges and Assortations, Medical Specialists, Allied Health Professional Associations.

Domain	Strategy	Key Area	Activities	Responsibility
		In-hospital stroke services	1. Establishing a referral / back-referral system and communication system with stakeholders of acute care settings and post-hospital care settings. 2. Implementing multidisciplinary case conferences for discharging and follow up stroke patients in liaison with the post-stroke care team in the community, for discharging and follow-up of stroke patients, depending on the multidisciplinary care needs. 3. Stroke services should ensure that, people with limited life expectancy following stroke receive advance care planning and end-of-life (palliative) care from the stroke service.	DDG – MS I, II, **NCD,** Planning, Director (Tertiary Care Services), Director (Medical Services), Director (Primary Care Services), Director (Youth, Elderly, Disabled), Provincial and District Directors of Health Services, Heads of Institutions, Professional Colleges and Associations, Medical Specialists, Nursing and Allied Health Professional Associations.
		Secondary prevention services	Administrators should commission services for secondary stroke prevention in accordance with the recommendations in this guideline. 1. people with stroke or TIA should be provided with information and advice on treatments and lifestyle changes to reduce their risk of recurrent stroke. 2. Ensure long term follow-up and support with continuity of measures of secondary prevention. • Administrators should support the lifestyle modification recommendations, healthy eating, and discourage use of alcohol and smoking. • Promoting people with disabilities to participate in exercises. 3. Ensure uninterrupted availability of essential drugs for at institutions providing secondary prevention services.	DDG – MS I, II, NCD, Director (NCD), Director (Primary Care Services), Director (Youth, Elderly, Disabled), Provincial and District Directors of Health Services, Heads of Institutions, Professional Colleges and Medical Specialists, Nursing and Allied Health Professional Associations, Primary Health Care.

Domain	Strategy	Key Area	Activities	Responsibility
	Strategy 1F - Developing protocols for care to ensure uniformity of care throughout the country.	Structure of stroke services	1. Developing and regular updating of protocols for care aligned with the updated evidence-based practices through a clinical expert committee and multidisciplinary team. 2. Dissemination of the contents of the updated protocols through effective means of group communications, printed materials, circulars and academic workshops and sessions.	**DDG –NCD, MS II, PHS II, Director (Health Education Bureau), Director Nursing,** Provincial and District Directors of Health Services, Heads of Institutions, Professional Colleges and Associations, Medical Specialists, Nursing and Allied Health Professional Associations.
		Acute stroke and stroke unit services	1. Formulation of protocols for acute and subacute care of stroke patients, based on updated evidence-based guidelines and adapted to the local setting.	**DDG – MS II,** NCD, Professional Colleges and associations, Medical Specialists, Nursing and Allied Health Professional Associations.
		Secondary prevention services	1. Administrators should ensure that there are, protocols to guide health care providers and social services that would enable seamless and safe community integration of the patient and implementation of secondary prevention strategies.	DDG – MS I, II, PHS II, NCD, **Director (NCD),** Director (Primary Care Services), Director (Youth, Elderly, Disabled), Provincial and District Directors of Health Services, Heads of Institutions, Professional Colleges and Associations, Medical Specialists, Nursing and Allied Health Professional Associations.

Domain	Strategy	Key Area	Activities	Responsibility
2. Capacity building for health staff who are involved in management of stroke patients.	**Strategy 2A** - Promoting stroke as a specialty by itself and conducting academic programmes for all grades of health care professionals in Sri Lanka.	Training Professionals	1. MoH should ensure that the Postgraduate Institute of Medicine recognizes Stroke as a speciality by itself and board certify competent stroke physicians to provide care for stroke patients. 2. MoH should ensure that the Postgraduate Institute of Medicine conducts Diploma Programmes on Stroke for grade medical officers leading them to grade promotions. 3. MoH should ensure that the Post Basic School of Nursing conducts Diploma courses on Stroke for nurses. 4. Universities should be promoted to conduct diploma and postgraduate courses on Stroke for the benefit of nurses and allied health professionals. 5. MoH should organize certificate courses for nurses, allied health professionals and minor staff on important components of stroke care.	DGHS, PGIM Professional Colleges and Associations, Medical Specialists, UGC.

Domain	Strategy	Key Area	Activities	Responsibility
	Strategy 2B - Improving the capacity of relevant staff by developing academic modules to enhance skills development in stroke care among health care professionals.	Structure of stroke services	1. Administrators should ensure that all those caring for people with stroke have the knowledge, skills and attitudes to provide safe, compassionate and effective care, especially for vulnerable people with restricted mobility, sensory loss, impaired communication, cognition and neuropsychological problems. 2. Implementation of a system of regular updating of competencies for all health staff involved in stroke care (including those who are involved in secondary prevention and long-term care), through regular need identification and through training programs according to the identified needs, combined with training evaluations. It is important to ensure participation of multidisciplinary teams for these capacity development activities.	**DDG** – MS I, II, **ET&R,** Planning, Director (Tertiary Care Services), Director (Training), Provincial and District Directors of Health Services, Heads of Institutions, Professional Colleges and Medical Specialists, Director – Nursing (Medical Services), Director (Nursing Education), Nursing and Allied Health Professional Associations and Universities, Principals of Nursing and Allied Health Training Schools.
		In-hospital stroke services	1. Conducting regular training programmes on stroke care to all levels of health care professionals involved in the management of acute, subacute and long-term care of stroke and to care givers/ relatives.	**DDG** – MS I, II, **ET&R,** Planning, Director (Tertiary Care Services), Director (Training), Provincial and District Directors of Health Services, Heads of Institutions, Professional Colleges and Medical Specialists, Director – Nursing (Medical Services), Director (Nursing Education), Nursing and Allied Health Professional Associations and Universities, Principals of Nursing and Allied Health Training Schools.

Domain	Strategy	Key Area	Activities	Responsibility
3. Establishing, monitoring and evaluation of stroke care services	**Strategy 3A** - Development and defining the standards of stroke care for each level of care in hospitals of the MoH as stated in the guideline.	Structure of stroke services	1. Establishing a system of development and updating of standards of stroke care aligned with the protocol development based on updated evidence-based practices through a clinical expert committee and multidisciplinary team. 2. Dissemination of the standards and expected level of performance to all health sector stakeholders involving stroke care at each level of healthcare, preferably through a password protected, web-based platform to ensure wider access.	**DDG – MS II,** Professional Colleges and Associations, Medical Specialists, Nursing and Allied Health Professional Associations. DDG – MS II, PHS II, Planning, **Director (Information),** Director (Health Education Bureau), Heads of Institutions, Professional Colleges and Medical Specialists, Nursing and Allied Health Professional Associations.
	Strategy 3B - Promoting the establishment of an electronic National Stroke Registry and sharing of information among all stakeholders, thereby establishing a system for monitoring the implementation of guidelines of stroke care.	Structure of stroke services	1. Administrators should ensure that the stroke services they commission participate in national audits. 2. Administrators should ensure that stroke services are monitored and evaluated regularly in terms of the process of care, including the patient experience and patient-centered outcomes.	DDG – MS I, II, Planning, **Director (Healthcare Quality and Safety),** Director Health Information, Heads of Institutions, Professional Colleges and Medical Specialists, Nursing and Allied Health Professional Associations.

Domain	Strategy	Key Area	Activities	Responsibility
4. Ensuring patient-centred care for stroke patients and families	**Strategy 4A** - Enhancement of patients' and public satisfaction by establishing standard stroke care accessible to all citizens in Sri Lanka.	Structure of stroke services	1. Administrators should ensure that there is sufficient information on services available from the MoH, provided to people with stroke and their family/ care-givers, in order to ensure timely access. 2. Establishing a system for assessing patient satisfaction and experience (either web-based or paper-based combined preferably with a Hotline and this hotline can be used for the provision of information). 3. Facilitating and establishing appropriate mechanisms for recognizing patient and caregiver needs and address these needs, including end-of-life care, advanced care planning and palliative care.	DDG – MS I, II, PHS II, Planning, **Director (Health Education Bureau),** Director Healthcare Quality and Safety, Professional Colleges. **Additional Secretary, Medical Services, public health services,** DDG – MS II, PHS II, Planning, **Director (Health Education Bureau),** Heads of Institutions, Professional Colleges **DDG – MS II,** Heads of Institutions, Professional Colleges, Associations, Specialist Physicians, Patient Support Groups.
		In-hospital stroke services	1. Assigning an officer within the stroke units for the provision of regular and updated information on clinical condition of patients for families/ care givers. The same officer, can act as a provider of information on discharge and follow-up, referrals for the multidisciplinary team and other levels of healthcare. 2. Commissioning officials in health and social care should ensure that care givers of people with stroke are provided with adequate information on available social services.	**DDG – MS II,** Heads of Institutions, Professional Colleges and Associations, Medical Specialists. Director (Youth, Elderly, Disabled), Director, Department of Social Services

Domain	Strategy	Key Area	Activities	Responsibility
		Long term services	1. Administrators • should ensure practical and emotional support needed for stroke patients living with disabilities. • should ensure long-term social support and support for leisure activities. 2. Implementing appropriate mechanisms for recognizing care-giver stress and helping the caregivers through feasible and recognized approaches such as networking with NGOs such as National Stroke Association of Sri Lanka, patient support groups, peer groups etc.	**DDG – MS II,** I, NCD, Planning, Director Healthcare Quality and Safety, Heads of Institutions, Professional Colleges, Assortations, NGOs, Patient Support Groups.
	Strategy 4B - Enhancement of public awareness and successful utilization of established stroke services including empowerment of the public on prevention of stroke.	Structure of stroke services	1. Administrators should ensure that there is sufficient information on services available from the MoH for primary and secondary prevention, diagnosis and management strategies, provided to public at large and patients with stroke and their family/ care-givers. 2. Administrators should commission a public education programme to ensure that the public personal can recognize a stroke or TIA and respond appropriately. 3. Establishing a system for information provision, either web-based or paper-based combined preferably with a Hotline.	DDG – MS II, PHS II, NCD, Planning, **Director (Health Education Bureau),** Director (NCD), Professional Colleges, NGOs, Patient Support Groups. DDG – MS II, PHS II, **Director (Health Education Bureau),** Professional Colleges, Patient Support Groups. **Additional Secretary, Medical Services, Public Health Services,** DDG – MS II, PHS II, Planning Director (Health Education Bureau), Director Health Information, Professional Colleges, NGO

Domain	Strategy	Key Area	Activities	Responsibility
5. Enhancing inter-sectoral collaboration for stroke care.	**Strategy 5A** – Ensuring close collaboration between public health and curative sector of the MoH and also with other sectors such as Ministry of Social Empowerment to deliver comprehensive and integrated services for people with stroke, to meet their complex and long-term needs.	Structure of stroke services	1. Establishing a coordinating mechanism with different sectors at national level and regional / institutional level, to facilitate the provision of service needs of stroke patients. These can be in the form of case conferences at the regional/ institutional level, where officials from other sectors are invited for the healthcare setting. At the national level, there may be a coordinating mechanisms and policy level dialogue between secretaries of ministries to facilitate the regional/ institutional level coordinating activities.	**Secretary, Additional Secretary MS, PHS, DDG – MS** I, **II,** PHS II, Planning, NCD, Provincial and Regional Directors of Health Services, Heads of Institutions, Professional Colleges.
		Long term services	1. Administrators should commission stroke rehabilitation services in accordance with the recommendations in this guideline to provide: a rehabilitation service capable of meeting not only the specific health but also social and vocational needs of people with stroke. 2. Stroke services should collaborate closely with the Ministry of Social Services and ensure arranging welfare facilities and other social and vocational needs for disabled stroke patients (Providing a wheelchair, sanitary facilities, access to house etc.).	**DGHS, DDG – MS II,** Planning, PHS II, Director (Youth, Elderly, Disabled), Provincial and Regional Directors of Health Services, Heads of Institutions, Professional Colleges, Associations, Medical Specialists, Nursing and Allied Health Professional Associations, Director, Department of Social Services

Domain	Strategy	Key Area	Activities	Responsibility
6. Promoting research on stroke care to generate evidence-based practices.	**Strategy 6A** - Promoting and conducting research on stroke in Sri Lanka for implementation of evidence-based findings.	Structure of stroke services	1. Identification of research priorities in relation to stroke care in Sri Lanka, and disseminate them among academia, professional colleges and postgraduate trainees. 2. Facilitation of conduction of research in stroke care, by establishing research grants and formulation of expert groups for advices, guidance and facilitation at the stroke unit levels. 3. Dissemination of research findings through publications, conferences and workshops and ensure these findings are translated into clinical practice.	**Secretary, DGHS, DDG** – MS I, II, **ET&R, NCD, Planning** Director (Research), **PGIM** Professional Colleges, Nursing and Allied Health Professional Associations.

Main focal point for each activity is indicated by **Bold** letters

DDG – Deputy Director General, MS – Medical Services, PHS – Public Health Services, ET&R – Education, Training and Research, NCD – Non Communicable Diseases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Part II

CLINICAL MANAGEMENT OF STROKE

1. Management of acute stroke and transient ischaemic attacks

1.1. Introduction

Stroke is the second most common cause of death worldwide and a major cause of functional disability. Stroke causes 20% mortality within the first year after the index attack while about 50% of the survivors suffer significant morbidity. Approximately, 85% of strokes are ischaemic and 15% are haemorrhagic.

There have been significant advances made in the medical management of acute strokes over the last three decades. Advances have occurred particularly in imaging, recanalization of blocked vessels in ischaemic strokes with thrombolysis and thrombectomy, and in the acute management of haemorrhagic strokes.

The National Institute of Neurological Disorders and Stroke (NINDS) trial in 1995, which showed improved clinical outcomes with intravenous rtPA within three hours of ischaemic stroke, revolutionized the management of acute ischaemic strokes and served as a catalyst for a series of trials on reperfusion therapy in ischaemic stroke. The focus of reperfusion therapy has been on salvaging the ischaemic penumbra, the survival of which is time dependent. Reperfusion within a narrow therapeutic window remains a challenge to health systems anywhere in the world. Despite thrombolysis being available in Sri Lanka for almost 15 years, less than 3% of acute ischaemic strokes are thrombolysed at present. Organization of services and development of guidelines are a vital component of establishing an effective acute stroke care programme. This chapter on 'Management of Acute stroke and TIAs' includes imaging in stroke, pre-hospital care, management of TIA, acute ischaemic stroke, hemorrhagic stroke, subarachnoid hemorrhage and stroke in pregnancy.

1.2. Diagnostic and interventional radiology in the management of stroke

Current evidence-based treatment for acute ischaemic stroke includes intravenous thrombolysis (IVT) and Mechanical Thrombectomy (MT), both of which require careful patient selection within a time-locked therapeutic window. It is therefore pertinent that priority be given to patients with acute stroke at the radiology department as further management is entirely dependent on the time from onset of symptoms to the imaging findings.

Radiology plays a crucial role in the management of acute stroke by providing important information about the location and extent of the stroke, and the underlying cause of the stroke. This information can help detect cerebral hemorrhage, stroke mimics as well as identify eligible patients for thrombolysis and thrombectomy, and guide the procedures themselves, which can improve the chances of a successful outcome for patients.

The rationale behind intervention in hyperacute stroke is based on a three-compartment model of brain parenchyma following a vascular occlusion. The infarct core represents non-viable brain tissue that cannot be salvaged even with prompt reperfusion. The area surrounding the infarct core known as the ischaemic penumbra represents brain with reduced blood flow that has the potential for survival if blood flow is restored immediately. Thus, the penumbra is the target for treatment by intravenous thrombolysis and mechanical thrombectomy. The zone outside the penumbera represents brain that is likely to be normal and survive without requirement of treatment.

While CT and MRI are the most commonly used brain imaging techniques, more advanced imaging techniques have been developed to precisely assess and differentiate the volume of non-viable brain tissue from potentially salvageable brain tissue.

- **Computer Tomography (CT)**
  - **Non-contrast enhanced CT of the brain**

    Sixteen slice or more CT facilities are available in hospitals in or above the level of base hospitals in Sri Lanka. Therefore, unenhanced CT is the imaging of choice for acute stroke management due to its wide availability and rapidity of obtaining images and its high sensitivity in detecting haemorrhages.

    However, the plain CT does not accurately indicate the presence of infarct core or provide information about the ischaemic penumbra. Based on the sensitivity in picking up acute haemorrhages in a clinically diagnosed stroke, unenhanced CT provides sufficient information to select patients for IVT and MT. In CT scans where changes of early cerebral infarctions are present, they correlate well with the outcome of the patient and the risk of cerebral haemorrhage following thrombolytic therapy. Furthermore, unenhanced CT is able to detect intraluminal thrombosis with reasonable sensitivity.

    Alberta Stroke Programme Early CT Score (ASPECTS) is a 10 point quantitative score that determines Middle Cerebral Arterial stroke severity using available computed tomography data. In calculating the ASPECT score, while the normal brain ASPECT score is 10, one point is subtracted from 10 for any evidence of early ischemic changes for each of the defined regions. A sharp increase in dependence and death occurs with an ASPECTS of 7 or less **(Fig 1.1).**

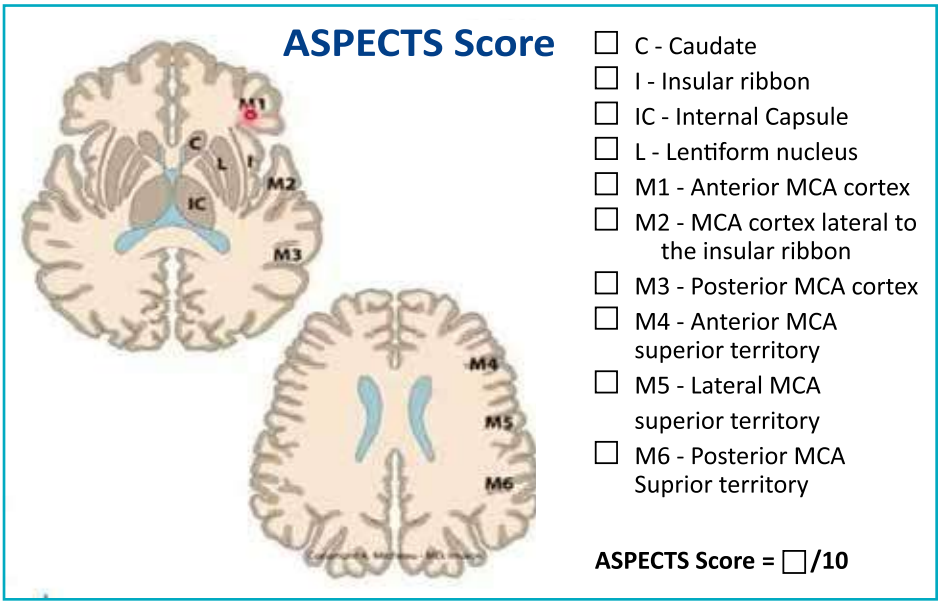


Fig 1.1 Alberta Stroke Programme Early CT Score

- **CT angiography (CTA) cerebral arteries**

  CTA is available in hospitals in Sri Lanka where 16 slice or more CT scanners are available. In addition to characterizing the thrombus occluding the cerebral artery, it may provide information on collateral supply to the ischemic territory. It is rapid and provides excellent spatial resolution in assessment of the intra- and extra-cranial vasculature.

  In the context of acute stroke, CTA provides information on the target for treatment. CTA must include the aortic arch to the vertex which is essential to identify tandem lesions such as an ICA stenosis or arterial dissection and to aid planning of access to the intracranial occlusion. The volume of thrombus demonstrated on CTA is an independent indicator of poor neurological outcome.

- **CT Perfusion (CTP)**

  CT perfusion uses a combination of CT imaging and a contrast agent to create detailed images of blood flow and tissue perfusion in the brain which is comparable to an MR perfusion. CTP can be used to asses cerebral blood flow and differentiate the penumbra from the core (area of infarcted brain tissue).

- **Magnetic Resonance Imaging (MRI)**

  MRI provides comprehensive multiparametric assessment of the brain parenchyma and cerebral circulation. It is superior to CT in many aspects, particularly, in the provision of Diffusion Weighted Imaging (DWI), which demonstrates the infarct core. DWI can be directly compared with Perfusion Weighted Imaging (PWI) and, other MR sequences and the clinical status to determine the tissue salvageability. Susceptibility weighted imaging (SWI) is highly sensitive in detecting haemorrhages

and microhaemorrhages, which may influence treatment decisions pertaining to thrombolysis. MRI is more sensitive than CT in diagnosing posterior circulation infarctions. Furthermore, MRI is useful in identifying salvageable ischaemic penumbra that is likely to benefit from reperfusion therapy in patients who present late or in whom the onset time of stroke is unknown as in patients with wake-up strokes. Despite its advantages, the use of MRI is limited by its non-availability in many centres and its potential to cause delay in instituting reperfusion therapy due to the longer duration for image acquisition compared to CT.

- **Diffusion Weighted Imaging (DWI)**
  DWI is currently the most sensitive imaging modality for the detection of acute ischemic strokes, as it can detect even small infarcts within minutes of onset. However, it is not totally specific for irreversible infarction and DWI positive lesions have been reversed with early reperfusion.

- **Magnetic Resonance Angiography (MRA) of cerebral vessels**
  MRA delineates the vascular tree perfusing the brain. However, it is less sensitive in assessing the collateral circulation distal to an arterial occlusion and luminal stenosis compared to CTA.

- **Perfusion Weighted Imaging (PWI)**
  PWI can provide information about the Cerebral Blood Flow (CBF), Cerebral Blood Volume (CBV) and Mean Transit Time (MTT) in the brain. This information can be used to identify the volume of the ischaemic penumbra.

- **Mechanical Thrombectomy (MT)**

  Mechanical clot retrieval or thrombectomy is a procedure used to treat acute ischaemic strokes caused by obstructing blood clots in a large vessel in the brain. The goal of thrombectomy is to remove the clot and restore the blood flow to the affected part of the brain.

  CT scan of brain and a CTA or MRA are essential to confirm the presence of a major vessel occlusion prior to thrombectomy. Thrombectomy is carried out under sedation or sometimes under general anaesthesia. Initially, a conventional cerebral angiography is done to identify the exact location of the arterial occlusion. Thrombectomy is performed by introducing a catheter through the femoral artery, which is guided to the site of the clot in the brain under the guidance of X-ray fluoroscopy followed by the introduction of the clot-retrieval device, such as a stent retriever, that is advanced through the catheter to the site of the clot and manipulated to retrieve the clot and re-establish the blood flow. Thrombectomy is performed for large vessel occlusions up to A2 and M2 in the anterior circulation, and the first branching divisions in the posterior circulation.

  - Facilities for MT are currently available at the National Hospital of Sri Lanka. Other hospitals that are recommended to establish MT are the National

Hospital of Kandy, Teaching Hospital Jaffna, National Stroke Centre Mulleriyawa, Teaching Hospital Karapitiya, Teaching Hospital Anuradhapura and Provincial General Hospital Badulla.

- **Doppler study of neck vessels**

  Doppler studies of neck vessels are indicated in TIA or minor strokes in the carotid arterial territory and assists in recognizing and characterizing the carotids stenosis.

1.3. Management of transient ischemic attacks (TIA)

Patients who had a sudden onset transient episode of neurological dysfunction caused by focal cerebral ischaemia of brain, retina and spinal cord are deemed to have a TIA. TIA increases the risk of stroke, particularly in the first few days immediately after the TIA. Thus, TIA is considered a neurological urgency.

- Patients with suspected TIA and their care givers should be educated on how to recognise stroke symptoms and the actions to be taken should there be a recurrence.
- MRI brain with DWI is sensitive in detecting minor infarcts that may mimic clinical TIA. As such, the decision for imaging for TIA is best made by the specialist. In instances where hemorrhage is suspected in patients on anticoagulants or with bleeding disorders, a non-contrast enhanced CT of the brain is recommended.
- Patients with TIA need specialist (neurologist/ specialist in internal medicine) attention. Patients who have developed a TIA more than one week ago, should be seen by the specialist as an out-patient. Patients who have developed a TIA less than a week ago, need admission to hospital for evaluation of risk factors and management unless a TIA clinic is available to see the patients within the next 48 hours.
- TIA patients presenting within 24 hours of symptom onset should receive loading doses of aspirin (300 mg) and clopidogrel (300 mg) as early as possible. Thereafter, patients should continue aspirin 75 mg and clopidogrel 75 mg daily for another 21 days after which patients should continue a single antiplatelet medication, either 75 mg of aspirin or 75 mg of clopidogrel per day indefinitely. For patients with TIA who are not appropriate for dual antiplatelet therapy, clopidogrel 300 mg loading dose followed by 75 mg daily should be given. A proton pump inhibitor should be considered for concurrent use with dual antiplatelet therapy to reduce the risk of gastrointestinal haemorrhage.
- In patients with atrial fibrillation anticoagulation should be commenced immediately.
- High intensity statin, atorvastatin 40 – 80 mg daily should be commenced immediately. The Clinical risk prediction score, $ABCD^2$ score is a useful tool for the estimation of short-term stroke risk **(Table 1.1).**

Table 1.1 ABCD^2 Score

ABCD^2 SCORE*		
Clinical Feature		Score
Age	≧ 60 years	1
Blood pressure	Systolic blood pressure > 140 or diastolic blood pressure > 90 mm Hg	1
Clinical symptoms	Unilateral weakness	2
	Speech disturbance without weakness	1
Duration of symptoms	>60 minutes	2
	10 – 59 minutes	1
Diabetes Mellitus	On oral medication or insulin	1
Total		7

*2-day risk of stroke was 0% for scores of 0 or 1, 1- 3% for 2 or 3, 4.1% for 4 or 5, and 8.1% for 6 or 7. Risk of stroke is 4- 8% in 30 days, 24 – 29% in 5 years.

- Elevated blood pressure should be corrected gradually, aiming for a goal of ≤140/90 mm Hg.
- Diabetics should achieve glycaemic control at earliest possible and should maintain HbA1C ≦7.0%
- Patients with carotid territory TIA should be screened for a carotid source of thromboembolism and patients with symptomatic, carotid stenosis between 50 - 99% should be offered carotid endarterectomy as early as possible, not later than 2 weeks after the onset of symptoms.
- Patients who are unsuitable for open surgery (e.g. inaccessible carotid bifurcation, re-stenosis following endarterectomy, radiotherapy associated carotid stenosis) should be considered for carotid angioplasty and stenting.
- Patient should be screened for a cardiac source of thromboembolism and if found, should be recommended anticoagulation treatment if the benefit outweighs the risk of major haemorrhage.
- A healthy lifestyle such as adequate physical activity, weight loss if overweight, screening and treatment for sleep apnoea, nutritional counselling, smoking cessation, and abstinence of alcohol consumption should be promoted.

1.4. Management of acute stroke

- **Prehospital care**

  An efficient pre-hospital care is mandatory for the effective management of acute stroke. Pre-hospital care is commenced by the ambulance service ("Suwa Seriya" ambulance service: call – 1990,) which responds within 20 minutes of a call anywhere in the country. The Emergency Medical Technician (EMT) of the ambulance service must be competent to use the F.A.S.T screening tool to identify a suspected stroke.

  - A trained EMT should assess the patient initially in the field and should communicate with the on-site doctor of the ambulance headquarters. A standard communication format such as ISBAR (Introduction, Situation, Background, Assessment, Recommendation) framework endorsed by World Health Organization, should be used for communication **(Table 1.2).** The on-site doctor will advise the EMT to provide basic airway and breathing support (supplementary oxygen, bag valve mask support), if indicated.
  - The EMT will be directed to the closest hospital with facilities for CT. In addition, a telephone call providing the information with vital parameters of the patient should be made by the EMT to the direct line of the A&E.
  - The ambulance service must be updated with the list of all hospitals with CT capabilities real time and with the list of dedicated telephone numbers of A&Es.

Table 1.2 ISBAR (Introduction, Situation, Background, Assessment, Recommendation) framework

ISBAR For Clear Communication	
I	**IDENTIFY:** Yourself (Name, position, location) & patient
S	**SITUATION:** Why you are calling (If urgent – say so)
B	**BACKGROUND:** Tell the story
A	**ASSESMENT:** What you think is going on
R	**REQUEST:** What you want from them

- **Preparation in the A&E following a pre-hospital alert**

  Following the pre-hospital alert regarding the Estimated Time of Arrival (ETA) of a suspected acute stroke patient, the following tasks would be initiated in the Emergency Department.

- Prepare space - Ideally the resuscitation bed of the Emergency Department or an acute monitoring bed.
- Inform the Radiology Department of a possible urgent CT brain on a suspected stroke patient giving an approximate time for the study.
- Prepare staff – Attendants to mobilize the patient; nurses for intravenous access, blood drawing, attach monitoring and administering drugs; doctors for assessment of the patient, perform advanced airway support if needed and communicating with the Acute Stroke Team (neurology/ radiology/ internal medicine)
- Prepare equipment – Equipment for monitoring, airway management, breathing support, intravenous access, drawing of blood for RBS, FBC, electrolytes, creatinine, INR/ APTT.

- **Assessment of the patient with acute stroke in the emergency department**
  - All patients suspected of having an acute stroke should be assessed immediately upon arrival at the ED for airway compromise. Patients with suspected stroke whose airway is considered at risk should be managed appropriately with suction, positioning, airway support and ventilatory assistance.
  - Supplemental Oxygen should be given to patients whose SpO2 is < 94%.
  - A peripheral IV access should be established.
  - Quick history taking and a focused neurological examination should be performed. Salient features that should be included in the history and the examination:
    - The time of onset of neurological symptoms.
    - The rapidity of the onset of neurological symptoms – sudden or gradual.
    - Examination: Face, arm and leg weakness. Impairment of speech/ mental status/ higher cortical function/ vision.
    - The stroke severity score using the National Institute of Health Stroke Scale (NIHSS) (**Annexure 1**).
  - Patients with residual neurological symptoms should remain nil by mouth until screened for dysphagia by a trained health care professional.
  - Check capillary blood glucose and send blood for FBC, INR and APTT.
  - Patients determined to be stable should be taken immediately to the radiology department and imaged with a non-contrast cranial CT (NCCT). If Large vessel occlusion is suspected in patients with a NIHSS score >6 and if the patient is potentially eligible for endovascular treatment, further radiological studies with CT angiography should be considered without causing a delay for thrombolysis.
  - The CT images should be examined by a specialist (radiologist/ physician/ neurologist) immediately after completion of the study.

1.5. Management of acute ischaemic stroke (AIS)

- Intravenous thrombolysis with either recombinant tissue plasminogen activator (rtPA) or tenecteplase (TnK) is recommended within 4.5 hours of onset of symptoms in eligible patients aged 18 to 80 years presenting with an AIS. In patients over the age of 80 years, intravenous thrombolysis is recommended within 0 – 3 hours of stroke onset while an individualized risk – benefit assessment should determine whether it should be administered within 3 – 4.5 hours of stroke onset.
- Patients should be evaluated for eligibility for thrombolysis using the form for 'Thrombolysis for Acute Stroke' **(Annexure 1)**.
- Patients with acute ischemic stroke, regardless of age or stroke severity, who were last known to be well more than 4.5 hours earlier should be considered for thrombolysis with alteplase if:
    - Treatment can be started between 4.5 and 9 hours of known onset, or within 9 hours of the midpoint of sleep when they have woken with symptoms.

      and
    - They have evidence from CT/ MR perfusion or MRI (DWI – FLAIR mismatch) of the potential to salvage brain tissue.

Table 1.3 Eligibility criteria for extending thrombolysis from 4.5 to 9 hours and wake-up stroke

	Time window	Imaging	Imaging criteria
Wake-up stroke	>4.5 hours from last seen well, no upper limit	MRI DWI-FLAIR mismatch	DWI lesion and no FLAIR lesion
Wake-up stroke or un-known onset time	>4.5 hours from last seen well, and within 9 hours of the midpoint of sleep. The midpoint of sleep is the time halfway between go-ing to bed and waking up	CT or MRI core-perfusion mismatch	Suggested: mismatch ratio greater than 1.2, a mismatch volume greater than 10 ml, and an ischaemic core volume < 70 ml.
Known onset time	4.5 – 9 hours	CT or MRI core – perfusion mismatch	Suggested: mismatch ratio greater than 1.2, a mismatch volume greater than 10 ml, and an ischaemic core volume < 70 ml.

- The recommended dose
    - Alteplase (rtPA) 0.9mg/ kg (max 90 mg). 10% of the calculated dose is to be given as an IV bolus over 1 minute and the remainder as an infusion over 1 hour.
    - Tenecteplase 0.25 mg/ Kg (max 25mg) IV bolus over 5 seconds.
- Patients suspected to have large vessel occlusion with NIHSS>6 who are potentially eligible for endovascular treatment, should undergo CTA. Endovascular treatment is recommended within 6 hours of stroke onset in patients with proximal intracranial large vessel occlusions confirmed on CTA. If the criteria for endovascular therapy (**Annexure 1**) are fulfilled and the facilities for interventional radiology are accessible within 6 hours from symptom onset, MT should not be delayed for the observation of clinical response to intravenous thrombolysis. The patients should be transferred to the DSA room immediately with the concurrence of the interventional radiologist. If interventional facilities are not available, consider transferring the patient to an institution with facilities for MT after discussing with the stroke team at the receiving hospital.
- If the patient develops perioral and lingual oedema as a hypersensitivity reaction to alteplase, the rtPA infusion should be stopped immediately, and steroids and antihistamines should be administered. The rtPA should not be resumed and the patient should have close cardio respiratory monitoring.
- Following intravenous thrombolysis, patients should be monitored closely for 24 hours at a location agreed in the Stroke Pathway of the Hospital (ETU/ ICU/ HDU/ Acute stroke unit) (**Annexure 2).**
- For patients with sudden neurologic deterioration during or shortly after rtPA infusion, consider the possibility of haemorrhagic complications, stop the infusion and repeat an NCCT brain (**Annexure 1**).
- Repeat an NCCT brain in 24 hours after thrombolysis prior to commencement of antiplatelet agents.
- All other patients who are not thrombolysed should be managed at a location designated for stroke patients (Stroke Unit or medical ward) or in the ICU if intensive care is warranted.

- **General Measures**
    - **Management of blood pressure in AIS**
        - Correction of hypotension and hypovolemia is recommended to maintain adequate systemic and cerebral perfusion.
        - In patients eligible for thrombolysis, the blood pressure (BP) should be <180/105 mmHg prior to and for 24 hours after following thrombolysis. If the BP is >185/ 110, it should be reduced using intravenous antihypertensives (preferably, labetalol; alternatives - hydralazine or sodium nitroprusside) (**Annexure 1**).
        - In patients not eligible for thrombolysis, the BP should be reduced only if it

exceeds 220/ 120 mmHg or in the presence of a hypertensive emergency. BP reduction should be gradual (not exceeding a reduction of >15% in the first 24 hours).

- **Temperature management**
  - If hyperthermic, treat with an antipyretic and manage the source of hyperthermia.
- **Glycaemic control**
  - Maintain plasma glucose between 140 – 180 mg/ dl.
- **Treatment with antiplatelet agents**
  - Patients presenting with a TIA or a minor (non-disabling) stroke who did not receive thrombolysis should be given a loading dose of aspirin 300 mg and clopidogrel 300 mg within 24 hours of the event followed by dual antiplatelet therapy (aspirin 75 mg and clopidogrel 75mg) for 3 weeks to reduce the risk of recurrent ischaemic stroke.
  - Patients who received thrombolysis should be commenced on a single antiplatelet agent 24 hours after thrombolysis.
- **Screening for dysphagia**
  - Patients should be screened by an experienced nurse or by the speech and language therapist using a validated swallowing screening tool for swallowing difficulties to determine the aspiration risk prior to allowing the oral intake of food, fluids or medication as soon as possible, at least within first 24 hours after admission. Patient should not be given anything orally until the swallowing assessment is carried out.
  - Patients who have dysphagia should have a nasogastric tube inserted to allow hydration and nutrition.
  - A patient's clinical status can change in the first few hours following the stroke; therefore, patients should be closely monitored for changes in swallowing ability following initial screening.
  - If the inability to swallow safely persists for more than 2 weeks, a percutaneous gastrotomy tube should be considered.
- **Guidance on urinary catheterization**
  - Urethral catheters: The use of chronic indwelling urethral catheters should generally be avoided due to the risk of urinary tract infections.
  - During the procedure of catheterization and throughout catheter drainage, excellent pericare and infection prevention strategies should be implemented to minimize risk of infections.
  - Insertion of an indwelling urethral catheter could be considered for patients undergoing EVT but should not delay achieving reperfusion. The need for retaining the catheter should be reconsidered after the end of the EVT procedure, and it should be discontinued as soon as the patient can be expected to resume voiding on their own.

- Insertion of an indwelling urethral catheter is not routinely needed prior to intravenous thrombolysis unless the patient is acutely retaining urine and is unable to void. If inserted for patient-specific reasons, it should not delay acute treatment.
- If used, indwelling catheters should be assessed daily and removed as soon as possible.
- Fluid status and urinary retention should be assessed as part of vital sign assessments.

- **Prophylaxis for deep vein thrombosis (DVT)**
  - In addition to maintaining good hydration and treatment with aspirin, intermittent pneumatic compression is recommended to prevent DVT for immobile patients with AIS, unless contraindicated.

- **Screening for depression**
  - Depression is not uncommon following a stroke. Antidepressants are recommended for depression following stroke.

- **Decompressive hemicraniectomy**

  Decompressive hemicraniectomy carried out within 48 hours of symptom onset reduces mortality and disability in patients presenting with a middle cerebral artery (MCA) infarction fulfilling all the following criteria:

  - Pre-stroke modified Rankin scale score < 2.
  - Clinical deficit indicating the infarction is in the MCA territory.
  - NIHSS score >15.
  - A decrease in the level of consciousness to a score of 1 or more on item 1a of the NIHSS.
  - CT brain showing an infarct of at least 50% of the MCA territory.

- **Rehabilitation**
  - Patients should receive multidisciplinary team stroke rehabilitation at an intensity that the patient can tolerate and benefit from.

1.6. Management of spontaneous acute intracerebral haemorrhage (ICH)

- **Diagnosis and evaluation**
  - Sudden onset focal neurological deficit with or without reduced consciousness, seizures or headache are common clinical features of ICH. It is often associated with significantly elevated blood pressure.
  - The diagnosis of ICH is established by imaging with a non-contrast enhanced CT scan of the brain.
  - Imaging to determine aetiology for ICH is indicated in younger patients with ICH or when an underlying possible aetiology is suspected such as in cortical haemorrhage or with CT brain suggestive of vascular malformation. Investigations to determine the aetiology should include MRI scan of brain

with SWI sequence (to look for amyloid angiopathy), CT angiography or MR angiography or conventional angiography to look for vascular anomalies such as aneurysms and arteriovenous malformations.

- After the initial diagnostic CT scan, at least one more imaging study should be performed to determine final haematoma size and to assess haematoma expansion. The timing of the second imaging should be based on the patient's clinical progress.

- **Clinical risk assessment**

  The ICH score can be used as a standard scoring system for assessment of the severity of illness.

  Table 1.4 Intra Cerebral Haemorrhage Score

Variable	Score
Haematoma volume ≥ 30ml*	1
Age ≥ 80 years	1
Glasgow Coma Scale 3 – 4	2
Glasgow Coma Scale 5 – 12	1
Glasgow Coma Scale 13-15	0
Infratentorial haematoma location	1
Intraventricular haemorrhage	1

  Scores range from 0 (least severe with low expected mortality) to 6 (the worst possible score with highest mortality).

  *ICH volume calculation is the product of the following 3 variables: (A × B × C)/2

  1. Largest diameter of the haematoma on CT (A)

  2. Largest diameter 90 degrees to A on the same CT slice (B)

  3. Number of 10 mm CT slices on which the ICH is seen(C)

- **Management of acute ICH**
  - Treatment setting
    - Preferably patients with a high ICH score should be managed in an ICU/ HDU setting, if facilities permit.
    - Some patients may be triaged to a stroke unit or high dependency unit depending on available facilities.
  - Indicators that should be monitored:
    - Level of consciousness
    - Vital parameters
    - Pupillary size and reaction to light
    - Neurological status
    - Appearing new neurological signs

- Body temperature
- Blood glucose level
- Oximetry

- **Blood pressure management**
  - BP management in acute ICH should be carried out with intensive BP monitoring preferably in an ICU/ HDU setting.
  - If the initial systolic blood pressure (SBP) is >220 mmHg, it should be lowered to 220 mmHg immediately.
  - If the initial SBP is 220 – 150 mmHg, attempt should be made to reduce the SBP to 140 mmHg within the first one hour and to maintain it long-term to reduce haematoma expansion, if patient remains stable.
  - Lowering the SBP <130 mm Hg in ICH not recommended and could be potentially harmful.
  - Intravenous I should be used as bolus dose or as an infusion to lower the BP. Intravenous hydralazine is an alternative. Oral antihypertensives agents should be started concurrently to maintain the target BP in the long-term.

- **Anticoagulation related acute ICH.**
  - Anticoagulant activity should be reversed in patients with acute ICH while withholding vitamin K antagonists (VKA) or direct oral anticoagulants (DOAC).
  - Reversal of anticoagulation with VKA.
    - Anticoagulation with VKA can be reversed by administering intravenous vitamin K, prothrombin complex concentrate (PCC) or fresh frozen plasma (FFP). PCC has been shown to be more efficacious than FFP.
    - In situations where
    - vitamin K 10 mg intravenously is contemplated, it should be given without waiting for INR. However, since high doses of vitamin K can result in a variable period of refractoriness to reinstitution of anticoagulation with VKA, PCC or FFP may be preferred if resumption of warfarin therapy is contemplated as in patients with metal prosthetic cardiac valves.
  - **Reversal of anticoagulation with DOAC**
    - Specific reversal agents for dabigatran is idarucizumab while for apixaban and rivaroxaban it is andexanet alfa.
    - PCC or FFP should be used when specific reversal agents are not available.
  - Optimal timing to restart anticoagulation after an ICH is unknown and should be based on patient specific factors considering risks and benefits.
  - Routine platelet transfusion is of no proven benefit in ICH and is not recommended.
  - Factor VIIa and tranexamic acid are of no proven benefit in ICH and are not recommended.

- **Management of increased intracranial pressure (ICP) in ICU/ HDU**
  - Indications for ICP monitoring:
    - GCS < 8
    - Impending trans-tentorial herniation
    - Significant intraventricular haemorrhage
    - Acute hydrocephalus
  - Elevate head end of the bed to 30 degrees and sedate the patient for comfort.
  - Avoid pressure over neck veins that might impede cerebral venous outflow.
  - Only 0.9% saline should be used as intravenous hydration. 5% dextrose should be avoided as it can increase cerebral oedema.
  - Intravenous 3% Hypertonic saline can be used to reduce cerebral oedema in patients with a goal of maintaining serum Na of 145- 155 m. mol per litre.
  - External ventricular drainage is recommended for progressive hydrocephalus.
  - Corticosteroids should not be used for the treatment of elevated ICP in ICH.

- **Management of seizures**

  Patients with acute ICH are at risk of developing seizures.

  - Early seizures (<14 days) are treated with intravenous antiseizure medication and continued for several days and weaned off when the patient is free of further seizures.
  - Prophylactic antiseizure medication may be harmful and is not recommended.
  - If patient remains unconscious, consider the possibility of non-convulsive seizures and EEG monitoring for potential non-convulsive seizures is recommended.

- **Neurosurgical referral**
  - Surgical intervention should be considered only in
    - cerebellar haematomas.
    - hemispheric ICH with life-threatening mass effect.
    - obstructive hydrocephalus.

  When the clinical status is stable, the patient should be transferred to the stroke unit for further rehabilitation.

1.7. Management of stroke in pregnancy

- **Initial emergency management**
  - Pregnant patients suspected to have an acute stroke should be brought to a rapid access stroke centre when possible. Ideally, the centre should have obstetric care facilities in addition to stroke care services. Institutions that lack these services should have predefined protocols for emergency collaborative management.
  - Protocols for rapid brain and vascular imaging will facilitate to differentiate acute ischemic strokes from haemorrhages and strokes related to preeclampsia and other aetiologies.
  - Focal neurological deficits are not a usual presentation in preeclampsia and acute stroke should be considered in obstetric patients presenting with sudden onset focal neurological deficits.
  - Protocols should be available to manage acute severe hypertension (>160/ 110mmHg) in pregnant patients. In Preeclampsia and in severe hypertension with neurological symptoms, the goal is to reduce the BP below 160/ 110 mmHg to reduce the risk of developing a stroke. The impact of blood pressure reduction on placental perfusion should be considered and wherever possible foetal monitoring and surveillance should be considered.
  - It is important to establish the gestational age in pregnant patients presenting with acute stroke to decide on appropriate management strategies and weigh the risks and benefits to the mother and the foetus.

- **Diagnostic imaging**
  - The foetal dose of radiation and the corresponding risk associated with neuroimaging in pregnancy is extremely small. However, the maternal patient should be counselled regarding the risks associated with neuroimaging.
  - In a situation where the pregnancy status is not established, considering the risk to the mother, it is acceptable to perform a CT scan of the brain.
  - For disabling severe strokes, standard diagnostics include imaging the brain and the cerebral vascular system immediately. This could be achieved by CT and CT angiography (CTA) of the head and neck vessels. Depending on the case and the facilities available at the centre, CT perfusion (CTP) and MRI brain scans are considered to diagnose the potential candidates for intravenous thrombolysis or endovascular thrombectomy. CTA and CTP scans utilise iodine contrast and have a greater radiation dose than standard non-contrast enhanced CT scans.
  - In severe acute strokes the health of the mother is paramount, and CT with CTA should be performed since it is the most accessible option and is required to consider the eligibility for thrombectomy. MRI Brain with time-of-flight (non-contrast) MRA is an alternative for CT/ CTA brain and has the advantage of not having ionising radiation.

- In selected cases, for example, in patients with a hyperdense middle cerebral artery on CT brain, a digital subtraction angiogram instead of a CTA would be of greater utility since it would facilitate endovascular treatment and reduce the radiation dose of having an additional CTA.
- A non-contrast CT (NCCT) of the mother's brain does not expose the foetus to the high levels of radiation which is associated with an increased risk of miscarriage, foetal malformation or other adverse pregnancy outcomes. Shielding the mother's abdomen and minimising the number of cuts is advisable during the NCCT.
- There is lack of evidence on the harm associated with the exposure to CT contrast medium. Less than 1% of CT contrast medium is excreted in breast milk and less than 1% is absorbed in the infant GI tract. It is acceptable to continue breast feeding after being exposed to CT contrast media.
- Institutional protocols on the modality of acute stroke imaging of pregnant patients and established methods of counselling the patient/ next of kin about the risk versus benefit of the imaging modality are helpful to minimize delays in clinical decision making and administering treatment.
- Pregnant patients (POA >24 weeks) should be wedged during supine imaging to allow for left uterine displacement.

- **Intravenous thrombolysis in pregnancy**
  - It is reasonable to administer intravenous alteplase in pregnant patients with severe disabling acute ischemic stroke who fulfil the eligibility criteria for thrombolysis.
  - The risk benefit consideration is complex and should be taken by a physician experienced in acute stroke care.
  - Alteplase is a large molecule and does not cross the placenta. Alteplase is not known to pose any haemorrhagic risk to the foetus.
  - Placental abruption can occur with or without alteplase and it is not known whether there is any association of alteplase with an increased risk of placental abruption. It is advisable to closely monitor and recognise placental abruption early.
  - The safety of intravenous alteplase in the early post-partum period (<14 days) has not been established, especially in relation to the risk of post-partum haemorrhage (PPH). Case reports indicate an increased risk of post-partum haemorrhage following alteplase administration in the early post-partum period and the risk may be greater following caesarean section.
  - The evidence of the safety of alteplase in post-partum patients who had epidural or spinal anaesthesia is limited and the risk of bleeding may be increased.

- **Endovascular thrombectomy (EVT) in pregnancy**
  - Pregnancy should not be considered a contraindication for thrombectomy in severe disabling acute ischemic strokes with large vessel occlusions and should be treated in accordance with the existing guidelines. In centres where rapid access endovascular therapy is available, pregnant patients with severe disabling strokes with large vessel occlusions could be treated immediately with EVT instead of following intravenous thrombolysis.

- **Management of acute haemorrhagic strokes (subarachnoid haemorrhage, intracerebral haemorrhage) during pregnancy**
  - Vascular imaging (time-of-flight MRA, CTA, DSA) may help decision making in the management of haemorrhagic strokes, unless it is a devastating haemorrhage with very poor prognosis.
  - Pregnancy should not be considered as a contraindication for angiography or endovascular diagnostic or therapeutic procedures.
  - Foetal radiation exposure should be minimised by abdominal shielding and judicious use of radiation.
  - Even though it is not reasonable to delay or defer maternal care, the potential risks to the foetus from exposure to ionising radiation and other procedural risks should be considered.
  - In ICH, priority should be given to managing the blood pressure, and identifying and rectifying any coagulopathies.
  - The blood pressure target initially should be 160/ 110 mmHg and thereafter 140/90 mmHg.
  - First line antihypertensive medications in pregnancy include labetalol, methyldopa and long acting nifedipine.
  - Angiotensin-converting enzyme (ACE) inhibitors and angiotensin II receptor blockers (ARBs) which are commonly used in stroke secondary prophylaxis are contraindicated in pregnancy and should be discontinued prior to pregnancy planning or immediately after pregnancy is recognised.
  - Care of ruptured cerebral aneurysms should follow the accepted standards of care through urgent multidisciplinary action including that of, a neurosurgeon, an interventional neuroradiologist, a neurologist and experts in maternal and foetal medicine. The choice to clip or coil the aneurysm depends on the available best option for the patient. Maternal safety is paramount in the management decision making and some treatment decisions may potentially compromise the pregnancy or foetus. If the gestational age and timing favours viable delivery of the foetus, then an emergency caesarean section should be considered.
  - The management of **ruptured Arterio-venous malformations (AVMs)** is based on accepted standards of care and the choice of treatment depends on the best available treatment option/ s for the patient regardless of the pregnancy status.

It requires urgent multidisciplinary action including that of, a neurosurgeon, an interventional neuroradiologist, a neurologist and experts in maternal and foetal medicine.

- **Early post-stroke management in a pregnant woman**
  - Evaluation to identify a cause of the stroke should be done to guide the secondary stroke prevention strategies.
  - Stroke rehabilitation should be initiated early in accordance with the usual standards of stroke rehabilitation in the acute phase. Rehabilitation goals may need to be modified based on the multidisciplinary team consultation comprising a neurologist, obstetrician, and rehabilitation experts.

- **Antithrombotic (antiplatelets and anticoagulants) use in pregnancy following ischaemic stroke or TIA**
  - Antithrombotic therapy would be decided based on the aetiology of the stroke, the size and recency of the stroke (the risk of haemorrhagic transformation is high in large and recent infarcts), and the stage of pregnancy (the bleeding risk is high the in peripartum and post-partum periods).
  - If considering anticoagulation therapy, in addition to the factors listed above, women's medical issues and anticipated obstetric complications should be considered.
  - When low-dose aspirin is indicated for prevention of stroke in women, it is reasonable to prescribe it in preconception, in all stages of pregnancy and in lactation.
  - In cases where low dose aspirin is inadequate for stroke prophylaxis, the decision to prescribe low molecular weight heparin (LMWH) or a combination of aspirin with LMWH for long-term management should be made in consultation with the relevant specialists.
  - If anticoagulation is considered, warfarin is potentially teratogenic and should be avoided especially between 6 to 12 weeks of gestation. LMWH is safe in all stages of pregnancy.
  - In situations where anticoagulation with warfarin is essential (e.g., women with mechanical heart valves), switching to an alternative (e.g., LMWH) as soon as recognising the pregnancy, and recommencing warfarin after 12 weeks of gestation until closer to delivery would be appropriate. In complex situations, the decision of a multidisciplinary team (consisting of a haematologist, a cardiologist, a neurologist and an obstetrician) is advisable.
  - In women who are already on direct oral anti-coagulants (DOAC) therapy should be switched to LMWH when a pregnancy is detected or if a pregnancy is planned since there is no data on safety of DOACs in pregnancy.
  - Prophylactic/ low dose LMWH should be discontinued at least 12 hours before regional anaesthesia and therapeutic/ full dose LMWH should be stopped at least 24 hours prior to regional anaesthesia or planned induction.

- If urgent procedures are planned and abrupt discontinuation of anticoagulation is anticipated, intravenous unfractionated heparin (UH) is preferred and administered according to institutional guidelines.
- LMWH/ intravenous unfractionated heparin could be restarted at least 4-6 hours after removal of an epidural catheter.
- Anticoagulants should be continued for 6 – 12 weeks post-partum in the absence of any contraindications.
- After 6 – 12 weeks post-partum, the choice of antithrombotic therapy is recommended as in non-pregnant women, having taken the factors such as breast feeding and future pregnancy planning into consideration. For anticoagulation choices, LMWH and warfarin are both considered safe in lactation. There is lack of data on safety of DOACs in lactation.

- **Blood pressure management for stroke prevention in pregnancy**
  - Commonly used first line antihypertensives in pregnancy are labetalol, methyldopa, long-acting nifedipine and hydralazine. Selection of a specific antihypertensive in pregnancy or lactation should be based on the adverse effects on the mother, foetus, or the new-born.
  - Angiotensin-converting enzyme (ACE) inhibitors and angiotensin II receptor blockers (ARB) carry an increased risk of foetal complications (renal) and low amniotic fluid, especially if used after the first trimester. ACE/ ARBs should be discontinued in women who are on these medications, ideally, when planning a pregnancy or immediately upon recognising a pregnancy. If these drugs have been taken inadvertently, the pregnant mother should be referred to a foetal medicine expert for counselling, foetal ultrasound scan and further management.
  - All pregnant women who have been diagnosed with hypertension during pregnancy should be evaluated by an expert in managing hypertension in pregnancy.
  - Pregnant women who are on antihypertensives for secondary prevention should maintain their blood pressure targets consistently below 140/ 90 mmHg. Monitoring should be done to detect an early rise of blood pressure or proteinuria, which would suggest preeclampsia.
  - Preeclampsia is a significant risk factor for long-term cardiovascular disease. For patients with preeclampsia or gestational hypertension, long term follow-up of hypertension should be planned.

- **Statins for ischaemic stroke prevention in pregnancy**
  - In pregnancy, interpretation of lipid levels is unreliable due to the physiological changes in pregnancy and should not be used to guide therapeutic decisions.
  - First line treatment for management of dyslipidaemia in pregnancy is healthy diet and exercise.
  - There is limited evidence on the safety of statins in pregnancy and should be avoided in preconception and throughout the pregnancy.

- Statins are excreted in breast milk and may cause harm to the new-born baby. Timing of restarting statins or newly prescribing statins in pregnancy or lactation for secondary prevention of stroke should be based on individual clinical circumstances (e.g., severity of condition such as high-risk myocardial infarction or lactation plans).

- **Management of pre-existing diabetes or gestational diabetes for stroke prevention in pregnancy**
  - Women with diabetes in pregnancy (pre-existing type 1 or type 2 or gestational diabetes) should be followed up by a multidisciplinary team to monitor glycaemic control and, maternal and foetal complications.
  - Nondiabetic women who had a prior stroke, and are considered at high risk to develop gestational diabetes, a glucose tolerance test could be offered early in pregnancy (e.g. 20 weeks instead 24-28 weeks).
  - Women with prior stroke and gestational diabetes should be counselled to ensure long term follow up with lifestyle interventions to minimise the future risk of developing diabetes mellitus and recurrent stroke.

1.8. Management of subarachnoid haemorrhage

Introduction

Subarachnoid hemorrhage (SAH) accounts for 2% to 7% of all strokes. Eighty five percent of subarachnoid hemorrhages are due to ruptured intracranial aneurysms. Presence of an unruptured cerebral aneurysm, history of a previous aneurysmal SAH, family history of an aneurysm (first degree relatives) or SAH, certain genetic syndromes (e.g., autosomal dominant polycystic kidney disease, type IV Ehlers Danlos syndrome) and aneurysms greater than 7 mm in size are associated with an increased the risk of SAH. Hypertension, smoking, alcohol, low BMI and the use of recreational drugs, especially sympathomimetics (cocaine) are other risk factors.

SAH is a neurological emergency associated with significant morbidity and mortality. Since headache may be the only presentation in SAH, a high index of clinical suspicion is warranted. Thus, any patient presenting with a sudden onset worst-ever (thunderclap) headache should be considered to have a SAH until proven otherwise. The risk of early aneurysmal rebleeding is high and rebleeds are associated with poor outcomes mandating urgent evaluation and treatment of a patient with suspected SAH. Non-invasive screening for patients with a history of SAH or a family history of SAH may be considered as a method of preventing SAH.

Additionally, SAH has a significant impact on cognition and psychosocial life. Thus, a comprehensive evaluation including cognitive, behavioral, and psychosocial assessments after discharge is recommended.

- **Diagnosis**
  - The typical presentation of SAH is a sudden severe headache with or without loss of consciousness or confusion.

- Other clinical features include.
  - Painful or stiff neck
  - Nausea and vomiting
  - Photophobia
  - Blurred or double vision
  - Focal neurological signs (hemiparesis)
  - Seizures
  - High blood pressure.
- If the clinical suspicion of SAH is high, the patient should be fast tracked for imaging in consultation with the radiologist and the neurosurgeon.

- **Imaging in people with suspected subarachnoid hemorrhage**
  - A non-contrast CT brain is the first diagnostic investigation in the acute stage.
  - In situations where non-contrast CT brain is negative and in places where MRI facility is available, proceed with MRI brain which is more sensitive in diagnosing SAH than head CT. The study should include an MRA which may demonstrate the aneurysm.
  - If the non-contrast CT brain is negative but the clinical suspicion is still high, proceed with a lumbar puncture 12 hours after the onset and look for CSF xanthochromia using a spectrophotometer.
  - If the imaging or LP is positive, proceed with a CT angiogram which can characterize and localize the aneurysm and guide decision making on the type of aneurysm repair.
  - A cerebral four vessel digital subtraction angiography (DSA) is the gold-standard in identifying aneurysms and is indicated if the CTA and/ MRA are negative in a patient with clinically probable SAH or if interventional treatment with coiling is planned.
  - Cerebrovascular imaging to identify occult, remnant or recurrence of aneurysm following aneurysmal repair may be considered appropriate clinical settings.

- **Specialist care, pharmacological treatment and surgery**

  The risk of SAH is a rebleed which could be potentially fatal.

  - Factors associated with rebleeding include
    - Temporal proximity to the first haemorrhage
    - High blood pressure/ pre-existing hypertension
    - High neurological grade
    - Associated intraventricular or intracerebral hemorrhage
    - Large aneurysm
    - Posterior circulation aneurysm
    - Acute hydrocephalus

- **Recommendations for management**
  - Stringent blood pressure control is recommended between the onset of SAH and the obliteration of the aneurysm. BP should be controlled with a titratable intravenous antihypertensive agent to balance the risk between an ischaemic stroke and a hypertension related rebleed. Optimal cerebral perfusion pressure should be always maintained. A target systolic blood pressure of < 160 mmHg is considered to be optimal.

- **Management of cerebral vasospasm and diffuse cerebral ischaemia after SAH**
  - Delayed cerebral ischaemia caused by cerebral vasospasm is known to occur following SAH. It is diagnosed in situations with delayed clinical deterioration, after excluding other causes of neurological deterioration.
    - In cases of delayed cerebral ischaemia, rescue therapies such as induced hypertension and intracranial balloon angiography or infusion of vasodilator drugs are recommended.

- **Recommendations to prevent vasospasm.**
  - Prescribe oral nimodipine 60 mg every 4 hourly (or if patient develops hypotension 30 mg every 2 hourly) for 21 days, to all patients with aneurysmal SAH.
  - Maintain euvolemia and normal circulating blood volume.
  - Transcranial doppler may be utilized to identify the development of arterial vasospasm.
  - Perfusion imaging with CT or MRI can be used to identify regions of potential brain ischaemia.

- **Hydrocephalus associated with SAH**
  - Acute hydrocephalus requires CSF diversion with an endovascular drain or lumbar puncture.
  - Chronic hydrocephalus requires a permanent diversion such as a ventriculo-peritoneal shunt.

- **Seizures**
  - Prophylactic anti-seizure medications are recommended in the immediate post-hemorrhagic period, but routine long-term use of anti-seizure medications are not recommended.
  - Routine long-term anti-seizure medications may be considered in special circumstances in patients with risk factors for delayed seizure disorders such as prior seizure, intracerebral haematomas, intractable hypertension, infarctions and aneurysms of the middle cerebral artery.
  - In circumstances of unavoidable delays in obliteration of the aneurysm, with a significant risk of rebleeding in the short term (<72 hours), therapy with tranexamic acid may reduce the risk of rebleeding.

- **Surgical and endovascular interventions for cerebral aneurysms**
  - Surgical clipping or endovascular coiling of the ruptured aneurysm should be attempted as soon as possible to prevent rebleeding. Complete obliteration of the aneurysm should be the goal.
  - Decision on the intervention requires a discussion between the neurosurgeon and the endovascular interventional radiologist.
  - Endovascular coiling is preferred where feasible while neurosurgical clipping is offered to those not suitable for endovascular coiling.
  - A delayed follow up vascular imaging following intervention should be considered for treatment of clinically significant remnant aneurysm.
  - Middle cerebral artery aneurysms and ruptured aneurysms with large (>50ml) intraparenchymal hemorrhage require microvascular clipping.
  - Elderly (>70 years of age), those with poor World Federation of Neurosurgeons Score (IV/V) grade and aneurysms at the basilar apex are associated with poor outcomes.
- **Recommendation for anaesthetic management for surgical and endovascular intervention**
  - Minimize the degree and duration of intraoperative hypotension during the surgery.
  - Prevent intraoperative hyperglycemia.
  - Use of general anesthetics during endovascular therapy may be beneficial in some candidates.
- **Management of other medical complications in SAH**
  - Monitor volume status and ensure euvolemia. If necessary, a central venous catheter, pulmonary wedge pressure measurements or fluid balance charts may be used in order to ensure euvolemia.
  - Maintain normothermia. Fever should be aggressively treated.
  - Maintain optimal glycaemic control as for patients with any critical condition. Always avoid hypoglycemia.
  - Fludrocortisone acetate and/or hypertonic saline may be used to treat serum sodium derangements.
  - DVT prophylaxis should be instituted in immobile patients. Pneumatic pressure stockings are used prior to obliteration of the aneurysm. After obliteration and achieving haemostasias low molecular weight heparin or heparin may be used. Heparin induced thrombocytopenia can occur and immediate discontinuation followed by treatment should be considered.
- **Systemic inflammatory response syndrome (SIRS)**

  SIRS complicates 50% of patients with SAH and meticulous management is required.

- **Anaemia:**
  - Haemoglobin less than 10 mg/dl within 4 days of admission increases the risk of delayed cerebral ischemia. However, due to the risk of transfusion related complications, a lower threshold of 7 mg/dl haemoglobin is considered the level for transfusion of packed red cells.

2. Recovery and rehabilitation

2.1. Introduction

This chapter focuses on recovery following a stroke and the importance of multidisciplinary rehabilitation that is implemented in a stroke unit and beyond. Hence it overlaps with acute stroke care, stroke unit care, secondary prevention and with community rehabilitation. Multidisciplinary rehabilitation in a stroke unit, involving nursing, physiotherapy, occupational therapy, speech and language therapy, counselling and social service support, is recommended. Rehabilitation should commence as early as possible as permitted by the condition of the patient.

Much impairment and restriction of activity are present from the onset of a stroke. Some recover rapidly and completely with no impairment present when a patient is discharged from the acute care setting. Others may have persistent impairment for weeks, months or years and require long term support with stroke unit care and long-term rehabilitation. The service organization and delivery of rehabilitation is more often focused for the first few months following a stroke and often fail to meet the long-term and evolving needs of stroke sufferers. As such, it is emphasized that over time the nature of rehabilitation will shift from restorative to compensatory and adaptive approaches and should not end solely because natural recovery appears to have reached a plateau.

This chapter provides recommendations on the management of specific losses and limitations that arise following the brain damage that occurs in stroke. The chapter addresses the problems in an alphabetical order. Recommendations are given for specific impairments (e.g. spasticity), activity limitations (e.g. driving), restricted participation in social functions (e.g. attending a wedding) and quality of life (e.g. sex).

Recommendations for Following losses and limitations are given below.

1. Activities of daily living
2. Arm function
3. Cognition
4. Communication
5. Continence
6. Fatigue
7. Hydration and Nutrition
8. Mental capacity
9. Mobility
10. Mood and well-being
11. Mouth care
12. Pain
13. Sensation
14. Sex

15. Skin integrity
16. Spasticity and contractures
17. Swallowing
18. Vision

2.2. Activities of daily living

After a stroke, severe impairment may limit one's ability to engage in activities of daily living. Therefore, healthcare professionals who provide rehabilitation services should be familiar with recommendations for addressing these impairments, to assist persons with a stroke in achieving independent living and maximum social participation.

- **Independence in daily living**

Personal activities of daily living (PADL) refer to a range of basic activities such as washing, dressing, bathing, toilet, eating, and drinking. These activities usually depend on the ability to transfer from one position to another and the use of at least one hand. After a stroke, PADL can be difficult due to both physical and cognitive impairment and environmental barriers. The resultant loss of function can have implications on a person's ability to live independently at home and is therefore a key part of stroke rehabilitation.

- People should be formally assessed regularly for their safety and independence in personal activities of daily living (PADL) and findings should be recorded using a standardized assessment tool such as the Barthel Index for activities of daily living **(Annexure 10).**
- All individuals with limitations of personal activities of daily living (PADL) should be referred to an occupational therapist and be offered training tailored to individual's needs and eventual discharge setting. The occupational therapist could involve other members of MDT in finding solutions for problems.
- People with a stroke should be offered, as needed:
  - Dressing practice for people with problems in dressing
  - Opportunities as appropriate to practice of self-care.
  - Assessment, provision, and training in the use of equipment and adaptations that increase safety in activity.
  - Training of family/ care givers in how to help the person.
- Targeted injection of botulinum toxin into localized upper limb muscles is recommended to reduce spasticity, to improve passive or active range of motions, and to improve dressing, hygiene and limb positioning.

- **Extended activities of daily living**

Extended activities of daily living (EADL) encompass both domestic and community activities such as cooking, housework and shopping that makes one fully independent.

- They should be formally assessed regularly for their safety and independence in EADL and findings should be recorded using a standardized assessment tool, Lawton Instrumental Activities of Daily Living scale **(Annexure 11).**

- Those with limited EADL limited by stroke should be:
  - Assessed by an occupational therapist, trained in how to achieve activities safely and be given opportunities to practice, provided that the goals potentially achievable.
  - Those who cannot undertake activity safely should be offered alternative means of achieving the goal to ensure safety and well-being.

- **Driving**

Being able to drive is important to people with a stroke for practical reasons, as well as it influences self-esteem and a feeling of wellbeing. However, there are potential risks associated with driving after a stroke. Healthcare professionals therefore need to discuss and give appropriate advice. The responsible body for medical evaluation of drivers for fitness and for their periodical review is the National Transport Medical Institute, under the Ministry of Transport and Civil Aviation in Sri Lanka. A guide to medical professionals to asses for fitness to drive published by the Drive and Vehicle Licensing Agency, UK is available at https://www.gov.uk/government/publications/assessing-fitness-to-drive-a-guide-for-medical-professionals)

- Those who have had an acute stroke or TIA should be asked about driving before they leave the hospital.
- Those who wish to drive should:
  - Be advised and documented of the exclusion period from driving and their responsibility to keep away if they have any persisting disability which may affect driving.
  - Be asked about or examined for absolute barriers for driving (e.g. epileptic seizure, visual field defects, reduced visual acuity or double vision).
  - Be offered an assessment of the impairments that may affect their eligibility including their cognitive, visual and physical abilities and be provided with a written record of the findings and conclusions.
- Those with persisting cognitive, language or motor disability who wish to return to driving should be referred for evaluation by a specialist in the field of disability concerned.

- **Work and leisure**

People with a stroke may require advice and support from healthcare professionals to enable them to resume their pre-stroke work and leisure activities.

- They should be asked about their pre-stroke work and leisure activities.
- Those who wish to return to work after a stroke should;
  - Be supported to return to their pre-stroke work when and wherever it is possible.
  - Be assessed cognitively, linguistically, and practically to establish their potential for return.
  - If return is feasible, stroke patients should be advised on the most suitable time and way to return to work.

        - Have their work requirements established with their employer prior to resuming work.
        - Advice of a specialist in rehabilitation should be sought whenever further advice is needed.
    - Those who wish to return to or take up leisure activities should have their cognitive and practical skills assessed and receive support to pursue their activity.

2.3. Arm function

Approximately 70% of people experience altered function of an arm after a stroke, and this persists in about 40% of survivors. This section includes interventions used in routine practice to improve arm function and users of guidelines should also refer to other relevant sections e.g. weakness, sensations, shoulder pain and subluxations and activities of daily living.

- Those with potential or actual arm movement should be given every opportunity to practice functional activities. Such practice should be characterized by movements that are of high intensity, repetitive and task specific. These activities could be bilateral or unilateral depending on the task.
- Those who have 20 degrees of active wrist extension and 10 degrees of finger extension in the affected hand should be considered for constraint-induced movement therapy.
- Those without movement in the affected arm after a stroke should be trained in how to care for their affected arm and monitored for any change.
- Those who have been assessed as cognitively suitable to participate in mental practice of an activity should be trained and encouraged to use it to improve arm function, as an adjunct to conventional therapy. (Motor imagery and mirror therapy). Those with reduced arm function after a stroke should only be offered neuromuscular electrical stimulation as an adjunct to conventional therapy.

2.4. Cognition

This section covers the range of cognitive problems that can occur after a stroke with recommendations to help the person with stroke to reduce the impact of these difficulties on social participation.

- **Cognitive impairment**

Cognitive impairment is associated with poor outcome following a stroke. Any person who is not progressing in rehabilitation as expected should receive a detailed assessment to determine whether cognitive impairments are responsible.

(https://strokengine.ca/en/assessments/loewenstein-occupational-therapy-cognitive-assessment-lotca/)

- Those with communication impairment should receive cognitive assessment using valid assessment in conjunction with a speech and language therapist.
- Those with cognitive problems should receive appropriate adjustments to their multidisciplinary treatments to enable them to participate, and this should be regularly reviewed.
- Those with acute cognitive problems whose care is being transferred from hospital to home should receive an assessment and the impairments should be communicated to the family/ caregivers.
- Those returning to cognitively demanding activities such as driving, or work should have their cognition fully assessed.
- Those with severe or persistent cognitive problems after a stroke should receive specialist assessment and treatment from a clinical psychologist.

- **Apraxia**

Apraxia is the difficulty in performing purposeful actions due to disturbance of the conceptual ability to organize actions to achieve a goal. People with apraxia often have problems carrying out everyday activities such as dressing or making tea despite adequate strength and sensation. They may find it difficult in selecting the correct object for a particular activity. It is usually associated with damage to the left hemisphere.

- People with difficulty executing tasks despite adequate limb movement should be suspected to have apraxia and assessed.
- People with apraxia should have the impairment and the impact on function explained to all the members of the MDT, patient and the family/ care giver.
- People with apraxia should be offered therapy and/or trained in compensatory techniques.

- **Attention and concentration**

Attention is a prerequisite for almost all cognitive functions and everyday activities. Disturbed alertness is common after a stroke especially in the first few days and weeks, and more so in non-dominant hemisphere stroke. Attention problems may lead to poor engagement, general slowness, fatigue, low mood and difficulty with independent living.

- Those who appear easily distracted or unable to concentrate should be suspected to have problems with attention.
- Those with impaired attention after a stroke should have;
  - The impairment explained to all the members of the MDT, their family/ caregivers.
  - Be given as many opportunities as reasonable to practice their activities under supervision.

- Have reduced background distractions.
- Have shorter treatment sessions.
- Have planned rest and avoid activities when tired.

- **Executive function**

Executive functions refer to the ability to plan and execute a series of tasks, inhibit inappropriate automatic impulses, regulate emotional responses, foresee the consequences of actions and make judgements about risk.

- People with an impairment of executive function and an activity limitation should be trained in compensatory techniques, including internal strategies (self-awareness and goal setting), structured feedback on performance of functional tasks and external strategies (e.g. use of electronic reminders or written check lists).
- Those with an executive disorder should have the impairment and the impact on function explained to all the members of the MDT, patient and the family/ care givers.

- **Memory**

Subjective problems with memory are very common after a stroke. Memory deficits can lead to longer hospital stay, poorer outcome, risks to personal safety, and cause distress to people with stroke and their family.

- People with memory impairment causing difficulties with rehabilitation should
  - Have the impairment explained to all the members of the MDT, patients and the family/ care givers.
  - Be assessed for treatable or contributing factors (e.g. delirium, hypothyroidism)
  - Have nursing and therapy sessions altered to capitalize on preserved abilities.
  - Be trained in approaches that help them to encode, store and retrieve new information.
  - Be trained in compensatory techniques to reduce their prospective memory problems (e.g. use of electronic reminders or written checklists)

- **Perception**

Perception involves the processing and interpretation of incoming sensations, which is essential for everyday activities. Perceptual functions include awareness, recognition, discrimination and orientation. Disorders of perception are common after a stroke and may affect any sensory modality (e. g. visual agnosia).

- People with agnosia after a stroke should:
  - Have the impairment explained to all the members of the MDT, patient and the family/ care givers.

- Have their environment assessed and adapted to reduce potential risks and promote independence.
- Be offered perceptual interventions, such as functional training, sensory stimulation or task repetition.

- **Spatial awareness**

Problems with spatial awareness (visuospatial neglect or sensory inattention) refers to a reduced awareness of some part of the person's body or their environment. It is more common in people with non-dominant hemisphere stroke and those with hemianopia.

- People with a stroke affecting non-dominant cerebral hemisphere should be considered at risk of impaired awareness on the contralateral side and should be assessed for.
- People with impaired awareness to one side after stroke should:
  - Have the impairment explained to all the members of the MDT, patient and the family/ care givers.
  - Be trained in compensatory strategies to reduce the impact on their activities.
  - Be given cues to draw attention to the affected side during therapy and nursing activities.
  - Be offered interventions aimed at reducing the functional impact of the reduced awareness.

2.5. Communication

- **Aphasia**

Aphasia refers to an impairment of language function affecting abilities including speaking, understanding, reading and writing. Aphasia is common following a stroke in the dominant hemisphere and may cause a significant impact on rehabilitation and the lives of individuals and their family/ caregivers.

- People with communication problems after a stroke should be assessed by a speech and language therapist and have the impairment explained to all the members of the MDT and patient's family/ care givers.
- In the first four months after a stroke, people with aphasia should be given the opportunity to have speech therapy with the speech and language therapist individually as frequently as tolerated.
- After the first four months, they should be reviewed to determine their suitability for further treatment with the aim of increasing participation in communication and social activities using group therapy/ family member/ volunteer/ computer-based practice/ Augmentative and alternative communication methods (AAC) guided by the speech and language therapist.
- People with aphasia after a stroke should be assessed and provided with

information about aphasia and communication practice in their preferred language.

- The care giver and family of a person with communication problems after a stroke should receive information and training from speech and language therapist to optimize the engagement of the patient participation in rehabilitation and promote autonomy and social participation.

- **Dysarthria**

Dysarthria is characterized by slow, weak, imprecise, and uncoordinated movements of the speech musculature and may involve respiration, phonation, resonance, oral articulation and prosody. Dysarthria is common in the early stages of a stroke and is often associated with dysphagia.

- People with dysarthria should be assessed by a speech and language therapist and have the impairment explained to all the members of the MDT, their family/ care givers.
- People with dysarthria after a stroke which limits communication should:
  - Be trained in techniques to improve the clarity of their speech.
  - Be assessed for compensatory, and augmentative and alternative communication techniques (e.g. letter board, communication aids) if speech remains unintelligible.
- The care givers and family of the person with communication problems should receive training in how to assist the person in their communication.

- **Apraxia of speech**

Occasionally a patient after a stroke has a specific and relatively isolated impairment of the ability to plan and execute the multiple skilled oral motor tasks that underlie successful talking – this is apraxia of speech. It is usually associated with the non-dominant hemisphere stroke.

- Those with apraxia should be recognized and be offered speech therapy to maximize articulation of key words to improve speech intelligibility.

2.6. Continence

Loss of bladder and bowel control is common in the acute phase of a stroke and may persist. Incontinence of urine greatly increases the risk of skin breakdown and pressure ulceration. Incontinence of faeces is associated with a more severe stroke and is more difficult to manage. Constipation is common, occurring in 55% of people within the first month of a stroke, and can further complicate urinary and faecal incontinence. Incontinence has a detrimental effect on the mood, confidence, self-image and participation in rehabilitation.

- Stroke unit staff should be trained in the use of standardized assessment and management protocols for urinary and faecal incontinence and constipation in people with stroke.

- People with a stroke should **not** have an indwelling urinary catheter inserted unless indicated to relieve urinary retention or when fluid balance is critical.

Those with a stroke who have continued loss of bladder and/ or bowel control 2 weeks after onset should be reassessed to identify the cause of incontinence. The treatment plan should include:

- Treatment of any identified cause of incontinence.
- Training for the person with a stroke and/ or their family/ caregivers in the management of incontinence.
- Behavioural adaptation if the person is able to participate.

Those with a stroke with continued urinary incontinence should be offered behavioural interventions and adaptations such as given below prior to considering pharmaceutical and long-term catheter options.

- Timed toileting
- Prompted voiding
- Bladder retraining
- Pelvic floor exercises
- External equipment such as urinals and Paul's tube

- People with a stroke with constipation should be offered
  - Advice on diet, fluid intake and exercise
  - A regulated routine of toileting
  - Review of the prescription to minimize use of constipating drugs
  - Oral laxatives
  - Education and information for the person with stroke and their family/ care givers
  - Rectal laxatives if severe problems persist.
  - Manual evacuation of feces when essential.

- **Maintenance of intact bladder and bowel function**
  - Check the patient for deterioration in the level of consciousness, dehydration, and immobility.
  - Develop a bowel training program according to the patient's bowel habits.
  - Encourage to take regular, well-timed meals, which include adequate fibre and fluids, to promote well-formed stool, and to do regular exercises.
  - Initiate a suppository and stool softener regime, initiate laxatives if suppository and softener are ineffective.
  - Enemas are avoided in the presence of increased ICP.
  - Observe urinary output for possible retention or incontinence and pattern of urinary elimination (amount, frequency, forcefulness of stream, constant dribbling).

- Establish a bladder training program when indicated.
- If the patient has retention of urine or if maintaining fluid balance chart is compulsory, insert an indwelling urinary catheter under highly aseptic techniques adhering to infection control guidelines. Remove it as soon as possible.
- Secure the catheter to the thigh.
- Observe input and output as well as QH temperature to detect signs of infections.

2.7. Fatigue

Fatigue is common after a stroke and may be the sole residual problem in people who have made an otherwise complete recovery. The most common feature of fatigue is lack of energy and the feeling of need to rest. Both mental and physical activity may bring on fatigue in a stroke patient and it could be associated with depression after stroke. Fatigue tends to decrease over time in most patients.

- Those with a stroke who report fatigue should be offered an assessment for mental and physical factors that may be contributing, particularly when engagement with rehabilitation or quality of life is affected.
- Those with fatigue after a stroke and their family/ caregivers should be given information, reassurance and support to manage fatigue.

2.8. Hydration and nutrition

Dehydration and malnutrition are common in hospital in-patients with a stroke and is associated with poor outcomes. Multiple factors may contribute to a high risk of dehydration and malnutrition in these people including physical, social and psychological issues. These include swallowing problems, reduced ability to self-feed, cognitive impairment, anxiety or depression and unfamiliar food and fatigue.

Malnutrition is associated with increased mortality and complications, as well as poorer functional and clinical outcomes. Poor nutritional intake, weight loss, feeding and swallowing problems can persist for many months after stroke.

- Patients with an acute stroke should have their hydration assessed on admission, should be reviewed regularly and managed so that normal hydration is maintained.
- Patients with an acute stroke should be screened for malnutrition on admission and at least weekly thereafter. Screening should be carried out by trained staff using a structured tool. (e.g. Global Leadership Initiative on Malnutrition (GLIM), Subjective Global Nutrition Assessment or Left Mid Upper Arm Circumference (MUAC))

- Patients with acute stroke who are adequately nourished on admission and are able to maintain nutrition orally should not routinely receive oral nutrition supplements.
- Patients with acute stroke who are unable to maintain nutrition and fluids orally should be:
  - Referred to a dietician/ nutritionist for nutritional assessment, advice and monitoring.
  - Be considered for nasogastric tube feeding within 24 hours of admission.
  - Be assessed for need of gastrostomy if they are unable to tolerate naso-gastric tube or if they are unable to swallow adequate food and fluids by 4 weeks from the onset of the stroke or are at high long-term risk of malnutrition.
  - People with difficulties in self-feeding after a stroke should be assessed and provided with the appropriate equipment and assistance (including physical help and verbal encouragement) to promote independent and safe feeding.
  - Those with a stroke discharged from specialist care services with continuing problems of meeting their nutritional needs should have nutritional status monitored regularly.
  - Those with a stroke receiving end-of-life care (palliative) should not have burdensome restrictions imposed on oral food and/or fluid intake if those restrictions would exacerbate suffering.

2.9. Mental capacity

This section covers the ability of people with stroke to make decisions about their health.

- When making decisions with and on behalf of people after a stroke, especially with regard to determining mental capacity and making decisions in the best interest of a person who lacks mental capacity, professionals should ensure that a person is not to be treated as unable to make a decision unless all practical steps to help him to do so have been taken without success.
- The multidisciplinary team should be involved in making decisions about the mental capacity. The team should communicate information and advice to the family/ caregivers and to the patient if applicable.

2.10. Mobility

- **Weakness and ataxia**

Hemiparesis and ataxia are common following a stroke and cause substantial disability, mainly through limiting mobility but also affecting arm functions.

- People with weakness and/ or ataxia after a stroke sufficient to limit their

activities should be assessed by a physiotherapist with experience in stroke rehabilitation.

- Those with weakness and ataxia after a stroke should be taught task-specific, repetitive, intensive exercises or activities that will increase strength.
- Targeted injection of botulinum toxin into lower limb muscles is recommended to reduce spasticity that interferes with gait function.

- **Balance**

Many people experience difficulty with balance after a stroke usually due to a combination of reduced motor control of limbs and trunk, altered sensation, and sometimes centrally determined alteration in body representation. Impaired balance reduces confidence and increases the risk of falls.

- Those with impaired sitting balance after a stroke should receive trunk training exercises.
- People with significant impairment of their balance and walking ability after a stroke should receive progressive balance training, functional task specific training, lower limb strengthening exercises and be considered for an ankle foot orthosis.
- Those with moderate to severe limitation of their walking ability after a stroke should be assessed for a walking aid to improve their stability.

- **Falls and fear of falling**

People with a stroke are at high risk of falls at all stages in their recovery. The high incidence of falls may be attributable to impairment of cognitive functions, motor weakness and to dual tasking. Non stroke factors such as medication increase the risk of falling in older people and in people with a stroke. Falls and fear of falling in stroke may lead to serious physical and psychological consequences compared to people without a stroke.

- Those with a stroke should be offered risk assessment of falls or fear of falling as part of their stroke rehabilitation. (Berge Balance Scale & The Falls Efficacy Scale-International (FES-I)
- Those with a high risk of falls after a stroke should be offered fragility fracture risk assessment and people with increased fracture risk should be offered calcium and vitamin D supplements.
- Those at high risk of falls after a stroke should be advised to participate in physical activity/ exercise which incorporates balance and co-ordination.

- **Walking**

Enabling people after a stroke to be able to walk independently is a highest priority activity in stroke rehabilitation. Exercises and equipment aimed at improving walking are essential components in achieving walking independently. Orthoses are external devices that support or enhance an impaired limb. Those most commonly used after stroke are ankle-foot orthoses (AFOs) to support hemiplegic foot and ankle. Some patients after

stroke prefer to practice walking with walking aid earlier rather than waiting until they can walk without one.

- People with limited ability to walk should be assessed by a physiotherapist with experience in stroke rehabilitation to guide management.
- Those with limited mobility should be trained in how to use appropriate mobility aids including a wheelchair to enable safe independent mobility.
- Those who are walking with difficulty or who are able to walk with assistance of a walking aid should undergo task specific walking training at sufficient intensity to improve endurance and walking speed.
- Those who are able to walk independently should be offered treadmill training with or without body weight support at a higher intensity than usual care and as an adjunct to other treatments.
- Those who have compromised ankle/ foot stability and or reduced ability to dorsiflex the foot (foot-drop") that impedes walking should be offered an AFO to improve walking and balance.
- Those who are with reduced ability to dorsiflex the foot should be offered functional electrical stimulation to improve their gait.

2.11. Mood and well-being

- **Anxiety, depression and psychological distress**

Mood disturbance presenting as depression or anxiety is common after a stroke and is associated with increased mortality. Furthermore, many people are troubled by psychological distress that does not meet diagnostic criteria for depression or anxiety.

- People with or at risk for depression or anxiety should be offered counseling / psychological intervention before considering antidepressant medication.
- Those with depression or anxiety who are treated with antidepressant medication should be monitored for adverse effects and treated for at least four months. People with low mood that has not improved after 2 – 4 weeks or with severe or persistent symptoms of emotional disturbance should receive an assessment by a psychiatrist for further management.

- **Emotionalism**

Emotionalism is an increase in emotional behavior (excessive crying or laughing) following minimal provoking stimuli. Emotionalism can be distressing for people with stroke and their families and can interfere with rehabilitation.

- People diagnosed with emotionalism should be appropriately distracted from the provoking stimulus when they show increased emotional behavior.
- Those with severe or persistent emotionalism should be given antidepressant medication. They should be monitored for adverse effects and treated for at least for four months beyond initial recovery.

2.12. Mouth care

Poor oral hygiene can lead to the development of ulceration, soreness and cracked lips and is associated with increased infection; in people with dysphagia, this increases the risk of aspiration pneumonia and sepsis. Maintaining good oral hygiene can be difficult due to cognitive impairment, dysphagia or arm weakness, and be made worse by inadequate control of saliva and medication side effects such as dry mouth (xerostomia). A clean and healthy mouth will prevent discomfort and assist in achieving good nutrition.

- The staff who provide care for people with stroke, especially those who have difficulty in swallowing should be trained in:
  - Assessment and provision of oral hygiene.
  - Awareness and recognition of swallowing difficulties.
- People with disability in self-care and/ tube fed should have mouth care with brushing teeth and cleaning of gums with a suitable cleaning agent, and removal of excess secretions at least 3 times a day and when required.
- Those who have dentures should have their dentures:
  - Cleaned regularly.
  - Put in during the day.
  - Checked and replaced if ill-fitting.
- Those with a stroke and their family/ caregivers should receive information and training in mouth care before transfer of their patient out of hospital.

2.13. Pain

Pain is a frequent problem after a stroke and can be due to many causes including neuropathic pain, musculoskeletal and depression.

- **Neuropathic pain (Central post-stroke pain)**

Stroke is one cause of pain following damage to neural tissues (neuropathic pain or central post stroke pain [CPSP]).

- People who are disturbed by CPSP should be treated with amitriptyline, gabapentin or pregabalin.
- Those with CPSP who do not achieve adequate control with initial medication should be considered for treatment with another drug or in combination with the original drug (Do not combine gabapentin and pregabalin).
- Those with CPSP who received medication should be regularly reviewed and if there is sufficient improvement, treatment should be continued and gradual reduction in the dose over time should be considered if improvement is sustained.

- **Musculoskeletal pain**

Musculoskeletal pain is not uncommon in people with a stroke. Prolonged immobility and abnormal posture can cause pain and exacerbate pre-existing musculoskeletal conditions such as osteoarthritis.

  - People with musculoskeletal pain should be assessed to ensure that movement, posture and moving and handling techniques are optimized to reduce pain.
  - Those who continue to experience musculoskeletal pain should be offered simple analgesics such as paracetamol, topical non-steroidal anti-inflammatory drugs or transcutaneous electrical nerve stimulation (TENS) before considering oral NSAIDs or opioid analgesics.

- **Shoulder pain and subluxation**
  - People with functional loss in their arm after a stroke should have the risk of shoulder pain reduced by:
    - Careful positioning of the arm, with the weight of limb supported.
    - Ensuring that family/ care givers handle the affected arm correctly, avoiding mechanical stress and excessive range of movement.
    - Avoiding the use of overhead arm slings and pulleys.
  - People with arm weakness should be asked regularly about shoulder pain and be offered regular simple analgesics.
  - Those with shoulder pain should only be offered intra-articular steroid injections if they also have inflammatory arthritis.

2.14. Sensation

Sensory loss in the form of pain, temperature, touch or position sense after a stroke is a recognized impairment.

- People with sensory loss should be educated about their symptoms and on how to avoid injury to the affected body part.

2.15. Sex

Sexual dysfunction is common after a stroke, affecting the person and their male or female partner. The physical and psychological impact of stroke can affect role identity and relationships with sexual partners, and sexual dysfunction can amplify already existing problems. It is typically multifactorial including other vascular diseases, altered sensation, limited mobility, the effects of drugs, mood changes and fear of precipitating a further stroke. Regaining intimacy with partners can have a positive effect on self-esteem and quality of life and help to strengthen relationships. Discussion of sex and sexual dysfunction after a stroke can be overlooked. Healthcare professionals are often reluctant to raise the issue, and people with a stroke are unlikely to raise the subject without encouragement.

- People should be asked, soon after discharge and at their 6 month and annual reviews, whether they have any concerns about sex. Partners should also have an opportunity to raise any problems.
- Those with sexual dysfunction after a stroke who want further help should be:
  - Assessed for treatable causes including a medication review.
  - Reassured that sexual activity is not contraindicated and is extremely unlikely to precipitate a further stroke.
  - Assessed for erectile dysfunction and the use of a phosphodiesterase type 5 inhibitor (e.g. sildenafil).
  - Advised against the use of phosphodiesterase type 5 inhibitor for 3 months after stroke and/ or until blood pressure is controlled.
  - Referred to a professional with expertise in psychosexual problems if sexual dysfunction persists.

2.16. Skin integrity

Bed bound stroke patients with paralysis carry a higher risk of developing pressure ulcers particularly over bony protuberances. Immobility, nutritional deficiencies, decreased immunity, cardiac disease and excessive moisture could increase the risk of pressure ulceration. From initial stages, nursing for stroke should be aimed at maintaining skin integrity and preventing pressure ulceration.

- Keep the patient on an air mattress/ firm mattress to relieve pressure until gaining the ability to move.
- Maintain clean and dry bed linen without creases and protect skin from heat and irritation.
- Clean and dry the skin twice a day. Cleansing with plain water is sufficient for urinary incontinence. Prompt skin cleansing using soap and rinse off thoroughly during fecal incontinence.
- Pay particular attention to areas with diminished sensation or lack of awareness.
- Turn and reposition once in two hours and do minor position changes when necessary to avoid sustained pressure. Use Braden Scale to monitor the risk of skin breakdown **(Annexure 12).**

2.17. Spasticity and contractures

Spasticity can cause discomfort or pain for the person with a stroke, difficulties for caregivers and is associated with activity limitation. Limbs affected by spasticity carry the risk of developing contractures. Contractures can impede activities such as washing or putting on clothes and may also be uncomfortable or painful and limit the ability to sit in a wheel chair or to be mobilize otherwise. Splinting or serial casts are used to prevent or treat contractures. Splinting is used to help manage tone, reduce pain and improve range of movement and function.

- People with a stroke should not be routinely offered splinting for the arm and hand.
- Those with motor weakness should be routinely assessed for spasticity as a cause of pain, limiting activities and as a risk factor for development of contractures.
- Those with spasticity should be offered simple measures to reduce spasticity such as advice on positioning, therapy with active and passive movements (with monitoring of the range of movement and alteration in function) and pain control.
- Those with persistent or progressive focal spasticity affecting one or two areas for whom a therapeutic goal can be identified (e.g. ease of care, pain) should be offered intramuscular botulinum toxin. This should be accompanied by rehabilitation therapy and /or splinting or casting up to 12 weeks after the injection. Further treatment should be planned according to the response following reassessment in 3 – 4 months.
- Those with generalized or diffuse spasticity should be offered treatment with skeletal muscle relaxants (e.g. baclofen, tizanidine) and monitored for adverse effects such as sedation and increased weakness.
- Those with stroke should only receive intrathecal baclofen or intraneural phenol in the context of a specialist multidisciplinary spasticity service.
- Those with increased tone that is reducing passive or active movement around a joint should only be offered splinting or casting following individualized assessment and with monitoring by appropriately skilled staff.

2.18. Swallowing

Swallowing difficulty or dysphagia is a commonly accompanying symptom after a stroke and it is associated with poor outcomes including higher risk of longer hospital stay, chest infection, disability and death. Delay in dysphagia assessment is associated with increased risk of stroke-associated pneumonia. Prompt detection of dysphagia in patients with acute stroke is therefore essential.

- People with acute stroke should have their swallowing screened on admission to the hospital and before being given any oral food, fluid or medication.
- All patients with dysphagia should be evaluated in detail by a speech and language therapist for swallowing rehabilitation.
- Until a safe swallowing method is established, people with dysphagia after acute stroke should be:
  - Immediately considered alternative fluids and receive adequate hydration, nutrition and medication by alternative means.
  - Considered for nasogastric tube feeding within 24 hours.
  - Referred to a nutritionist for specialist nutritional assessment, advice and monitoring.

- People with suspected aspiration or who require tube feeding or dietary modification should be considered for instrumental assessment (video fluoroscopy or fiber-optic endoscopic evaluation of swallowing)
- Those with difficulties in self-feeding should be assessed and provided with the appropriate equipment and assistance to promote independent and safe feeding.
- Those should be considered for gastrostomy feeding if they:
  - Are unable to swallow adequate food and fluids orally by four weeks from the onset of stroke.
  - Are at high long-term risk of malnutrition.
- Those who are continuing to have dysphagia for food or fluids should be trained, or have family/ care givers trained, in the management of their swallowing difficulty and be regularly reassessed.
- Those with stroke receiving end-of-life (palliative) care should not have burdensome restrictions imposed on oral food and/ or fluid intake if those restrictions would exacerbate suffering.

2.19. Vision

People with stroke often have visual problems including altered acuity, field loss such as hemianopia, and disruption of eye movements causing diplopia, nystagmus, blurred vision and loss of depth perception. Ocular stroke causes visual loss due to central or branch retinal artery occlusion. They should be jointly managed by the stroke physician and the ophthalmologist. Cognitive disorders such as visual agnosia and visuospatial neglect should not be confused with visual impairment.

- People with a stroke should:
  - Be assessed for visual acuity whilst wearing the appropriate glasses to check their ability to read newspaper text and see distant objects clearly.
  - Be examined for the presence of visual field defect and eye movement disorders.
  - Receive necessary information, support and advice if they are with altered vision, visual field defects or eye movement disorders after stroke.

3. Long term management and secondary prevention of stroke

Risk of recurrent stroke is substantial, estimated to be 11% within the first year and 26% within next 5 years after the first stroke. Effective secondary prevention measures can reduce the risk of recurrent strokes and other vascular events by 20% to 30%. Approximately, 15% of strokes are preceded by a transient ischaemic attack (TIA). Given that the risk of stroke is high after a TIA, estimated to be 10% at 2 days and 17% at 90 days, it provides an opportunity to prevent a stroke by early implementation of secondary prevention measures.

3.1. General recommendation

- All secondary prevention strategies should be started in the acute or post-acute phase and continued long-term after discharge from the hospital.
- Patients and caregivers should be given clear information on secondary prevention measures before discharge from hospital.
- Changing patient behaviour and compliance to pharmacological and non-pharmacological interventions should be achieved through the multiple disciplines involved in stroke management and rehabilitation.
- Specific recommendations for pharmacological interventions should be tailored to the stroke subtype and aetiology, and accessibility to the patient.
- Preventive strategies aimed at lifestyle modification should be commensurate with the functional capacity of the patient.

3.2. Lifestyle modifications

Recommendations for lifestyle modifications for secondary prevention of stroke are drawn from convincing primary prevention data from broad cardiovascular disease populations.

- **Smoking cessation**
  - Patients who have been smoking tobacco should be advised to stop smoking completely.
  - Patients with poor adherence to smoking cessation should undergo counselling with or without drug therapy (nicotine replacement or treatment with bupropion).
  - Advice should be given to avoid environmental (passive) tobacco smoking.
- **Dietary Interventions**
  - Diets with low saturated fat (high monounsaturated/ saturated fat ratio), plant-based foods (5 portions of vegetables and fruits per day) and fish should be recommended.

- The recommended sodium intake should be 2.5g of salt (1 gm sodium) per day.
- Advice should be given to avoid excess alcohol consumption.

- **Physical Activity**
  - Patients should be encouraged to undertake physical activity for fitness unless there are contraindications. Exercise prescriptions should be individualized and reflect treatment goals and activity recommendations.
  - Those capable of physical activity should be advised to engage in at least moderate intensity aerobic activity for a minimum of 10 minutes four times a week or vigorous intensity aerobic activity for a minimum of 20 minutes twice a week.
  - Patients should be referred for a supervised exercise programme under the guidance of either a physical therapist or a cardiac rehabilitation professional.

- **Oral contraceptive use**
  - Pre-menopausal women who develop a stroke or TIA and request contraception should not be offered the combined oral contraceptive pill. Instead, an alternative hormonal (progestogen-only) or non-hormonal contraceptive methods should be recommended.
  - Post-menopausal women with an ischaemic stroke or TIA who wish to start or continue hormone replacement therapy should receive advice based on the overall benefit of such therapy while taking in to account the woman's preferences.

3.3. Pharmacological therapy

- **Hypertension**

There is insufficient evidence to determine the optimal timing of blood pressure (BP) reduction in acute stroke. The recommendations below pertain to the BP management of neurologically stable patients in the post-acute phase and thereafter.

  - Patients with hypertension who experience a stroke or TIA should be treated with a thiazide diuretic, calcium channel blocker, angiotensin converting enzyme inhibitor or angiotensin receptor blocker to lower the blood pressure and reduce the risk of recurrent stroke.
  - In patients with hypertension who experience a stroke or TIA, a BP goal of < 130/80 is recommended to reduce the risk of recurrent stroke and other vascular events.
  - Patients with no history of hypertension who experience a stroke or TIA and a persistent BP of ≥ 130/ 80 will benefit from antihypertensive medication to reduce the risk of recurrent stroke and other vascular events.
  - When treating hypertension, individualized drug regimens based on the

patient's profile and the patient's preferences are recommended to maximize the treatment efficacy and adherence.

- **Hyperlipidaemia**
  - Patients with an ischaemic stroke or TIA without coronary heart disease or a major cardiac source of embolism and LDL cholesterol of > 100 mg/ dl should be treated with high intensity statin therapy (Atorvastatin 40 - 80 mg/ day or Rosuvastatin 20 - 40 mg/ day) to reduce the risk of recurrent stroke.
  - Patients with an ischaemic stroke or TIA and atherosclerotic disease (intracranial, carotid, aortic or coronary) should receive lipid lowering therapy with a statin, and ezetimibe if needed, to maintain a LDL cholesterol goal of < 70 mg/ dl to reduce the risk of major cardiovascular events.
  - In patients with a stroke or TIA and hyperlipidemia, adherence to changes in lifestyle and the response to LDL-C–lowering medication should be assessed by measurement of lipids 4 to 12 weeks after statin initiation or dose adjustment and every 3 to 12 months thereafter.
- **Diabetes mellitus**
  - In patients with an ischaemic stroke and TIA and diabetes, the goal of glycaemic control should be individualized based on the risk of adverse events and patient characteristics and preferences.
  - For most patients, especially, those <65 years of age and without life-limiting comorbid illnesses, achieving a HbA1c goal of ≤ 7.0 is recommended to reduce the risk of microvascular complications.
  - In patients with an ischemic stroke or TIA and diabetes, treatment with GLP – 1 receptor agonists and sodium glucose cotransporter – 2 inhibitors have additional benefit beyond glycaemic control in reducing the risk of future major adverse cardiovascular events (i.e. stroke, MI, cardiovascular death)
- **Antiplatelet therapy**
  - In patients with a non-cardioembolic ischaemic stroke or TIA, antiplatelet therapy is indicated to reduce the risk of recurrent ischaemic stroke and other cardiovascular events while minimizing the risk of bleeding.
  - For patients with a non-cardioembolic ischaemic stroke or TIA, aspirin 75 - 300 mg daily, clopidogrel 75 mg, or the combination of aspirin 75 mg and extended-release dipyridamole 200 mg twice daily is indicated for secondary prevention of ischaemic stroke.
  - For patients with recent minor (NIHSS score 5 non-cardioembolic ischaemic stroke or high-risk TIA (ABCD2 score 4) dual antiplatelets (aspirin plus clopidogrel) should be initiated early (ideally within 12 – 24 hours of symptom onset or at least within 7 days of onset) and continued for 21 – 90 days, followed by a single antiplatelet drug, to reduce the risk of recurrent ischaemic stroke.

- For patients already taking aspirin at the time of a non-cardioembolic ischaemic stroke or TIA, the benefit of increasing the dose of aspirin or changing to an alternative antiplatelet medication remains unknown.
- For patients with a non-cardioembolic ischaemic stroke or TIA, the continuous use of dual antiplatelet medications (aspirin plus clopidogrel) for >90 days or the use of triple antiplatelet therapy is associated with an excessive risk of major haemorrhage.

- **Anticoagulation**
  - **General**

    Patients with intermittent or persistent cardiac arrhythmias causing embolism should be referred for electrocardiogical assessment and insertion of permanent pacemakers and other electrocardiological interventions, if indicated.

    Patients with atrial fibrillation (AF) who develop an ischaemic stroke or a TIA should be treated with oral anticoagulation to reduce the risk of recurrent stroke, regardless of the type (valvular or non-valvular) and pattern (paroxysmal, persistent or permanent) of the AF.

  - **Non-valvular atrial fibrillation (AF)**
    - Patients with non-valvular AF who develop an ischaemic stroke or TIA should be treated with oral anticoagulation (apixaban, dabigatran, edoxaban, rivaroxaban or warfarin) to reduce the risk of recurrent stroke.
    - In patients with a TIA in the setting of a non-valvular AF, it is reasonable to initiate anticoagulation immediately after the index event to reduce the risk of recurrent stroke.
    - In patients with an ischaemic stroke and AF who are at high risk of haemorrhagic conversion, it is reasonable to delay oral anticoagulation for a period of 14 days to reduce the risk of ICH.
    - In patients with an ischaemic stroke and AF who are at a low risk of haemorrhagic conversion, it is reasonable to initiate oral anticoagulation at 2 – 14 days after the index event to reduce the risk of recurrent stroke.
  - **Atrial flutter**

    Patients with atrial flutter who develop an ischaemic stroke or TIA should be treated with oral anticoagulation to reduce the risk of recurrent stroke.

  - **Valvular heart disease**
    - In patients with an ischaemic stroke or TIA and valvular AF, warfarin is recommended to reduce the risk of recurrent stroke or TIA.
    - In patients with a mechanical mitral valve and a history of an ischaemic stroke or TIA before valve replacement, aspirin (75–100 mg/ d) is recommended in addition to warfarin with an INR target of 3.0 (range, 2.5 – 3.5) to reduce the risk of thrombosis and recurrent stroke or TIA

- In patients with an ischaemic stroke or TIA and infective endocarditis who present with recurrent emboli and persistent vegetations despite appropriate antibiotic therapy, early surgery (during initial hospitalization before completion of a full therapeutic course of antibiotics) is reasonable to reduce the risk of recurrent embolism if there is no evidence of intracranial haemorrhage or extensive neurological damage.
- In patients with a bioprosthetic aortic or mitral valve, a history of an ischaemic stroke or TIA before valve replacement, and no other indication for anticoagulation, therapy with oral anticoagulation is recommended for 3 to 6 months from the valve replacement.

- **Left ventricular (LV) thrombus**
  - In patients with a stroke or TIA and a LV thrombus, anticoagulation with warfarin for at least 3 months is recommended to reduce the risk of recurrent stroke.
  - In patients with a stroke or TIA in the setting of an acute anterior myocardial infarction with a reduced ejection fraction (EF<50%) but no evidence of LV thrombus, empirical anticoagulation for at least 3 months may be considered to reduce the risk of recurrent cardioembolic stroke.
- **Cardiomyopathy**
  - In patients with a ischaemic stroke or TIA and left atrial or left atrial appendage thrombus in the setting of ischaemic, non-ischaemic, or restrictive cardiomyopathy and LV dysfunction, anticoagulant therapy with warfarin is recommended for at least 3 months to reduce the risk of recurrent stroke or TIA.
  - In patients with an ischaemic stroke or TIA in the setting of a mechanical assist device, treatment with warfarin and aspirin can be beneficial to reduce the risk of recurrent stroke or TIA.
  - In patients with an ischaemic stroke or TIA in sinus rhythm with ischaemic or non-ischaemic cardiomyopathy and reduced EF without evidence of left atrial or LV thrombus, the effectiveness of anticoagulation compared with antiplatelet therapy is uncertain, and the choice should be individualized.
- **Congenital heart disease**
  - In patients with an ischaemic stroke or TIA and Fontan palliation, anticoagulation with warfarin is recommended to reduce the risk of recurrent stroke or TIA.
  - In patients with cyanotic congenital heart disease and other complex lesions, ischaemic stroke or TIA of presumed cardioembolic origin, therapy with warfarin is reasonable to reduce the risk of recurrent stroke or TIA.
- **Arterial dissection**
  - In patients with an ischaemic stroke or TIA after an extracranial carotid or vertebral arterial dissection, treatment with an anticoagulant or an antiplatelet agent for at least 3 months for at least 3 months is indicated to prevent recurrent stroke or TIA.

- In patients with a stroke or TIA and extracranial carotid or vertebral artery dissection who have recurrent events despite antithrombotic therapy, endovascular therapy may be considered to prevent recurrent stroke or TIA.

- **Antiphospholipid Syndrome**
  - In patients with an ischaemic stroke or TIA who meet the criteria for antiphospholipid syndrome, it is recommended to anticoagulate with warfarin to reduce the risk of recurrent stroke or TIA.

- **Patent foramen ovale (PFO)**
  - In patients with a non-lacunar ischaemic stroke of undetermined cause and a PFO, recommendations for PFO closure versus medical management should be made jointly by the patient, the cardiologist, and the neurologist, taking into account the probability of the causal role for the PFO.
  - In patients 18 to 60 years of age with a non-lacunar ischaemic stroke of undetermined cause despite a thorough evaluation, and a PFO with high-risk anatomic features (large shunt size and an atrial septal aneurysm), it is reasonable to choose closure with a transcatheter device and long-term antiplatelet therapy over antiplatelet therapy alone for preventing recurrent stroke.

3.4. Carotid revascularization

- In patients with a non-disabling stroke or TIA, when revascularization is indicated, it is recommended that the procedure is performed as early as possible, ideally within 2 weeks and not beyond 12 weeks of the index event, to increase the likelihood of a stroke-free outcome.
- Carotid endarterectomy (CEA) procedures should be performed by operators with established periprocedural stroke and mortality rates of <6% to reduce the risk of surgical adverse events.
  - In patients with a nondisabling ischaemic stroke or TIA within the past 6 months and a symptomatic severe (>70%) carotid artery stenosis, CEA is recommended to reduce the risk of future strokes.
  - In patients with symptomatic severe stenosis (≥70%) in whom anatomic or medical conditions are present that increase the risk for surgery (such as radiation-induced stenosis or restenosis after CEA) it is reasonable to choose carotid artery stenting (CAS) to reduce the periprocedural complication rate.
  - In patients ≥70 years of age with stroke or TIA in whom carotid revascularization is being considered, it is reasonable to select CEA over CAS to reduce the periprocedural stroke rate.
  - In patients in whom revascularization is planned within 1 week of the index stroke, it is reasonable to choose CEA over CAS to reduce the periprocedural stroke rate.

4. Stroke in paediatric age group

4.1. Acute stroke in paediatric age group

Children or adolescents presenting to a health care with a clinical deficit (motor, sensory or otherwise) in a healthcare setting do not necessarily suffer from acute ischaemic stroke (AIS) or haemorrhagic stroke (HS). Many of these events could have a non-vascular diagnosis, as data from developed countries, suggest that around 50% of cases may fall under such diagnoses.

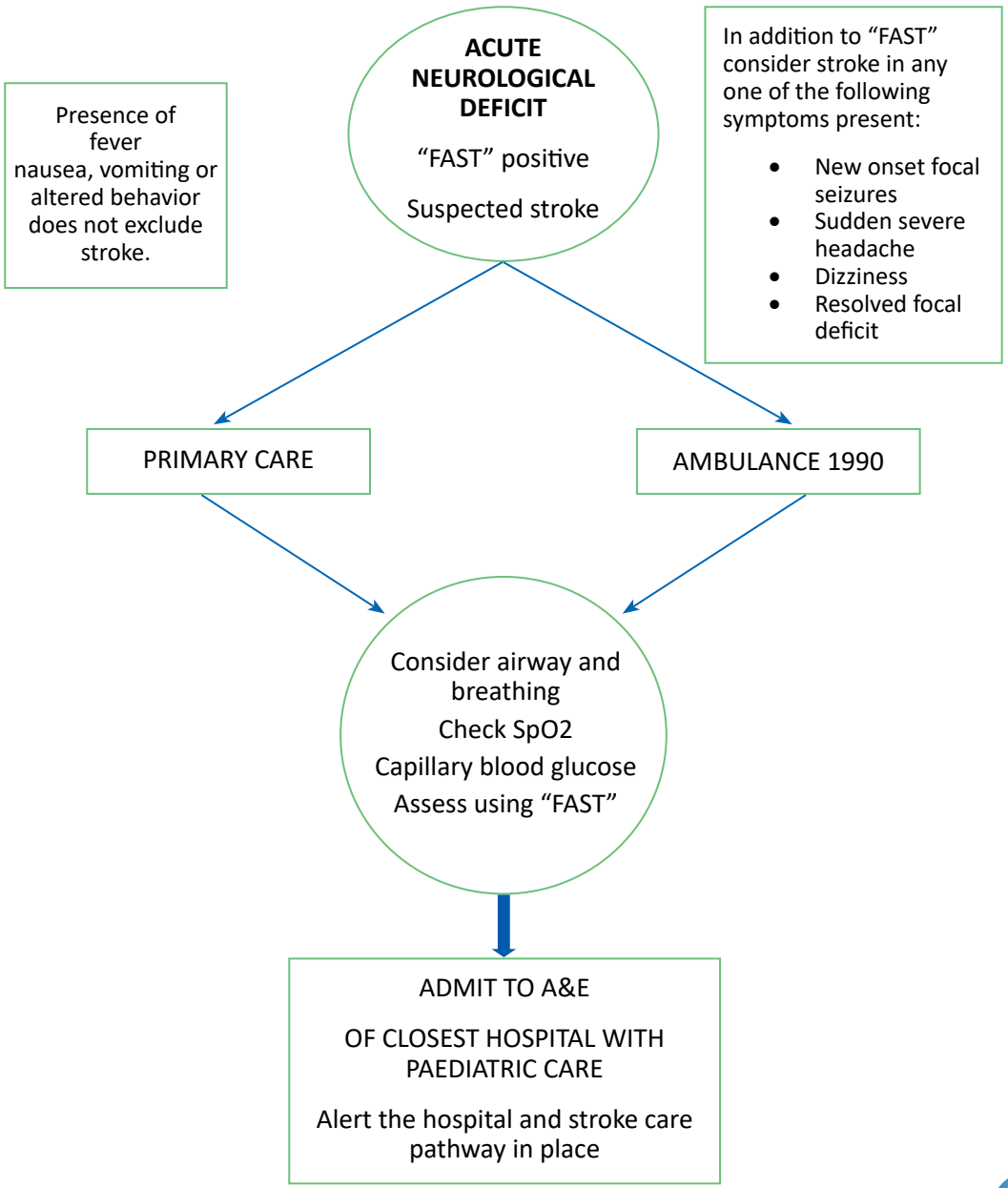
Clinical presentation of AIS and HS may be indistinguishable prior to imaging in many occasions. The mean duration taken for presentation to medical attention in childhood stroke is substantial. Often, these children or adolescents with stroke are brought to the closest hospital requiring transfer to specialized centres. This also may contribute to the delay in appropriate investigations in order to proceed with acute management.

This guideline provides information on referral and management pathways for paediatric stroke. The guideline begins from the point of referral (acute presentation) and covers up to long-term rehabilitation and community care.

- **Clinical Diagnosis**
  - Suspect stroke if a child presents with acute neurological deficit or speech disturbance
  - Make use of **"**FAST" to identify stroke in young children and adolescents. However, absence of "FAST" does not exclude a stroke.
    "FAST" stands for:
    - **F**ace: there will be a deviation of face or mouth to a side
    - **A**rms: may not be able to lift the arm
    - **S**peech: may be slurred, or the child may not be able to talk at all despite appearing to be awake (Age appropriate signs should be used)
    - **T**ime: It is time to call 1990 or rush to hospital immediately if any of these signs/ symptoms are present
  - Consider stroke in any child with following symptoms:
    - New onset focal seizure
    - Sudden severe headache
    - Dizziness
    - Resolved focal deficit
  - Do not exclude stroke in the presence of fever, nausea & vomiting and altered behavior.
- **Prehospital care/ Primary Health care**
  - Prehospital care commences at the time the patient is suspected to have a stroke. However, generally it is considered to be from the point of arrival of 1990 ambulance service.

- Following are recommended:
  - Consider airway and breathing
  - Check SpO2
  - Check capillary blood glucose
  - Assess using “FAST”
  - Alert stroke care pathway in place and admit to the A & E of the closest hospital with paediatric care services.

Fig 4.1 Prehospital care for paediatric stroke



- **Management at A&E**

Firstly, assess the level of consciousness by using AVPU scale (**A**lert; response to **V**oice; response to **P**ain; **U**nresponsive) or age appropriate Glasgow Coma Scale (GCS) **(Annexure 13).**

  - Use Paediatric NIH Stroke Scale (PedNIHSS) to assess the neurological status **(Annexure 14).**
  - Protect airway and consider intubation if
    - GCS <8
    - Loss of brain stem reflexes
    - Signs of raised ICP
  - Use high flow O_2 and target for SpO_2 >92%
  - Monitor blood pressure, temperature, oxygen saturation, heart rate and respiratory rate.
  - Establish IV access and send blood for FBC, INR, APTT, urea, electrolytes, blood glucose, CRP, LFT and blood culture as appropriate.
  - Keep nil by mouth until swallow safety has been established.
  - Maintain normal fluid, glucose and electrolyte balance. Give fluid bolus 10ml/ kg 0.9% NaCl, treat hypotension, hypoglycemia & seizures, if necessary.
  - If thrombolysis is contemplated as a treatment option, arrange urgent non-contrast CT brain preferably within 25 minutes. CTA could be arranged simultaneously if endovascular treatment considered
  - Observe for development of seizures which is seen in 15-25% of childhood strokes. In centers where facilities are available EEG monitoring is recommended to detect subclinical seizures
  - Ask for history of
  - Congenital heart disease
  - Sickle cell disease
  - Recent head/ neck injury
  - Active Communication with the family starting from peripheral hospital to the specialized center, regarding the progress of condition. On discharge, should guide them through the rehabilitation process including supporting schooling.

- **Management of acute ischemic stroke with thrombolyisis in children (Off label use)**
  - The use of recombinant tissue plasminogen activator (rtPA) could be considered in children over eight years of age presenting with AIS and may be considered in children aged between two and eight years on an individualized basis. Dose of Alteplase (tissue plasminogen activator): bolus of 0.09/ kg followed by 0.81mg/ kg infused over 1 hour (Maximum dose 90mg).
  - Following criteria need to be fulfilled for thrombolysis:
    - An acute focal neurological deficit consistent with arterial ischaemia AND
    - PedNIHSS > or equal to 4 and < or equal to 24

        - Treatment can be administered if within 4.5 hours of onset of symptoms.
        - Intracranial haemorrhage has been excluded by Non Contrast CT MRI with appropriate sequences
    - Consider endovascular treatment after discussion with interventional radiologist
    - Should receive treatment for hypertension only in the following circumstances.
        - Hypertensive encephalopathy
        - End organ damage or dysfunction. e.g. Cardiac or renal failure
    - Consider decompressive craniectomy when indicated.
    - Discuss and explain about the possible diagnosis, investigations and the expected problems to the parents/ care givers and child from the time of presentation.

- **Management of Hemorrhagic stroke**
    - Follow the management as in ICH in adult patients (Ref 3.6) where applicable
    - Prioritize neurosurgical referral
    - Interpret BP readings based on age & height specific centile BP figures
    - Investigate for a secondary cause for haemorrhage early

- **Stroke mimics**
    - Follow with MRI scan with stroke protocol to exclude possibility of ischemic stroke. Specific management should be planned based on the final diagnosis

4.2. Rehabilitation

Early functional assessment and plan for rehabilitation

There are numerous functional assessment tools used to assess different subsets of functional ability in post stroke children. There is no single assessment tool validated for paediatric stroke, up to date.

The functional assessment tool is generally used by the members of the multidisciplinary team (including doctors, occupational therapists, physiotherapists, speech and language therapists) and it provides information on clinical assessment of a child's functions and activities relevant to child's age and developmental abilities.

- Children should be assessed using functional assessment tools as soon as possible during hospital admission, preferably within first 72 hours.
- When working with children and adolescents, combined approach with families is important in supporting identification of priority areas for assessment and intervention.
- Use the International Classification of Functioning, Disability and Health (ICF) framework **(Annexure 15)** to identify domains for assessment and intervention, including impairments in body structure and functions, and activity limitations.

- Consider the use of both clinical and instrumental methods to assess body structures and functions. Key areas to consider include:
  - Swallow safety
  - Hydration and nutrition
  - Pain
  - Motor function (muscle functions, movement functions)
  - Vision and hearing
  - Sleep
  - Sensation and perception
  - Fatigue
- Assess activity limitations, using clinical and instrumental methods as appropriate. Key areas to consider are:
  - Mobility and gross motor activities (walking and moving, changing and maintaining body position)
  - Eating and drinking (ingestion)
  - Self-care (washing, dressing, toileting)
  - Communication, including language understanding and expressive skills (receiving, producing and conversation)
  - Social interaction (interpersonal interactions and relationships)
  - Behavior and emotion (general tasks and demands, including handling stress and other psychological demands, and managing one's own behavior)
  - Cognition (learning and applying knowledge)
  - Play and fine motor activities.
- Consider the use of both functional and developmental assessments to describe and monitor any change in children's abilities and limitations.
- Undertake at least weekly multidisciplinary review of abilities and rehabilitation needs during the in-patient stage.
- Initiate early liaison with community-based medical, nursing, occupational therapists, physiotherapists, psychologists, orthotists, speech and language therapists to establish links with local networks.

4.3. Secondary Prevention

- Investigate for risk factors for acute ischemic stroke **(Table 4.1 & 4.2)**

Table 4.1 Risk factors for AIS in children

Arteriopathy	• Focal cerebral arteriopathy of childhood • Moyamoya syndrome • Arterial dissection • Central nervous system (CNS) vasculitis
Cardiac disease	• Congenital and acquired cardiac diseases • Bacterial endocarditis • Arrhythmias • Additional risk factors in children and young people with cardiac disease such as right to left shunt, global or segmental hypokinesia
Cardiac surgery/ interventions	Endovascular surgeries, open cardiac surgeries
Infections	Varicella zoster -history within a year of infection Viral upper respiratory tract infections
Thrombophilic conditions	Genetic: Factor V Leiden (FVL), PT20210, MTHFR c677T, protein C deficiency, increased lipoprotein(a) (Lp(a)), more than 2 genetic thrombophilia traits, high homocystinuria (HCY) Acquired: Antiphospholipid syndrome (APLS)
Other relevant conditions	• Iron deficiency anaemia • Sickle cell disease • Trisomy 21 • Neurofibromatosis • Malignancy and long-term effects of treatment for malignancy Auto-immune diseases, e.g. systemic lupus erythematosus, • Illicit drugs and other recreational drugs (e.g. cocaine) • Cerebral Autosomal Dominant Arteriopathy with Sub-cortical infarcts and Leukoencephalopathy (CADASIL) • Mitochondriopathy (e.g. MELAS, POLG1 mutation) • Fabry disease • PHACE syndrome, ACTA 2/ COL4A1 mutation • Deficiency of Adenosine Deaminase 2

Table 4.2 Investigations in children and young people with a diagnosis of AIS:

Haematological	Full blood count, blood picture, iron status (e.g. iron, ferritin, total iron binding capacity) and haemoglobinopathy screen
Biochemistry	Plasma homocysteine, alpha galactosidase, fasting blood sugar, fasting cholesterol, and Lipoprotein(a)
	Lupus anticoagulant and anti cardiolipin antibody,
Imaging	CT or MRI * CT angiogram (CTA)-aortic arch to vertex or MR angiogram MR venogram Transcranial doppler
Cardiac	Echocardiogram with bubble study ECG
	Varicella IgM and IgG and other viral aetiologies

*MRI is the modality of choice for follow-up imaging of children with AIS as it provides the best assessment of the extent of any permanent structural damage and of the cerebral circulation. Consider the clinical circumstances and the presence of conditions predisposing to recurrence (e.g. moyamoya or other arteriopathy) when considering the frequency and duration of follow-up imaging in childhood AIS.

- **Antiplatelet therapy in AIS in children**
  - Prescribe aspirin 5 mg/ kg up to a maximum of 300 mg/ day within 24 hours of diagnosis of AIS in the absence of contraindications (e.g. parenchymal haemorrhage). After 14 days reduce dose of aspirin to 1mg/ kg to a max of 75mg and may continue up to 6 months or more.
  - Delay administering aspirin for 24 hours in patients who had received IV thrombolysis for acute ischaemic stroke.
  - The decision of anti-platelet Vs anti coagulation with heparin or warfarin is still debated.
- **Cardio-embolic stroke**
  - In children with cardiac disease presenting with AIS, make a multidisciplinary decision (including contributions from haematologist, paediatric neurologist and cardiologist) regarding the optimal antiplatelet versus anticoagulation with assessment of the risk-benefit in individual cases.

ANNEXURES

Annexure 1

Ministry of Health

Form for Management of Acute Stroke
A & E / WARD / ICU / STROKE UNIT

Name	:……	Age:	…….. Years	Date:	……..
PHN/BHT No	:……			Gender:	Female / Male

Time:

At onset of stroke	:…… AM/ PM	At arrival to OPD	:…… AM/ PM
At arrival to CT room	:…… AM/ PM	At completing CT brain	:…… AM/ PM
Blood reports received at	:…… AM/ PM	At commencing thrombolytic	:…… AM/ PM
At CT Angiogram	:…… AM/ PM	At thrombectomy	:…… AM/ PM
Thrombolytic Agent used	:……	Flow achieved at	:…… AM/ PM

THROMBOLYSIS CHECK LIST

	INCLUSION CRITERIA	Yes	No
1.	Diagnosis of ischemic stroke with a measurable neurological deficit (Defined as impairment of language, motor function, cognition, gaze, vision or neglect)		
2.	Symptom onset within 0 - 4.5 hours		
3.	Age ≥ 18 yrs		

	ABSOLUTE CONTRAINDICATIONS	Yes	No
1.	Past history of Intra Cranial Haemorrhage		
2.	Arteriovenous malformations		
3.	Intra cranial neoplasms (Intra-axial)		
4.	Intra cranial or intra spinal surgery over last 3 months		
5.	Major surgery within 14 days		
6.	Sub Arachnoid Haemorrhage suspected		
7.	Active internal bleeding		
8.	Platelet count <100000/cmm		
9.	INR >1.7		
10.	Heparin given within last 48 hrs with elevated APTT		

ABSOLUTE CONTRAINDICATIONS		Yes	No
11.	LMWH within 24 hrs Unless the coagulation tests* are normal *APTT, INR, Ecarin clotting time, TT, Factor Xa assays, Plt count		
12.	Direct thrombin inhibitor or factor Xa inhibitor within 48 hrs unless the coagulation tests* are normal *APTT, INR, Ecarin clotting time, TT, Factor Xa assays, Plt count		
13.	NCCT showing hypodensity > 1/3 of the cerebral hemisphere		

RELATIVE CONTRAINDICATIONS		Yes	No
1.	Intracranial neoplasm Probably recommended if extra axial.		
2.	Aneurysms - Recommended if unruptured and unsecured aneurysm < 10mm Risk unclear if greater size		
3.	Ischemic Stroke within 3 months. Risk raised; degree unclear		
4.	Acute anterior Myocardial Infarction within last 3 months		
5.	GI or GU surgery within 21 days. Consider rtPA if no structural bleeding lesions		
6.	Major extracranial trauma within 14 days		
7.	Arterial puncture at a non-compressible site within 7days		
8.	Rapidly improving symptoms. rtPA should be administered if symptoms are still disabling		
9.	Minor stroke (Typically NIHSS score <5) (Risks benefits should be weighed)		
10.	Seizure at onset with post ictal residual deficits		
11.	SBP >185 or DBP>110 but treatment recommended if BP can be lowered safely		
12.	Pregnancy		
13.	Blood Glucose < 50mg/Consider rtPA if deficits still present after glucose administration		

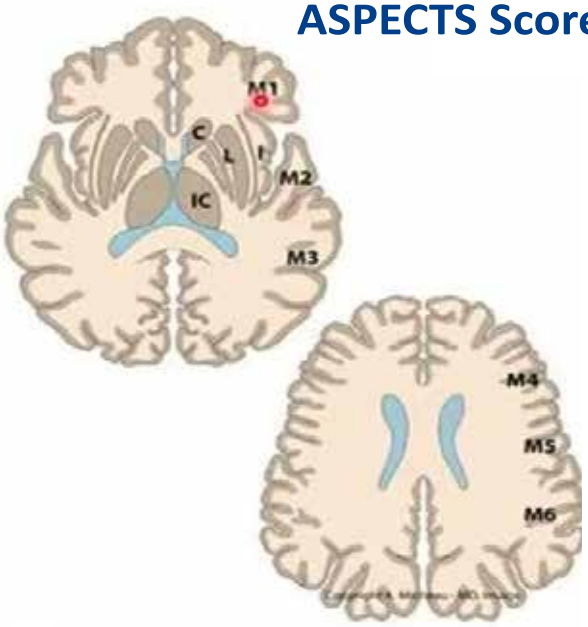
CRITERIA FOR ACUTE ENDOVASCULAR TREATMENT		Yes	No
1.	Age > 18 years		
2.	NIHSS SCORE ≥ 6		
3.	Estimated time from symptom onset to groin puncture < 6hrs		
4.	Good pre stroke functional status MRS 0 -2)		
5.	ASPECTS score ≥ 6 on baseline CT scan		
6.	Presence of intracranial artery occlusion		

NIHSS Score

Category	Score/Description	Date/Time Initials	Date/Time Initials	Date/Time Initials
1a. Level of Consciousness (Alert, drowsy, etc.)	0 = Alert 1 = Drowsy 2 = Stuporous 3 = Coma			
1b. LOC Questions (Month, age)	0 = Answers both correctly 1 = Answers one correctly 2 = Incorrect			
1c. LOC Commands (Open/close, make fist/let go)	0 = Obeys both correctly 1 = Obeys one correctly 2 = Incorrect			
2. Best Gaze (Eyes open - patient follows examiner's finger or face)	0 = Normal 1 = Partial gaze palsy 2 = Forced deviation			
3. Facial Fields (Introduce visual stimulus/threat to Pt's visual field quadrants)	0 = No visual loss 1 = Partial Hemianopia 2 = Complete Hemianopia 3 = B lateral Hemianopia (Blind)			
4. Facial Paresis (Show teeth, raise eyebrows and squeeze eyes shut)s	0 = Normal 1 = Minor 2 = Partial 3 = Complete			
5a. Motor Arm - Left Sb. Motor Arm - Right (Elevate arm to 90^0 if patient is sitting 45^0 if supine)	0 = No drift 1 = Drift 2 = Can't resist gravity 3 = No effort against gravity 4 = No movement X = Untestable (Joint fusion or limb amp)	Left Right		
6a. Motor Leg - Left 6b. Motor Leg Right (Elevate leg 300 with patient supine)	0 = No drift 1 = Drift 2 = Can't resist gravity 3 = No effort against gravity 4 = No movement X = Untestable (Joint fusion or limb amp)	Left Right		
7. Limb Ataxia (Finger - nose, heel down shin)	0 = No ataxia 1 = Present in one limb 2 = Present in two limb			
8. Sensory (Pin prick to face arm, trunk, and leg - compare side to side)	0 = Normal 1 = Partial loss 2 = Severe loss			
9. Best Language (Name item, describe a picture and read sentences)	0 = No aphasia 1 = Mild to moderate aphasia 2 = Severe aphasia 3 = Mute			
10. Dyaarthria (Evaluate speech clarity by patient Repeating listed words)	0= Normal articulation 1 = Mild to moderate slurring of words 2 = Near to unintelligible or worse X = Intubated or other physical barrier			
11. Extinction and Inattention (Use information from prior testing to identify neglect or double simul taneous stimuli testing)	0 = No neglect 1 = Partial neglect 2 = Complete neglect			
	TOTAL SCORE			

INITIAL	SIGNATURE	INITIAL	SIGNATURE	INITIAL	SI

ASPECTS Score



- ☐ C - Caudate
- ☐ I - Insular ribbon
- ☐ IC - Internal Capsule
- ☐ L - Lentiform nucleus
- ☐ M1 - Anterior MCA cortex
- ☐ M2 - MCA cortex lateral to the insular ribbon
- ☐ M3 - Posterior MCA cortex
- ☐ M4 - Anterior MCA superior territory
- ☐ M5 - Lateral MCA superior territory
- ☐ M6 - Posterior MCA Suprior territory

ASPECTS Score = ☐ /10

PROCEDURE OF rtPA ADMINISTRATION

Total dose: 0.9mg/ kg of estimated weight (maximum dose 90mg)

Bolus dose: 1O% of total over 1minute. 9O % as Infusion over 60 minutes

PROCEDURE OF TENECTEPLASE ADMINISTRATION

Single bolus at 0.25 mg/ kg (maximum 25 mg)

TO REDUCE THE BLOOD PRESSURE BEFORE rtPA

- If DBP>110 or SBP >180 give labetalol 10mg -20mg over 2 minutes, repeat dose in 10 minutes if needed
- If BP starts to rise post alteplase bolus, then set-up iv labetalol infusion (2-8mg/ min)
- Titrate to SBP 150-160; DBP 90-100 mmHg.
- Maximum dose of Labetalol is 300mg/ 24 hours, keep heart rate >60bpm.
- If no response or contra-indications to labetalol, give iv GTN (0.5 -10 mg/ hour) and use same target parameters

POST THROMBOLYSIS CARE

- Monitor GCS, pulse and BP every 15 minutes for first 2 hours then every 30 minutes for 6 hours, then every hour for 18 hours
- Monitor for :
    - intracranial or major internal and superficial bleeding.
    - Fall in GCS >2, NIH score change >4, new headache, bradycardia, rise in BP, or nausea/ vomiting.
    - tachycardia, hypotension, fall in hemoglobin or evidence of melaena/ hematuria.

If internal bleeding suspected: -

- **STOP tPA/ TNK INFUSION** and inform doctor on-call who should arrange urgent CT scan.
- Take blood for aPTT, INR, FBC, Group and Save -Consider cryoprecipitate 6-8 units if-significant fall in Hb. If platelets low give platelets 6-8 units.
- Discuss with neurosurgeons/ hematology on-call Consultant if appropriate.

Repeat CT brain in 24 hours; Give antiplatelets after 24 hours if no contraindications.

IF NOT THROMBOLYSED; REASON FOR NOT THROMBOLYSING

Hemorrhagic stroke	Yes □	No □
Outside the time window	Yes □	No □
Severity (<4 or >25 NIH)	Yes □	No □
Co-morbidity/ Medication/ Lack of consent	Yes □	No □
Others (Please state)		

Annexure 2

Ministry of Health

FORM FOR MONITORING AFTER THROMBOLYSIS

Name	
Age	
BHT	
Ward / ICU	
Date	
Duration from onset to thrombolytic administration	
Thrombolytic agent	

Time since bolus	BP	HR	SaO_2	RESP. RATE	TEMP	GCS	REMARKS
Base line							
15 min							
30 min							
45 min							
1 hr							
1 hr 15 min							
1 hr 30 min							
1 hr 45 min							
2 hr							
2 hr 30 min							
3 hr							
3 hr 30 min							
4 hr							
4 hr 30 min							
5 hr							
5 hr 30 min							
6 hr							
6 hr 30 min							

Time since bolus	BP	HR	SaO_2	RESP. RATE	TEMP	GCS	REMARKS
7 hr							
7hr 30 min							
8 hr							
9 hr							
10 hr							
11 hr							
12 hr							
13 hr							
14 hr							
15 hr							
16 hr							
17 hr							
18 hr							
19 hr							
20 hr							
21 hr							
22 hr							
23 hr							
24 hr							

Annexure 3

Ministry of Health

FORM FOR DATA COLLECTION FOR STROKE REGISTRY

CRITERIA FOR INCLUSION: All consecutive patients with a presumed diagnosis of stroke, transient ischemic attack (TIA) and unspecified cerebrovascular accident presenting within 14days of stroke onset.

To be filled by the Nursing Officers

PATIENT REGISTRATION					
Stroke ID (Auto):			NIC No:		
PHN No:			BHT No:		
Initial Admission:	☐ Medical ward/Medical ICU		☐ Neurosurgery ward/ Neurosurgery ICU		
	☐ Stroke unit		☐ Neurology ward/ Neurology ICU		
	☐ Another hospital				
*First name:			*Last name:		
*Date of birth:		Age:	*Gender:	☐ Male	☐ Female
*Address:			*Contact No:	Mobile:	
Name of the guardian:			Contact No:	Mobile:	
				Home:	

To be filled by the Medical Officers

EVENT DETAILS				
*Onset of Stroke/ TIA (last seen normal):		**Date (DD/MM/YYYY):	Time (am/pm)	Time Unknown:
*Initial Admission:		**Date (DD/MM/YYYY):	Time (am/pm):	
Initial symptom(s)				
☐ Weakness		☐ visual disturbances		
☐ speech disturbances		☐ seizure		
☐ sensory symptoms		☐ unsteady gait		
☐ swallowing difficulty		☐ sphincter involvement		
*Modified Rankin's Scale on admission[₸]: 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐				
RISK FACTORS				
Patient was on antiplatelet at the time of stroke:		☐ Yes	☐ No	☐ Not known
*Past history of stroke:	☐ Yes	☐ No	☐ Do not know	
*Hypertension:	☐ Yes	☐ No	☐ Newly diagnosed	
*Diabetes mellitus:	☐ Yes	☐ No	☐ Newly diagnosed	
*Ischemic heart disease:	☐ Yes	☐ No	☐ Newly diagnosed	
*Dyslipidemia	☐ Yes	☐ No	☐ Newly diagnosed	
Other heart disease:	☐ Atrial fibrillation	☐ Heart failure		
	☐ Prosthetic valve	☐ Valvular disease		
	☐ ASD/PFO	☐ VSD		
Current smoker[₹]	☐ Yes ☐ No	**Alcohol intake (Units /Frequency)**	☐ Yes	☐ No

[₸]***Modified Rankin's Scale:*** *1 - No significant disability; 2 - Sight disability; 3 - Moderate disability; 4 - Moderately severe disability; 5 - Severe disability; 6 - Dead*

[₹] ***Current smoker:*** *who had smoked ≥100 cigarettes in his lifetime and smoked within the past 30 days.*

INVESTIGATIONS				
*Brain Imaging:	☐ CT	☐ MRI	☐ Not done	
*Finding:	☐ Normal	☐ Hemorrhagic infarction		
	☐ Infarction	☐ Hemorrhage	☐ Other	
*ECG Evidence of atrial fibrillation		☐ Yes	☐ No	
Echocardiography	☐ Done	☐ Not done		
Cardiac source of embolism	☐ Yes	☐ No		
Carotid Doppler	☐ Done	☐ Not done		
Carotid stenosis >70% ☐ No	☐ Symptomatic vessel	☐ Asymptomatic vessel	☐ Both	
***DIAGNOSIS**				
☐ Intra cerebral hemorrhage		☐ Ischemic stroke		
☐ Transient Ischemic attack		☐ Other		

MANAGEMENT				
*Thrombolysis given or not		☐ Yes	☐ No	☐ Not indicated
Bedside swallowing screen performed within 24hours		☐ Yes	☐ No	☐ Not indicated
Admitted to stroke unit		☐ Yes	☐ No	
*Discharged on antiplatelet agent	☐ Yes	☐ Not indicated	☐ No	
If yes, type	☐ Aspirin	☐ Aspirin & Clopidogrel		
	☐ Clopidogrel	☐ Aspirin & Dipyridamole		
*Discharged on anticoagulation		☐ Yes	☐ No	
*Discharged on statin		☐ Yes	☐ No	
*Discharged on antihypertensive agent		☐ Yes	☐ No	

COMPLICATIONS	
☐ Aspiration pneumonia	☐ Pulmonary embolism/ DVT
☐ Urinary tract infection	☐ Decubitus ulcer

FINAL DISPOSITION		
*If patient died before discharge, Date of death:		
*Date of discharge:		
***Modified Rankin's Scale at discharge:**	**0** ☐ **1** ☐ **2** ☐ **3** ☐ **4** ☐ **5** ☐ **6** ☐	
Discharged with	☐ Tube feeding	☐ Urinary catheter
Referred to clinic for follow up		
☐ Physiotherapy	☐ Social services office	☐ Psychological counselling
☐ Occupational therapy	☐ Speech therapy	☐ Not indicated

[ǂ] ***Transient Ischemic attack:*** *stroke symptoms that last less than 24 hours*

*** *Fields noted by this Asterix are mandatory***

Annexure 4

Ministry of Health

POST STROKE CHECK LIST

Patient's Name: …… Clinic No: ……

				Date	Date	Date
1	Secondary prevention	Have you received medical advice on health-related lifestyle changes or medications to prevent another stroke?	No			
			Yes			
2	Mobility	Do you find it difficult to move safely (From bed to chair)?	No			
			Yes			
3	Activities of daily living	Do you find it difficult to take care of yourself? (Dressing bathing etc.)	No			
			Yes			
4	Spasticity	Do you have increasing stiffness in your arms, hands, or legs?	No			
			Yes			
5	Swallowing	Do you have difficulty in swallowing food or drinks?	No			
			Yes			
6	Communication	Are you finding it difficult to communicate?	No			
			Yes			
7	Cognition	Are you finding it difficult to think, concentrate or remember things?	No			
			Yes			
8	Incontinence	Are you having problems in bladder / bowel control?	No			
			Yes			
9	Mood	Do you feel more anxious or depressed?	No			
			Yes			
10	Pain	Do you have any new pain?	No			
			Yes			
11	Fatigue	Are you experiencing fatigue that is interfering with your ability to do your exercises or other activities?	No			
			Yes			
12	Personal relationships	Have your personal relationships (with family, friends or others) become more difficult or strained	No			
			Yes			
13	Sexual dysfunction	Do you find it difficult to engage in sexual activities?	No			
			Yes			
14	Life after stroke	Do you find it difficult to carry out leisure activities, hobbies or work?	No			
			Yes			
15	Other challenges	Do you have other challenges or concerns related to your stroke that interfere with your recovery or causing you distress?	No			
			Yes			
	Courtesy - Canadian stroke best practice recommendations					

Annexure 5

EQUIPMENT FOR THERAPY UNITS FOR 20 BEDDED STROKE UNIT

MINISTRY OF HEALTH SRI LANKA

	Unit / Section	Equipment	Quantity
	Physiotherapy unit		
01.		Parallel bars with mirror 12f	2
02.		Steps railing support	1
03.		Stationary recumbent cycles (static cycles)	2
04.		Arm peddlers (hand exercisers)	2
05.		Wall bar sets 2f	4
06.		Pulley unit	2
07.		Balancing boards	4
08.		Dumbbells and Wrist/Ankle Weights set (different weights)	1
09.		Treatment couches	3
10.		Adjustable bed	1
11.		Wheel chairs	4
12.		Armed chairs	10
13.		Stools 2f	5
14.		Stools ½ f	3
15.		Walkers	4
16.		Quadruped sticks	4
17.		Swiss balls	4

	Unit / Section	Equipment	Quantity
	Occupational therapy unit		
	Assessment		
	Strength		
01.		Baseline 7-piece evaluation kit	1
02.		Baseline push pull dynamometer (115Kg, 250 lb)	1
		Optional accessories handles	1
		Optional accessories handles	1
		Functional lift base	1
03.		JAMAR smedley hand dynamometer	1
04.		JAMAR Hydraulic pinch gauge	1

	Unit / Section	Equipment	Quantity
	Sensation		
01.		Queens perrcussor	1
02.		Wartenburg stainless steel pinwheel	1
03.		JAMAR Monofilaments	
		Complete hand monofilament kit	1
		Complete foot monofilament kit	1
		Pad of 100 hand documentation forms	1
		Pad of 100 hand documentation forms	1
	Range of motion		
01.		Baseline 180 digit goniometer - steel	1
02.		Baseline posture evaluator	1
03.		Six piece goniometer	1
	Function perceptual and cognitive assessments		
01.		Complex form board	1
02.		Stereognosis kit	1
03.		25 hole pegboard with coloured pegs	1
04.		Sensory stimulation activities kit	1
05.		LOTCA-G Battery	1
06.		Purdue peg board test	
		Kit	1
		Replacement pack	1
07.		Jebsen-Taylor Hand Function Test	1
08.		Box and Block test	1
09.		Minnesota Manual Dexterity Test	1
		replacement cylinders	1
10.		Multi-phase desensitization kit	1
		individual top covers	1
11.		Nine-hole peg test	1
12.		Hot and cold discrimination kit	1
13.		Adult Feeding Evaluation Kit	1
	Therapy equipment		
01.		Compress Clini Press unit	1
		Arm garment – Blue	2
		Large Leg Garment – Blue	2

	Unit / Section	Equipment	Quantity
02.		Kinetec ™ Centura 5™ - Shoulder CPM Machine	1
03.		Kinetic ™ Maestra Hand and wrist CPM Mechine	1
04.		Rolyan Stacking Cone Patteren Board	1
05.		Rolyan semi-circular Peg Board	1
06.		Incline Board	1
07.		Shoulder Excersise Ladder	1
08.		Rolyan Pipe Tree	1
09.		Rolyan Pronation/supination wheel	1
10.		Rolyan Single Curved Shoulder Arc	1
11.		Rolyan Work Bench	1
	Clinic furniture		
01.		Electric Adult Tilt Table - Dark Blue	1
02.		Gas-Lift Stools	2
03.		Gas-Lift Chair Without Arm	2
04.		Gas-Lift Chair With Arm	2
05.		Therapy Benches	1
06.		Posure Mirrors Mobile	1
07.		Economy Multi-Purpose Trolley	1
08.		Universal OT Table	1
09.		Treatment Table	1
10.		Width and Height Adjustabe Parralal Bars	1
11.		Whiteboard	1
	Splinting and accessories		
01.		Heat Pan Cart	1
02.		Deep 56L Heat pan UK plug	1
03.		Nylon Spatula	1
04.		Steinel ™ Air Gun With LCD Display HG2310LCD	1
		Air Gun Nozzeles	1
		Air Gun Nozzeles	1
		Air Gun Nozzeles	1
		Air Gun Nozzeles	1
		Air Gun Nozzeles	1
05.		Neoprene Sealing Iron	1
06.		Splinting Kit	1

	Unit / Section	Equipment	Quantity
07.		Cutting Mat	1
08.		Softtouch ™ Rotary Cutter	1
09.		Fiskars ™ Non-stick Scissors	1
10.		Super Shears	1
11.		Curved Scissors	1
12.		Unlimited scissors	1
13.		Strapping Carousel	1
		Wall Bracket	1
14.		Velcro ® Brand Self Adehesive Hook (Reel)	25
		Velcro ® Brand Sew-On Loop (Reel)	50
15.		Extra Soft Splint Padding (Sheets)	50
16.		Hapla ™ Fleecy Foam (Sheet)	50
17.		Tailor Splint ™	
		3.2 mm - 1% perforated Beige 46X61 CM	100
		2.4 mm - 1% perforated Beige 46X61 CM	20
18.		Aquaplast - T ™	
		4.8 mm - Solid (4 packs)	25
19.		Contoured Arm Support	2
20.		Urias ™ Pressure Splints (long arm)	4
21.		Urias ™ Pressure Splints (Full foot and leg W/ Sole, open toe)	2
22.		Hand pump	2
	Aids for daily living		
01.		Savanah ™ Wall Mounted Showr Seats (backrest and arms)	1
02.		Long handled Toe Washer	1
03.		Foot Brush and Sponge	1
04.		Bendable Long Handle Sponges	1
05.		Flannel Strap and Wash Mit	1
06.		Etac Socky Long Stocking Aid	1
07.		Dressing stick	1
08.		Buckingham Bra-Angel	1
09.		SlipLift Pants Aid	1
10.		Button Hook and Zip Puller	1
11.		Long Handled Combs and Brushes	1

	Unit / Section	Equipment	Quantity
12.		Nail Care Combination Set	1
13.		Reacherr Shoehorn	1
14.		Kings Assessmnet Kit 33 pieces	1
15.		Kitchen Work Station	1
16.		Multi-Holder	1
17.		The Functional Hand Splint	1
18.		Handi-Reacher ™	1
19.		Crystal Tap Turner	1
20.		Readezy book stand	1
	Speech and Language Therapy Unit		
	Sound /articulation measuring apparatus		
01.		Electroglottograph (EGG)	1
02.		Laryngograph	1
03.		Pocket Spirometer	2
04.		Articulation assessments (Please refer to the list of recommended articulation assessments)	1
05.		Diagnostic Stroboscopes	1
06.		Voice Synthesizer	1
07.		Augmentative Communication Devices	2
08.		Pure tone audiometry	1
09.		Laryngoscope	1
	Analytical software		
01.		Language Analysis Software	
02.		Signal Analysis Software	
03.		Speech Analysis Software	
	Medical software (to be used by 02 therapists)		
01.		Aphasia Treatment – Aphasia Tutor by Bungalow Software	
02.		Multi-Speech – KayPENTAX	
03.		Speech Training System – Video Voice	
04.		Text to Speech – Universal Reader by Premiere Assistive Technology	
	Dysphagia management		
01.		Fiberoptic endoscopic evaluation of swallowing test	1

	Unit / Section	Equipment	Quantity
02.		Mini Refrigerator	1
03.		Blender	1
04.		Hotplate	1
05.		Stethoscopes	2
06.		Tongue depress	2
07.		Thickner food	1 can
08.		Dysphagia diagnostic assessments	
	Language therapy		
01.		Laptops	1
02.		Tabs	2
03.		Photocopy machine	1
04.		Printers	1
05.		Head phones	2
	Other stimulatory Tools		
01.		Adult board game	2
02.		Adult picture stimuli sets	2
03.		Adults language and articulation workbooks	2
04.		Adults therapy books	2
	Furniture and other items		
01.		Tables	3
02.		Wall mirrors	1
03.		Small mirrors	2
04.		Chairs	10
05.		Mat	2
06.		Cupboard	2
07.		Bookshelf	2
08.		Wheel chairs	2
09.		Bed	1
10.		Pen torch	2
	Disposable items		
01.		Iced chips	
02.		Cutlery	
03.		Disposable tongue depressors	
04.		Tooth brushes	
05.		Gloves, masks, cotton, gauze, hand sanitizer	

Annexure 6

ESSENTIAL MEDICINE THAT SHOULD BE AVAILABLE IN THE EMERGENCY TROLLY

Number	Name of the drug	Preparations available	Tablet/ vial strength
1.	Adrenalin 1:1000	Injection	1 mg/ ml
	Atropine sulphate	Injection	0.4 mg/ ml, 8 mg/ 20 ml
	Hydrocortisone Sodium Succinate	Injection	100 mg in 1 vial
	Midazolam	Injection	5mg/ ml, 50mg/ 10 ml
	Fentanyl	Injection	50mcg/ ml in 2 ml vials
	Ketamine Hydrochloride	Injection	500 mg/ 10 ml (50 mg/ ml)
	Suxamethonium	Injection	50 mg/ ml vials
	Labetalol	Injection	20 mg/ 4 ml
	Hydralazine	Injection	20 mg/ ml vial
	Aspirin	Tablets	150 mg
	Clopidogrel 75 mg oral	Tablets Capsules	75 mg
	Salbutamol	Nebuliser solution	2.5 mg/ 2.5 ml Nebuliser solution
	Normal saline for fluid bolus	Infusion	0.9% 500 ml bottles
	Noradrenaline iv	Injection	4 mg/ 4 ml – 4 mg/ 2 ml
	Potassium Chloride	Injection/ infusion	40 mEq/ 20 ml
	Magnesium Sulphate	Injection	50% (5 grams/ 10 ml)
	Amiodarone	Injection	150 mg/ 3 ml vials
	Recombinant Tissue Plasminogen Activator	Injection	10, 20, 50 mg vials
	Tenecteplase	Injection	40 mg vials

Annexure 7

MEDICINES THAT SHOULD BE AVAILABLE IN THE STROKE UNIT

Number	Name of the medicine	Preparations	Strength of Tablet/ Vial
Antihypertensives			
	Atenolol	Tablets	50 mg
	Captopril	Tablets	25 mg
	Losartan Potassium	Tablets	25, 50 mg
	Prazosin	Tablets	0.5, 2 mg
	Nifedipine SR	Tablets	20 mg
	Verapamil	Tablets	40 mg
	Labetalol	Injection	20 mg/ 4 ml
Hypoglycaemic agents			
	Soluble Insulin short acting	Injection	100 IU/ ml
	Insulin intermediate acting	Injection	
	Metformin	Tablets	500 mg
	Gliclazide	Tablets	40, 80 mg
Cholesterol lowering agents			
	Atorvastatin	Tablets	10, 20 mg
Antiplatelets			
	Aspirin	Tablets/ Capsules	75, 150 mg
	Clopidogrel	Tablets/ Capsules	75 mg
Antianginal medicine			
	Isosorbide mono nitrate	Tablets	20 mg
	Isosorbide dinitrate	Injections	10 mg
	Glyceryl Trinitrate	Tablets	300 Micro G
Anticoagulants			
	Heparin	Injection	5000 iu/ ml
	Enoxaparin	Injection	40 mg/ .4 ml
	Warfarin	Tablets/ Capsules	1, 5 mg
Thrombolytics			
	Alteplase	Injections	20, 50 mg vials
	Tenecteplase	Injections	40 mg vials

Number	Name of the medicine	Preparations	Strength of Tablet/ Vial
Antiepileptics			
	Oxcarbazepine	Tablets	300 mg
	Sodium valproate	Tablets	200, 300 mg
	Levetiracetam	Tablets	500, 750 mg
	Clonazepam	Tablets	0.5, 2 mg
	Lamotrigine	Tablets	50, 100 mg
	Clobazam	Tablets	10 mg
	Topiramate	Tablets	25, 50, 100 mg
	Pregabalin	Tablets & Capsules	50, 75 mg
	Phenytoin Sodium	Injection	100 mg/ 2 ml
	IV Levetiracetam	Injection	500 mg/ 5 ml
Medicine for neuropathic pain			
	Amitriptyline	Tablets	25 mg
	Gabapentin	Tablets	100, 300 mg
Anxiolytics			
	Diazepam	Tablets	5 mg
	Diazepam	Injection	5 mg/ ml
	Midazolam	Injection	5mg/ ml, 50mg/ 10 ml
Drugs for Parkinson's			
	Benzhexol	Tablets	2 mg
	Levodopa + Carbidopa	Tablets	250/25, 100/25
	Ropinirole	Tablets	0.5
Choline esterase inhibitors			
	Donepezil	Tablets	5 mg
Anti spastic medicine			
	Baclofen	Tablets	10 mg
	Botulinum toxin type A	Injections	100 units/ vial
Antipsychotic medicine			
	Risperidone	Tablets/ Capsules	1, 2 mg
	Haloperidol	Tablets/ Capsules	1.5 mg
	Quetiapine	Tablets/ Capsules	25, 50 mg

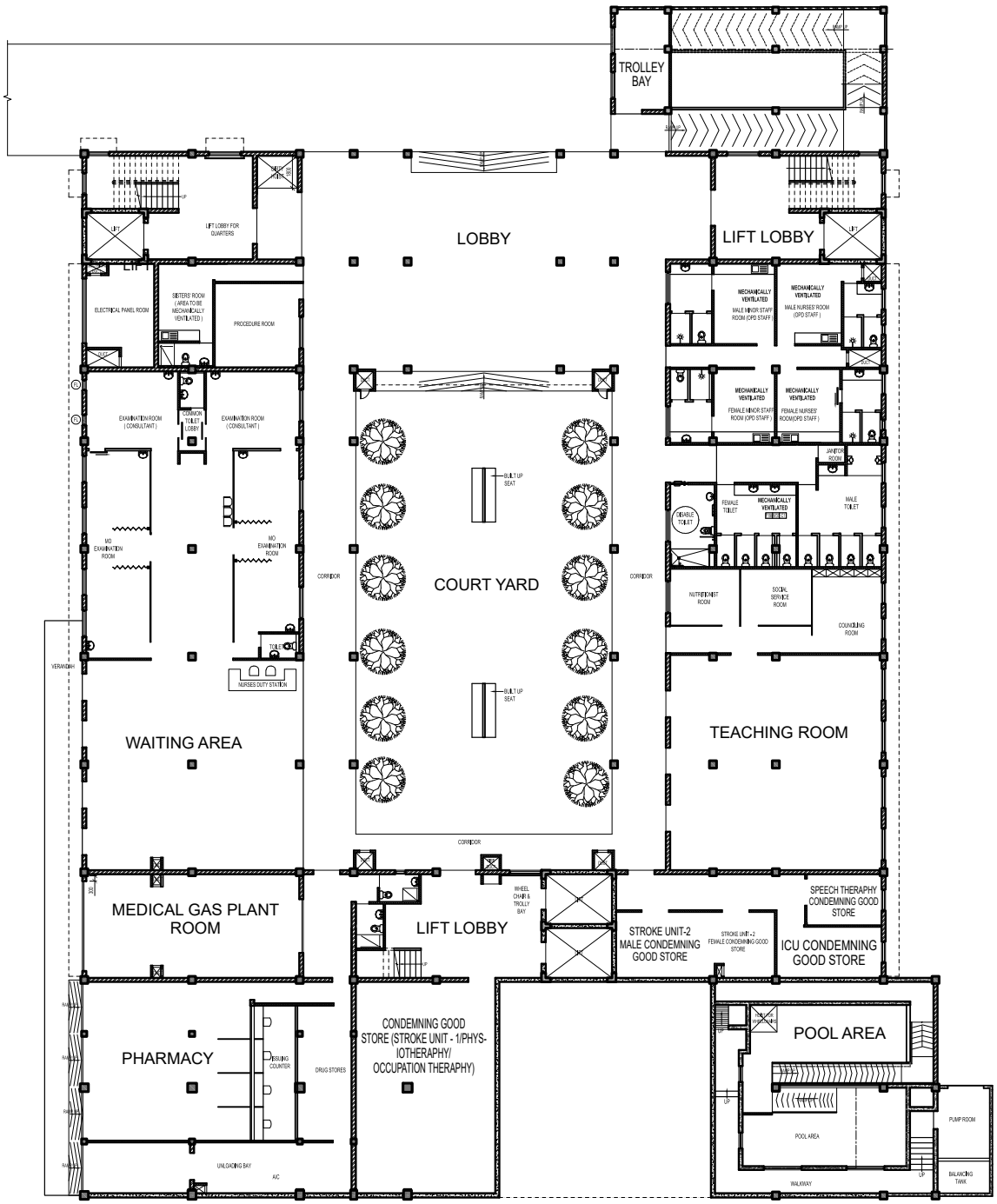
Number	Name of the medicine	Preparations	Strength of Tablet/ Vial
Antidepressants			
	Fluoxetine	Tablets	20 mg
	Venlafaxine	Tablets/ Capsules	37.5, 75 mg
	Citalopram	Tablets	20 mg
Antidiuretics			
	Frusemide	Tablets	40 mg
	Hydro chlorothiazides	Tablets	25, 50 mg
	Spironolactone	Tablets	25 mg
Antiemetics			
	Metoclopramide	Tablets	10 mg
	Ondansetron	Tablets	4 mg
	Ondansetron	Injections	4 mg/ 2 ml
Steroids			
	Prednisolone	Tablets/ Capsules	5 mg
	Dexamethasone	Tablets/ Capsules	0.5 mg
	Hydrocortisone	Injections	100 mg/ vial
Analgesics			
	Paracetamol	Tablets	500 mg
	Tramadol	Tablets	50 mg
	Morphine	Injection	10 mg/ 10 ml
	Pethidine	Injection	50 mg/ 1 ml
Anti-inflammatory medicine			
	Diclofenac sodium	Tablets	50 mg
	Ibuprofen	Tablets	200 mg
	Mefenamic acid	Tablets	500 mg
Antibiotics			
	Ampicillin	Capsules	250 mg
	Co- amoxiclav	Capsules	500/ 125 mg
	Erythromycin	Tablets	250mg
	Cephalexin	Tablets	250 mg
	Oral Penicillin	Tablets	250 mg
	Metronidazole	Tablets	200, 400 mg
	Metronidazole	Injection	500 mg in 100 ml

Number	Name of the medicine	Preparations	Strength of Tablet/ Vial
	Ampicillin	Injection	250, 500 mg vial
	Co-amoxiclav	Injection	500/ 100 mg vial
	Cefuroxime	Injection	750 mg vial
	Cefotaxime	Injection	500, 1000 mg vial
	Ceftriaxone	Injection	1000 mg vials
	Cefoperazone- Sulbactam	Injection	1000 mg
	Meropenem	injection	1000 mg
Haemodynamic medicine			
	Dopamine Hudrochloride	Infusion	250, 500, 1000 ml bottles with 800, 400 and 200 mcg/ml
1.	Dobutamine	Infusion	250 mg in 50 ml
	Nitroprusside	Infusion	25 mg/ ml
	Adrenaline 1: 1000	Injection	1 mg/ 1 ml
	Vasopressin	Injection	20 units/ ml or 200 units/ 10 ml vials
	Nimodipine	Capsules	30 mg
Other preparations			
	Ca gluconate	Injection	1000 mg/ 10 ml vial
	Sodium Bicarbonate	Injection	Na 50 mEq & HCO_3 50mEq in 50 ml vials
	$MgSo_4$	Injection	50% (5 grams/ 10 ml)
	Mannitol	Infusion	20%
	Dextran 40	Injection	With 500 ml 0.9% Sodium Cloride
	Normal saline	Infusion	500 ml 0.9% solution
	Hartman's solution	Infusion	1000 ml

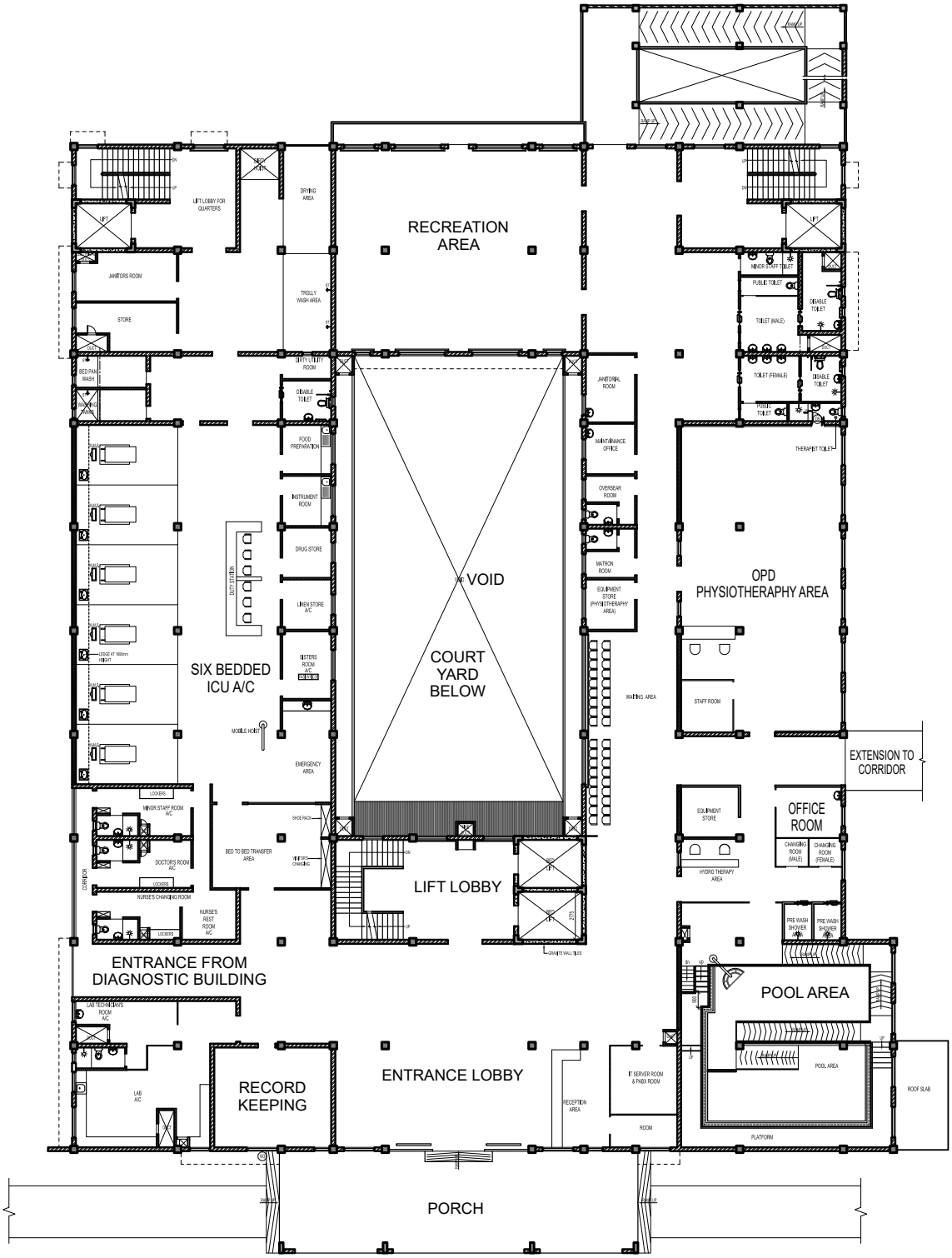
Number	Name of the medicine	Preparations	Strength of Tablet/ Vial
Respiratory medicine			
	Salbutamol	Nebuliser solution	2.5 mg/ 2.5 ml Nebuliser solution
	Ipravent	Nebuliser solution	15 ml vials
	Pulmicort	Nebuliser solution	0.5 mg/ 2 ml
	Theophyline	Tablets	150, 300 mg
Urological medicine			
	Oxybutynin	Tablets/ Capsules	2.5, 5 mg
	Tolterodine Tartrate	Tablets/ Capsules	2 mg
For hiccups			
	Chlorpromazine	Tablets/ Capsules	25, 50 mg
Vitamins			
	Thiamine	Tablets/ Capsules	10, 100 mg
	Thiamine	injection	50 mg/ml, 100 mg/ ml
	Methyl cobalamin		1500 mg
	Folic acid	Tablets	5 mg
Alcohol withdrawal			
	Chlordizepoxide	Tablets/ capsules	5, 10 mg
For SAH			
	Nimodipine	Tablets/ Capsules	30 mg
Antispastic			
	Baclofen	Tablets/ Capsules	10 mg

Annexure 8

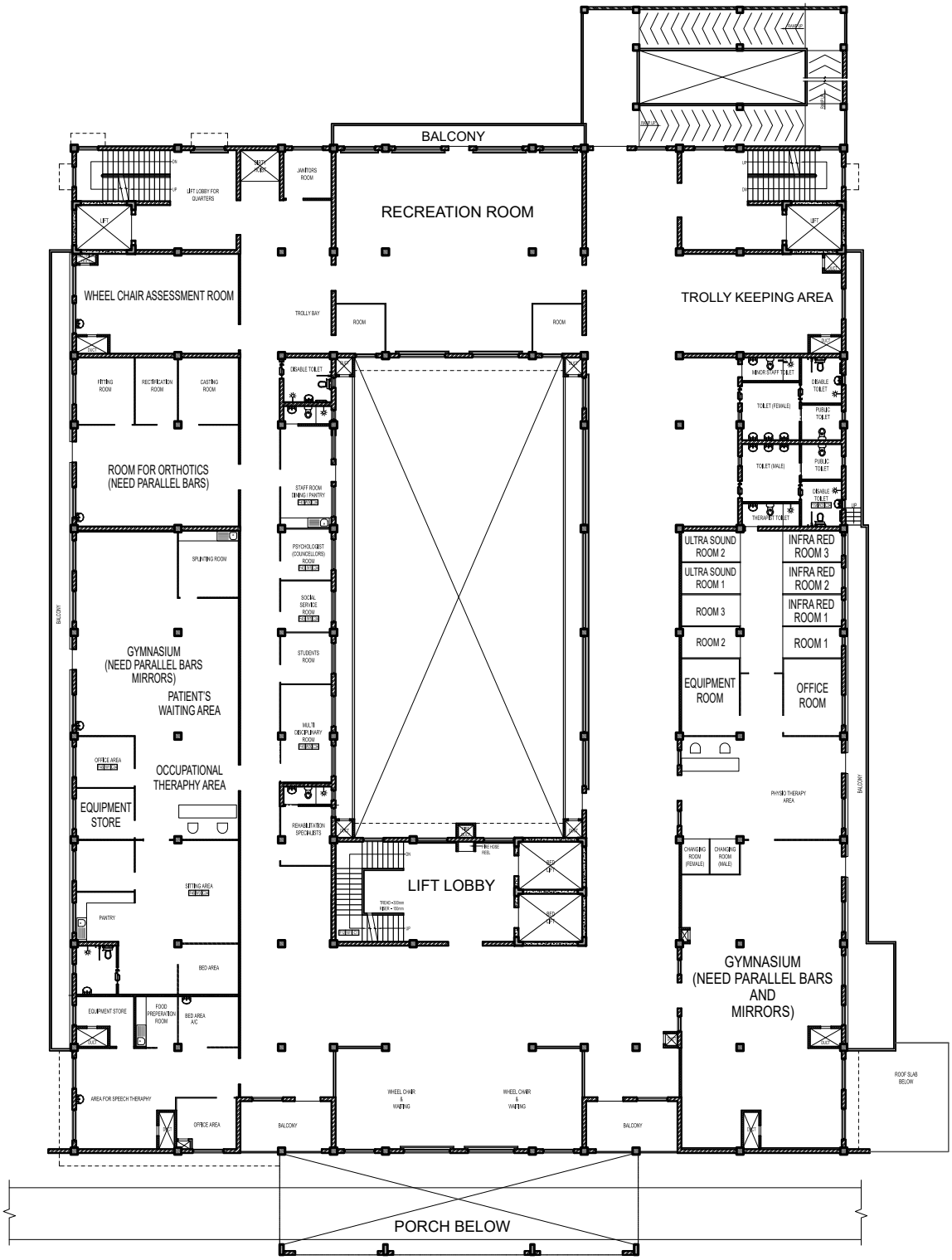
BUILDING PLAN FOR NATIONAL STROKE CENTRE MULLERIYAWA



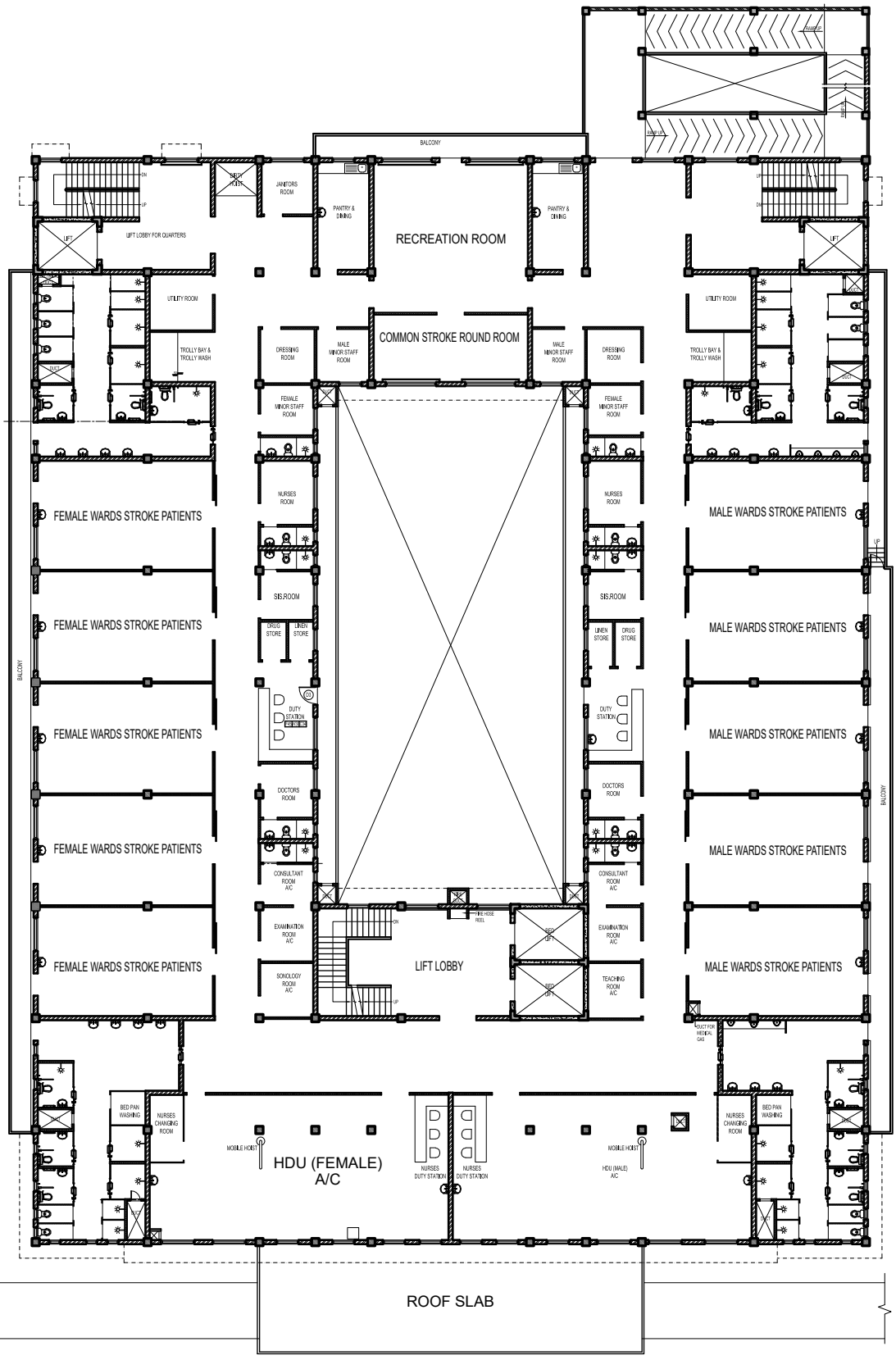
BASEMENT FLOOR PLAN



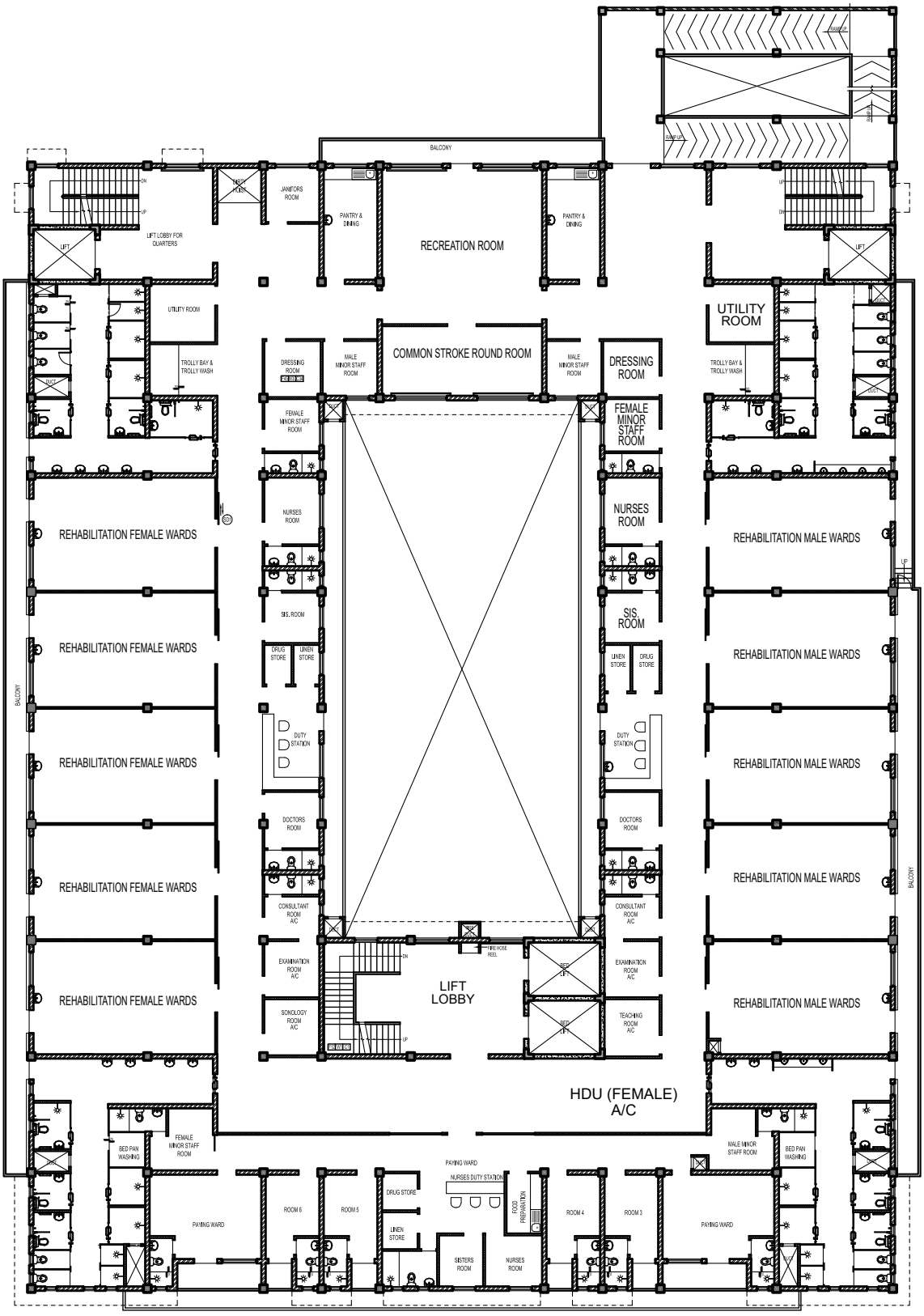
GROUND FLOOR PLAN



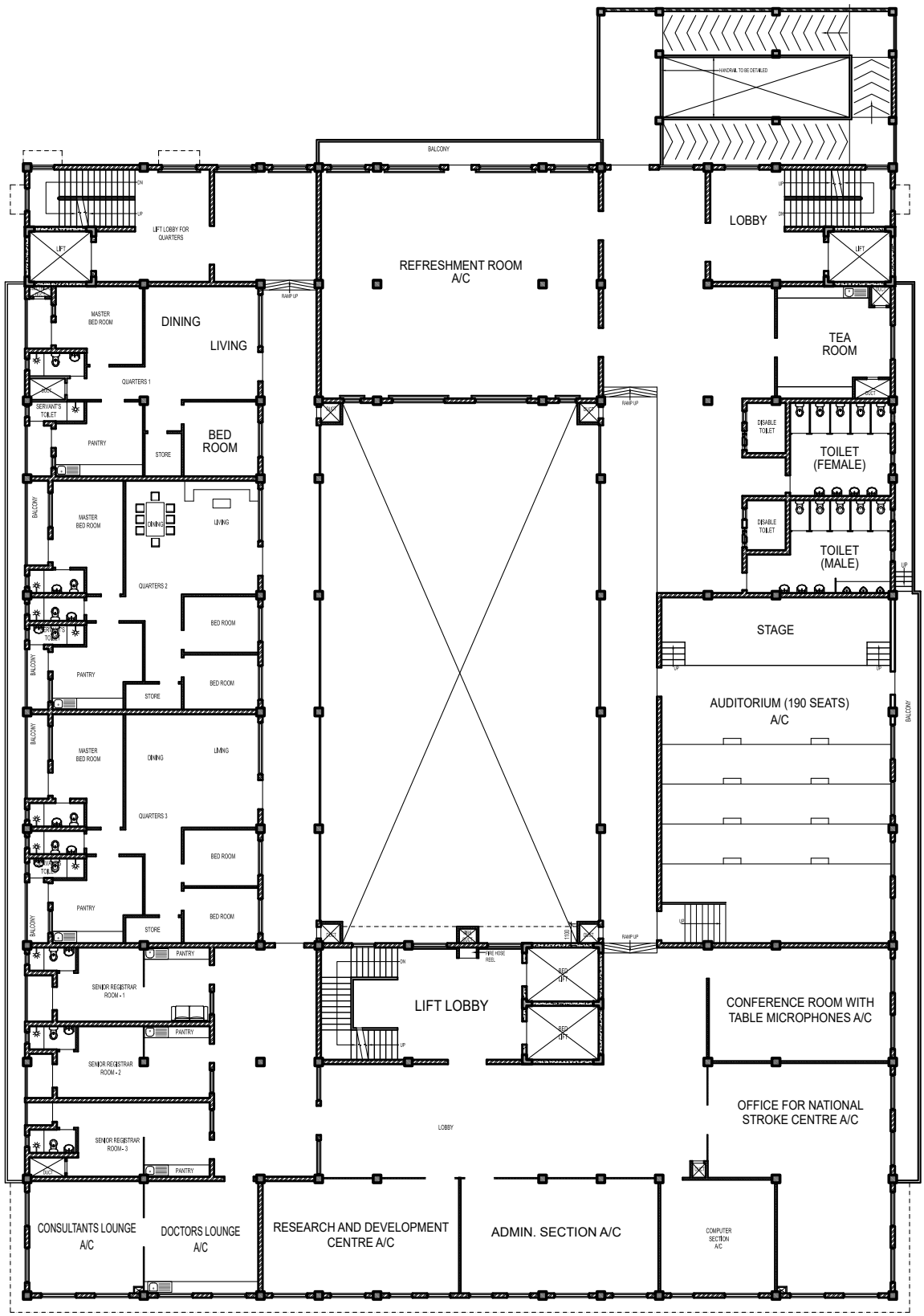
FIRST FLOOR PLAN



SECOND FLOOR PLAN



THIRD FLOOR PLAN



FOURTH FLOOR PLAN

Annexure 9

MEDICAL EQUIPMENT FOR NATIONAL CENTRE MULLERIYAWA

Equipment for ground floor

	Floor/ level	Unit/ Sec-tion	Equipment name	Quantity	Description
	Ground floor	Six bedded ICU			
			ICU ventilator	08	Portable
			7 Channel Multi-Monitor	10	
			Pulse oxy-meter	04	MRI compatible
			Defibrillator with pacing	02	
			Portable ultrasound scanner	01	
			Portable echo cardiogram	01	
			Syringe pumps	30	
			Infusion pumps	05	
			Adjustable ICU beds	07	
			Adjustable patient trolleys with side railing	02	
			Patient warmer	02	
			Blood and fluid warmer	01	
			Suction apparatus- double jar	02	
			Mobile ventilator	02	MRI compatible
			Patient scoops radiolucent	02	
			Doppler hand held	01	
			Oxygen regulator	12	
			C PAP machine	02	
			Aneroid BP apparatus	04	
20.			Nebulizer machine	03	
21			Transport type multi monitor-5 channel	02	All transport
22.			ECG machine	01	

	Floor/ level	Unit/ Section	Equipment name	Quantity	Description
23		**Emergency area adjacent to ICU**	Automated external defibrillator	01	
24		**Laboratory for ICU**	5 part hematology analyzer	01	
25			Serum electrolyte analyzer	01	
26			Coulometer	01	
27			Microscope	01	
	Second floor	Male ward – stroke patients			
1			Patient beds- adjustable	50	Automatic beds
2			3 channel multi-monitor	10	For a ward
3			Suction apparatus double jar	04	
4			Pulse oxymeter	10	
5			Nebulizer machine	05	
6			Aneroid BP apparatus	10	
7			Defibrillator	2	
8			Adjustable patient trolleys	4	Specification will be provided
9			Syringe pumps	10	
	Second floor	**Female ward -stroke patients**			
1.			Patient beds- adjustable	50	Automatic beds
2.			3 channel multi monitor	05	
3.			Suction apparatus double jar	04	
4.			Pulse oximeter	04	
5.			Nebulizer machine	05	Specification will be provided

	Floor/ level	Unit/ Section	Equipment name	Quantity	Description
			Aneroid BP apparatus	05	
			Defibrillator	01	
			Adjustable patient trolleys	02	
			Syringe pumps	10	
	Floor/ level	**Unit/ Section**	**Equipment name**	**Quantity**	**Description**
		HDU-Male 10 Beds			
1			5 channel multipara monitor	12	
2			Defibrillator	02	
3			C pap Machine	04	
4			Mobile ventilator	01	
5			HDU beds ICU	10	
6			Patient warmer	01	
7			Pulse oximeter	03	2 MRI compatible
8			Syringe pumps	20	
9			Nebulizers	02	
10			Suction apparatus	02	
11			Infusion pumps	04	
12			Spot lamps	02	
13			Aneroid type BP apparatus	04	
14			Spinal board	02	
15			Adjustable patient trolley	02	
		HDU – Female 10 Beds			
1			5 channel multipara monitor	10	
2			Defibrillator	02	
3			C pap Machine	02	
4			Mobile ventilator	01	
5			HDU beds	10	

	Floor/ level	Unit/ Section	Equipment name	Quantity	Description
6			Patient warmer	01	2 MRI compatible
7			Pulse oximeter	03	
8			Syringe pumps	10	
9			Nebulizers	02	
10			Suction apparatus	02	
11			Infusion pumps	04	
12			Spot lamps	02	
13			Aneroid type BP apparatus	04	
14			Spinal board	01	
15			Adjustable patient trolley	01	
		Examination room male side	BP apparatus- aneroid	02	
		Examination room female side	BP apparatus- aneroid	02	
		Dressing room –male side	Mini autoclave machine	02	
		Dressing room female side	Mini autoclave machine	02	
		Rehabilitation wards--Male			
1.			Patient beds- adjustable	50	
2			3 channel multi monitor	10	Wall first cubicle
3			Suction apparatus double jar	02	All wards same spec
4			Pulse oximeter	02	
5			Nebulizer machine	02	

	Floor/ level	Unit/ Section	Equipment name	Quantity	Description
6			Aneroid BP apparatus	04	
7			Defibrillator	01	
8			Adjustable patient trolleys	02	
9			Syringe pumps	04	
		Rehabilitation wards--female			
1			Patient beds- adjustable	50	
2			3 channel multimonitor	02	
3			Suction apparatus double jar	02	
4			Pulse oximeter	02	
5			Nebulizer machine	02	
6			Aneroid BP apparatus	04	
7			Defibrillator	01	
8			Adjustable patient trolleys	02	
9			Syringe pumps	04	

Lab equipment for the diagnostic unit ground and first floor(submitted)

	Unit	Equipment	Quantity	Description
	Diagnostic Unit-Radiology section			
		MRI scanner	1,5 t	
1		CT scanner	128 side	
2		Ultrasound scanner	high end with Doppler	
3		Angiography section		
	Microbiology unit			

	Unit	Equipment	Quantity	Description
1		Hot air oven	1	
2		Binocular microscope-	1	
3		Bio safety cabinet	1	
4		Blood culture system preparation	1	
5		Microscopes- binocular	1	
	Histopathology			
1		Fully automated slide stain machine	1	
2		Tissue processor machine	1	
3		Tissue embedding system	1	
4		Rotatory microtome	1	
5		Slide cabinet	1	
6		Binocular microscope-	2	
		Grossing station	1	
	Hematology section			
1		Five part analyzer	1	
2		Coagulometer	1	
3		Cardiac enzyme analyzer	1	
4		Microscope- binocular	2	
	Biochemistry section			
		Fully automated biochemistry analyzer-	1	
1		Electrolyte analyzer-	1	
2		Biochemistry analyzer-	1	
	Clinical chemistry			

	Unit	Equipment	Quantity	Description
		Binocular microscope-	1	
	Physiotherapy equipment			
1	**Rehabilitation**	MOTOMED-upper/lower limbs	3	
2		STANDING LIFTER-Sara steady	3	
3		Height adjustable parallel bars	3	
4		Ceiling suspension/Gantry machine	3	
5		Height adjustable wide plinth	5	
6		Weights for Physiotherapy	4 sets	
7		Treadmill	3	
1	**ROBOTICS – Lower Limb**	Lokomat – weight assisted robotic machine for gait training	2	
1	**ROBOTICS-Upper limb**	Armeo power	2	
2	**Transferring**	Rota standing patient turner	2	
3		Return 7500 transfer system	2	Length 150cm -155 cm
4	**Standing**	Journey stand aid	4	
	Walking			
1		Height adjustable adult parallel walking bars	3	
2		Moving walking walking aids for patients with Hemiplegia /joint pain/inconvenience in mobility /exercise trauma	3	
3		Forearm walking frame with castors	3	
4		Cooper walking frame Short	4	
5		Cooper walking frame tall	3	
6		MT -200 Rehabilitation treadmill for gym	3	

	Unit	Equipment	Quantity	Description
7		Oxford advance electric Mobile hoist	2	
8		Oxford advance electric Mobile hoist	2	
	Positioning			
1		Harley positioning Aid Small roll	5	
2		T roll positioning aid	5	
3		E roll large	5	
4		Adjustable rehabilitation steps	3	
5		Deluxe therapy tilt table model ST7647 electric –height and tilt	2	
6		Mobi 540	3	
7		Gym ball	5	
8		WIIFII board	3	
	Equipment for hydrotherapy unit			
	Pool Assistance area			
	Aquatic Exercise		4	
1		Aquatic exercise bike	2	
2		Pool lifts	4	
3		Pool access chairs	5	
4		Swim pull buoy (red)	5	Adult
5		Swim pull buoy (Blue)	5	Junior
6		Swim belt (Blue)	5	size 14
7		Swim belt (red)	5	size 19
8		Swim belt (Blue)	5	size 19
9		Swim belt (red)	5	one size 10
10		Swim belt (red)	5	One size 14

	Unit	Equipment	Quantity	Description
11		Standard aquatic exercise kit (blue)	5	Large 16
12		Standard aquatic exercise kit (red)	5	Small 16
13		Standard aquatic exercise kit (red)	5	Large 16
14		Standard aquatic exercise kit (blue)	5	Small 16
15		Standard aquatic exercise kit (red)	5	Medium 16
16		Standard aquatic exercise kit (red)	5	Medium 16
17		Pool noodle (colors vary) (Blue)	10	One size
18		Deluxe Kickboard (Red)	10	One size
19		Deluxe Kickboard (blue)	10	One size
20		Deluxe aquatic exercise kit (blue)	5	Large
21		Deluxe aquatic exercise kit (blue)	5	Medium
22		Deluxe aquatic exercise kit (Red)	5	Medium
23		Deluxe aquatic exercise kit (Red)	5	Large
24		Classic kick board (blue)	5	On size
25		Classic kick board (Red)	5	On size
26		Aquatic Jogger Belt (red)	5	Medium
27		Aquatic Jogger Belt (red)	5	Small
28		Aquatic Jogger Belt (red)	5	Large
29		Aquatic ankle cuffs (red)	10	One size

	Unit	Equipment	Quantity	Description
	Machinery and equipment for prosthetic and orthotic unit			
	Casting Room			
		Casting chair	2	
1		Assessment table	1	
2		Swivel chair	2	
3		Cart for plaster bandage	1	
4		Laser liner-	1	
5		M-L body caliper-	2	
6		Measuring tape	2	
7		Plaster Caster scissor-	2	
8		Scissor-	2	
9		Adjustable Knife	2	
10		Goniometer-	2	
11		Stainless steel basin	2	
12		Hip leveling guide	1	
13		Compensation board set	1	
14		Level	1	
15		Hip compass	1	
16		Indelible pencil (consumable items)	10	
17		Ceramic water basin	2	
18		Plaster separation sink	2	
19		Upright cabinet	1	
20		Trash container	2	
	Rectification Room			
1		cast holders	2	
2		stainless steel casting table	1	
3		angled frames with grates	2	

	Unit	Equipment	Quantity	Description
4		bench vise with swivel mount	4	
5		trash container (consider trash separation)	02	
6		sand box	01	
7		M-L caliper	01	
8		Ceramic water basin	02	
9		Plaster separation sink	02	
10		Surform round, flat, half round (consumable items)	02	
11		Electric cast cutter	01	
12		Hammer	01	
13		Wire brush	02	
14		Plaster mixing bawl	02	
15		Plaster spatula	02	
16		Plaster scoop	01	
17		Plaster stirrer	01	
18		Plaster powder container	01	
19		Plaster mixing bucket	02	
20		Plaster room shelving unit	01	
21		Adjustable knife	02	
22		Measuring tape	02	
23		Spatula	02	
24		Goniometer	02	
25		Indelible pencil (consumable items)		
26		Swivel chair	02	
27		Stapler gun	05	
	Machine Room			
1		Oven for large thermoplastic sheets	01	

	Unit	Equipment	Quantity	Description
2		Oven with windows	01	
3		Vacuum pump machine	01	
4		Air Compressor with gun	1	
5		Socket Router for connection to central dust collection system	1	
6		belt sander	1	
7		Bench grinder	1	
8		Exhaust system	1	
9		Air compressor	1	
10		Standing Press drill machine	1	
11		Tool cabinet	1	
12		Dust collector system	1	
13		Bench grinder	1	
14		Anvil	1	
15		Shelving for sheet material storage	1	
16		Trash container (consider trash separation)	2	
	Workstation			
1		Workbench	2	
2		Bench vice with vise lift assist with floor stand	2	
3		Swivel chair	4	
4		Storage cabinet	2	
5		Tool cabinet	1	
6		Air gun	1	
7		Heat gun	2	
8		Hand drill machine	2	
9		Cast cutter	2	

	Unit	Equipment	Quantity	Description
10		Reverting bar	1	
11		Bending iron set	2	
12		Glue container	2	
13		A-P benders pair	1	
14		Deburring knife	2	
15		Pipe cutter	1	
16		Number stamp set	1	
17		Letter stamp set	1	
18		Twist drill set	1	
	Tool box with tools		4	
1		Measuring tape	1	
2		Right angle ruler 90 degree	1	
3		Scriber	1	
4		Screw driver (Phillip and flat)	1	
5		Allen wrench set	1	
6		Hammer (locksmith's hammer and ball peen)	1	
7		Chisel set	1	
8		Revert header	1	
9		Revert set	1	
10		Wire brush	1	
11		Pliers	1	
12		Eye protector	1	
13		Measuring tape	1	
14		Right angle ruler 90 degree	1	
15		Scriber	1	
16		Screw driver (Phillip and flat)	1	
17		Allen wrench set	1	

	Unit	Equipment	Quantity	Description
18		Hammer (locksmith's hammer and ball peen)	1	
19		Chisel set	1	
20		Ear protector	1	
21		Vise grip pliers	1	
22		Tailor's scissor	1	
23		Hacksaw	1	
24		File (flat, half round, round, square)	1	
25		Side cutting pliers	1	
5		Plumb line	1	
6		Center puncher	1	
7		12' ruler	1	
8		Pair of thermal resistance gloves	1	
9		Respirator / mask	1	
10		Ear protector	1	
11		Exhaust system for glue station	1	
12		Sewing machine (heavy duty)	1	
13		Soldering iron	1	
14		Welding gun	1	
15		Revolving Hole punch	1	
16		Sharpening stone	1	
17		Jig saw	1	
18		Plastic Trim line cutter	1	
19		1m meter ruler	1	
20		Water level	1	
21		Parallel scriber	1	

	Unit	Equipment	Quantity	Description
	Patient filtering room			
1		Movable mirror	2	
2		Parallel bar long and height adjustable	2	
3		Swivel chair	2	
4		Chair for patient	10	
5		Elbow crutches pairs	4	
6		Walking Frame	4	
7		Walking stick	4	
8		Foot pressure mapping scanner	1	
9		Wheel chair	1	
	Patient filtering room			
1		Portable screen	2	
2		Compensation board set	1	
3		Laser liner	1	
	Store room orthotics and prosthetics			
1		Storage cabinet	2	
2		Shelf system	1	
3		Shelving for sheet material storage	2	
4		Shelving for bar stocks storage	1	
5		Material transfer trolley	1	
	Patient screening area			
1		Examination bed	1	
2		Table	1	

	Unit	Equipment	Quantity	Description
3		Chair	1	
4		Storage cabinet	2	

	Equipment	product	Quantity	Description
	Occupational Therapy Equipment			
	Assessment			
1		Strength		
2		Baseline 7-piece evaluation kit	1	
3		Baseline push pull dynamometer (115Kg, 250 lb)	1	
4		Optional accessories handles	1	
5		Functional lift base	1	
6		Baseline hydralic wrist forearm	1	
7		JAMAR smedley hand dynamometer	1	
8		JAMAR Hydraulic pinch gauge	1	
	Measurement			
1		Scoliometer	1	
	Anthropometry			
1		Large	1	
2		Small	1	
3		CROM (cervical range of motion instrument)	1	
4		Wrist inclinometer	1	
5		Baseline circumference tape	1	
6		Foot volumeter set	1	
7		Hand volumeter set	1	
	Sensation			
1		Queens perrcussor	1	

	Equipment	product	Quantity	Description
2		Wartenburg stainless steel pinwheel	1	
3		JAMAR Monofilaments		
4		Complete hand monofilament kit	1	
5		Complete foot monofilament kit	1	
6		Pad of 100 hand documentation forms	1	
7		Neuro thesiometer	1	
8		Battery charger	1	
9		Multi-Task Dressing Vest - Largre Adult Vest	2	
10		Dressing Cube	1	
11		Geo-Lastic Art	1	
12		Sensory Testing Shield	1	
13		Cognitoys Set	1	
14		Mega 4 in a Line	1	
15		Shape Dominoes	1	
	Range of motion			
1		Baseline 180-digit goniometer – steel	3	
2		Baseline posture evaluator	1	
3		Adjustable wall goniometer	1	
4		Six piece goniometer	1	
5		17cm Goniometer	1	
6		20 cm Goniometer	1	
7		15cm Goniometer	1	

	Equipment	product	Quantity	Description
	Function Perceptual and cognitive assessments			
1		Complex form board	1	
2		Steriognosis kit	1	
3		Easy grip pegs	1	
4		25 hole pegboard with coloured pegs	1	
5		Rivermead perceptual assessment battery	1	
6		Sensory stimulation activities kit	1	
7		LOTCA-II Battery	1	
8		LOTCA-G Battery	1	
9		Purdue peg board test Kit	1	
10		Replacement pack	1	
11		Roeder manipulative apptitude test Kit	1	
12		Replacement pack	1	
13		Jebsen-Taylor Hand Function Test	1	
14		Box and Block test	1	
15		Minnesota Manual Dexterrity Test	1	
16		replacement cylinders	1	
17		Grooved pegboard	1	
18		replacement pegs	1	
19		Multi-phase desenstization kit	1	
20		individual top covers	1	
21		Nine-hole peg test	1	

	Equipment	product	Quantity	Description
22		Hot and cold discrimination kit	1	
23		Wooden 9 hole peg test	1	
24		Depth persception peg board set	1	
25		O' conner finger dexterity test	1	
26		O'conner tweezers dextrerity test	1	
27		Adult Feeding Evaluation Kit	1	
	Therapy equipment			
1		Compress Clini Press unit	1	
2		Arm garment – Blue	2	
3		Large Leg Garment – Blue	2	
4		Kinetec ™ Centura 5™ - Shoulder CPM Machine	1	
5		Kinetic ™ Maestra Hand and wrist CPM Mechine	1	
6		OxyCycle Powered Pedal Excersiser	1	
7		Rolyan Stacking Cone Patteren Board	1	
8		Rolyan Stacking Cones	1	
9		Rolyan semi-circular Peg Board	1	
10		Incline Board	1	
11		Shoulder Excersise Ladder	1	
12		Rolyan Climbing Board and Bar	1	
13		Rolyan Climbing Board Accessory kit	1	
14		E-Z Exer board	1	
15		Rolyan Horizontal Ring Tree	1	
16		Rolyan vertical ring tree	1	

	Equipment	product	Quantity	Description
17		Jux-A-Cisor Arm Exersiser	1	
		Rolyan Pipe Tree	1	
		Rolyan Pronation/supination wheel	1	
		Rolyan Single Curved Shoulder Arc	1	
	Shoulder rotation exerciser			
1		Saeboglide ™	1	
2		Upper eEtremity Workstations	1	
3		Rolyan Multi-functional Work station	1	
4		Rolyan Work Bench	1	
5		Rolyan Forearm- Based Skateboard	1	
6		Figure-8 Board System	1	
7		Grahamizer 1 Multi-use Excerciser	1	
	Clinic furniture			
1		Bariatric Platform - Dark Blue	1	
2		Low Wide Excersie Table	2	
3		Electric Adult Tilt Table - Dark Blue	1	
4		Gas-Lift Stools	5	
5		Gas-Lift Chair Without Arm	4	
6		Gas-Lift Chair With Arm	4	
7		Therapy Benches L	2	
8		Therapy Benches M	2	
9		Therapy Benches S	2	
10		Doherty Panel Screen System - Polyester Screen Blue	2	

	Equipment	product	Quantity	Description
11		Posure Mirrors Mobile	2	
12		Economy Multi-Purpose Trolley	2	
13		Orion Unit	2	
14		Adjustable Arm Table	2	
15		Universal OT Table	1	
16		Treatment Table	2	
17		Midland™ Laminate Top Adjustable Work Table - Large	3	
18		Economy Group Therapy Table – Round	2	
19		Grahamizer 1 Multi-Used Exreciser	2	
20		Width and Height Adjustabe Parralal Bars	1	
21		Whiteboard	1	
	Splinting and accessories			
1		Heat Pan Cart	1	
2		Deep 56L Heat pan UK plug	1	
3		Nylon Spatula	1	
4		Steinel ™ Air Gun With LCD Display HG2310LCD	1	
5		Air Gun Nozzles (different sizes)	1	
6		Neoprene Sealing Iron	1	
7		Splinting Kit	1	
8		Cutting Mat	1	
9		Softtouch ™ Rotary Cutter	1	
10		Fiskars ™ Non-stick Scissors	1	
11		Super Shears	1	
12		Curved Scissors	1	

	Equipment	product	Quantity	Description
13		Unlimited scissors	1	
14		Strapping Carousel	1	
15		Wall Bracket	1	
16		Velcro ® Brand Self Adehesive Hook (Reel)	25	
17		Velcro ® Brand Sew-On Loop (Reel)	50	
18		Extra Soft Splint Padding (Sheets)	50	
19		Hapla ™ Fleecy Foam (Sheet)	50	
20	**Tailor Splint ™**			
		3.2 mm - 1% perforated Beige 46X61 CM	10	
		2.4 mm - 1% perforated Beige 46X61 CM	20	
21	**Aquaplast - T ™**			
1		4.8 mm - Solid (4 packs)	25	
2		Contoured Arm Support	2	
3		Urias ™ Pressure Splints (long arm)	4	
4		Urias ™ Pressure Splints (Full foot and leg W/Sole, open toe)	2	
5		Hand pump	2	
6		Aids for Daily Living	2	
7		Savanah ™ Wall Mounted Showr Seats (backrest and arms)	2	
9		Long handled Toe Washer	1	
10		Foot Brush and Sponge	1	
11		Bendable Long Handle Sponges	1	
12		Flannel Strap and Wash Mit	1	
13		Etac Socky Long Stocking Aid	1	

	Equipment	product	Quantity	Description
14		Dressing stick	1	
15		Buckingham Bra-Angel	1	
16		SlipLift Pants Aid	1	
17		Button Hook and Zip Puller	1	
18		Long Handled Combs and Brushes	1	
19		Nail Care Combination Set	1	
20		Reacherr Shoehorn	1	
21		Kings Assessment Kit 33 pieces	1	
22		Kitchen Work Station	1	
23		Multi-Holder	1	
24		The Functional Hand Splint	1	
25		Handi-Reacher ™	1	
26		Crystal Tap Turner	1	
		Readezy book stand	1	

	Unit	Equipment	Quantity	Description
	Speech Therapy Equipment			
	Sound/ Articulation measuring apparatus			
1		Electroglottograph (EGG) -	1	
2		Electropalatograph (EPG) –	1	
3		Laryngograph -	3	
4		Pocket Spirometer -	10	
5		Expiratory Muscle Strength Trainer EMST150™ -	5	
6		Diagnostic Stroboscopes -	1	
7		Augmentative Communication Devices -	10	

	Unit	Equipment	Quantity	Description
8		Therapeutic voice synthesizers-	1	
9		Pure tone audiometry –	1	
10		Laryngoscope -	5	
	Analytical software (Yo be used by 15 therapists)			
1		Language Analysis Software		
2		Signal Analysis Software		
3		Speech Analysis Software		
	Medical software (to be used by 15 therapists)			
1		Aphasia Treatment – Aphasia Tutor by Bungalow Software		
2		Multi-Speech – KayPENTAX		
3		Speech Training System – Video Voice		
4		Text to Speech – Universal Reader by Premiere Assistive Technology		
	Assessment tools (software) (To be used by 15 therapists)			
1		Articulation assessments tools		
2		Dysphagia assessment tools		
	Dysphagia management			
1		Fiber-optic endoscopic evaluation of swallowing test -	2	
2		Refrigerator	2	

	Unit	Equipment	Quantity	Description
3		Blender	5	
4		Hotplate /Microwave	2	
5		Stethoscopes	5	
6		Tongue depress	20	
7		Thickner foo	5 cans	
8		Electromyography	1	
	Language therapy			
1		Laptops	5	
2		Big tabs	10	
3		Photocopy machine	1	
4		Printers	1	
5		Laminating machines	2	
6		Head phones	10	
	Other stimulatory tools			
1		Adult board game	10	
2		Adult picture stimuli sets	10	
3		Adults language and articulation workbooks	20	
4		Adults therapy books	20	
	Furniture and other item			
1		Tables (small)	10	
2		Wall mirrors	2	
3		Small mirrors	10	
4		Chairs – 25 (10 revolving chairs and patient chairs)	15	
5		Folding Mat	5	

	Unit	Equipment	Quantity	Description
6		Cupboard	6	
	Disposable items (needs to be supply every month)			
1		Iced chips		
2		Cutlery		
3		Disposable tongue depressors		
4		Tooth brushes		
5		(Gloves, masks, cotton, gauze, hand sanitizer)		

Annexure 10

The BARTHEL INDEX

THE BARTHEL INDEX

Patient Name: _____

Rater Name: _____

Date: _____

Activity	Score
FEEDING 0 = unable 5 = needs help cutting, spreading butter, etc., or requires modified diet 10 = independent	_____
BATHING 0 = dependent 5 = independent (or in shower)	_____
GROOMING 0 = needs to help with personal care 5 = independent face/hair/teeth/shaving (implements provided)	_____
DRESSING 0 = dependent 5 = needs help but can do about half unaided 10 = independent (including buttons, zips, laces, etc.)	_____
BOWELS 0 = incontinent (or needs to be given enemas) 5 = occasional accident 10 = continent	_____
BLADDER 0 = incontinent, or catheterized and unable to manage alone 5 = occasional accident 10 = continent	_____
TOILET USE 0 = dependent 5 = needs some help, but can do something alone 10 = independent (on and off, dressing, wiping)	_____
TRANSFERS (BED TO CHAIR AND BACK) 0 = unable, no sitting balance 5 = major help (one or two people, physical), can sit 10 = minor help (verbal or physical) 15 = independent	_____
MOBILITY (ON LEVEL SURFACES) 0 = immobile or < 50 yards 5 = wheelchair independent, including corners, > 50 yards 10 = walks with help of one person (verbal or physical) > 50 yards 15 = independent (but may use any aid; for example, stick) > 50 yards	_____
STAIRS 0 = unable 5 = needs help (verbal, physical, carrying aid) 10 = independent	_____
TOTAL (0–100):	_____

Provided by the Internet Stroke Center — www.strokecenter.org

The Barthel ADL Index: Guidelines

1. The index should be used as a record of what a patient does, not as a record of what a patient could do.
2. The main aim is to establish degree of independence from any help, physical or verbal, however minor and for whatever reason.
3. The need for supervision renders the patient not independent.
4. A patient's performance should be established using the best available evidence. Asking the patient, friends/relatives and nurses are the usual sources, but direct observation and common sense are also important. However direct testing is not needed.
5. Usually the patient's performance over the preceding 24-48 hours is important, but occasionally longer periods will be relevant.
6. Middle categories imply that the patient supplies over 50 per cent of the effort.
7. Use of aids to be independent is allowed.

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Annexure 11

INSTRUMENTAL ACTIVITIES OF DAILY LIVING SCALE (IADL)

M.P. Lawton & E.M. Brody

A. Ability to use telephone

1. Operates telephone on own initiative; looks up and dials numbers, etc.	1
2. Dials a few well-known numbers	1
3. Answers telephone but does not dial	1
4. Does not use telephone at all.	0

B. Shopping

1. Takes care of all shopping needs independently	1
2. Shops independently for small purchases	0
3. Needs to be accompanied on any shopping trip.	0
4. Completely unable to shop.	0

C. Food Preparation

1. Plans, prepares and serves adequate meals independently	1
2. Prepares adequate meals if supplied with ingredients	0
3. Heats, serves and prepares meals or prepares meals but does not maintain adequate diet.	0
4. Needs to have meals prepared and served.	0

D. Housekeeping

1. Maintains house alone or with occasional assistance (e.g. "heavy work domestic help")	1
2. Performs light daily tasks such as dish-washing, bed making	1
3. Performs light daily tasks but cannot maintain acceptable level of cleanliness.	1
4. Needs help with all home maintenance tasks.	1
5. Does not participate in any housekeeping tasks.	0

E. Laundry

1. Does personal laundry completely	1
2. Launders small items; rinses stockings, etc.	1
3. All laundry must be done by others.	0

F. Mode of Transportation

1. Travels independently on public transportation or drives own car.	1
2. Arranges own travel via taxi, but does not otherwise use public transportation.	1
3. Travels on public transportation when accompanied by another.	1
4. Travel limited to taxi or automobile with assistance of another.	0
5. Does not travel at all.	0

G. Responsibility for own medications

1. Is responsible for taking medication in correct dosages at correct time.	1
2. Takes responsibility if medication is prepared in advance in separate dosage.	0
3. Is not capable of dispensing own medication.	0

H. Ability to Handle Finances

1. Manages financial matters independently (budgets, writes checks, pays rent, bills goes to bank), collects and keeps track of income.	1
2. Manages day-to-day purchases, but needs help with banking, major purchases, etc.	1
3. Incapable if handling money.	0

Source: Lawton, M.P., and Brody, E.M. "Assessment of older people: Self-maintaining and instrumental activities of daily living." Gerontologist 9:179-186, (1969).

Annexure 12

BRADEN SCALE

BRADEN SCALE - For predicting pressure score risk

SEVERE RISK: Total score ≤ 9 **HIGH RISK:** Total score 10 - 12 **MODERATE RISK:** Total score 13 - 14 **MILD RISK:** Total score 15 - 18				**DATE OF ASSESS** ♦			
RISK FACTOR	**SCORE/DESCRIPTION**				**1**	**2**	**3**	**4**
SENSORY PERCEPTION Ability to respond meaningfully to pressure-related discomfort	**1. COMPLETELY LIMITED** - Unresponsive (does not moan, flinch, or grasp) to painful stimuli, due to diminished level of consciousness or sedation. **OR** limited ability to feel pain over most of body surface.	**2. VERY LIMITED** - Responds only to painful stimuli. Connot communiate discomfort except by moaning or restlessness, **OR** has a sensory impairment which limits the ability to feel pain or discomfort over ½ of body.	**3. SLIGHTLY LIMITED**-Responds to verbal commands but cannot always communicate discomfort or need to be turned, **OR** has some sensory impairment which limits ability to feel pain or discomfort in 1 or 2 extremities.	**4. NO IMPAIRMENT**-Responds to verbal commands. Has no sensory deficit which would limit ability to feel or voice pain or discomfort.				
MOISTURE Degree to which skin is exposed to moisture	**1. CONSTANTY MOIST** - Skin is kept moist almost constantly by perspiration, urine, etc. Dampness is detected every time patient is moved or turned.	**2. OFTEN MOIST** - Skin is often but not always moist. Linen must be changed at least once a shift.	**3. OCCASIONALLY MOIST**-Skin is occasionally moist, requiring an extra linen change approximately once a day.	**4. RARELY MOIST**-Skin is usually dry; linen only requires changing at routine intervals.				
ACTIVITY Degree of physical activity	**1. BEDAST** - Confined to bed.	**2. CHAIRFAST**-Ability to walk severely limited or nonexistent. Cannot bear own weight and/or must be assisted into chair or wheelchair.	**3. WALKS OCCASIONALLY**-Walks occasionally during day, but for very short distances, with or without assistance. Spends majority of each shift in bed or chair.	**4. WALKS FREQUENTLY**-Walks outside the room at least twice a day and inside room at least once every 2 hours during waking hours.				
MOBILITY Ability to change and control body position	**1. COMPLETELY IMMOBILE** - Does not make even slight changes in body or extremity position without assistance.	**2. VERY LIMITED**- Makes occasional slight changes in body or extremity position but unable to make frequent or significant changes independently.	**3. SLIGHTLY LIMITED**-Makes frequent though slight changes in body or extremity position independently.	**4. NO LIMITATIONS**-Makes major and frequent changes in position without assistance.				
NUTRITION Usual food intake pattern [1]NPO: Nothing by mouth. [2]IV: Intravenously. [3]TPN:Total parenteral nutrition.	**1. VERY POOR** - Never eats a complete meal. Rarely eats more than 1/3 of any food offered. Eats 2 servings or less of proein (meat or dairy products) per day. Takes fluids poorly. Does not take a liquid dietary supplement, **OR** IS NPO[1] and/or maintained on clear liquids or IV[2] for more than 5 days.	**2. PROBABLY INADEQUATE**-Rarely eats a complete meal and generally eats only about ½ of any food offered. Protein intake includes only 3 servings of meat or dairy products per day. Occasionally will take a dietary supplement **OR** receives less than optimum amount of liquid diet or tube feeding.	**3. ADEQUATE**-Eats over half of most meals. Eats a total of 4 servings of protein (meat, dairy products) each day. Occasionally refuses a meal, but will usually take a supplement if offered, **OR** is on a tube feeding or TPN3 regimen, which probably meets most of nutritional needs.	**4. EXCELLENT**-Eats most of every meal. Never refuses a meal. Usually ats a total of 4 or more servings of meat and dairy products. Occasionally eats between meals. Does not require supplementation.				
FRICTION AND SHEAR	**1. PROBLEM**-Requires moderate to mazimum assistance in moving. Complete lifting without sliding against sheets is impossible. Frequently slides down in bed or chair, requiring frequent repositioning with mazimum assistance. Spasticity, contractures, or agitation leads to almost constant friction.	**2. POTENTIAL PROBLEM**-Moves feebly or requires minimum assistance. During a move, skin probably slides to some extent against sheets, chair, restraints, or other devices. Maintains relatively good position in chair or bed most of the time but occasionally slides down.	**3. NO APPARENT PROBLEM**-Moves in bed and in chair independently and has sufficient muscle strength to lift up completely during move. Maintains good position in bed or chair at all times.					
TOTAL SCORE	**Total score of 12 or less represents HIGH RISK**							

ASSESS	**DATE**	**EVALUATOR SIGNATURE/TITLE**	**ASSESS.**	**DATE**	**EVALUATOR SIGNATURE/TITLE**
1	/ /		3	/ /	
2	/ /		4	/ /	

NAME-Last	First	Middle	Attending Physician	Record No.	Room/Bed

Annexure 13

GLASGOW COMA SCALE AND PAEDIATRIC GLASGOW COMA SCALE

Sign	Glasgow coma scale	Paediatric Glasgow coma scale	Score
Eye opening	Spontaneous	Spontaneous	4
	To command	To sound	3
	To pain	To pain	2
	None	None	1
Verbal response	Oriented	Age-appropriate vocalization, smile, or orientation to sound; interacts (coos, babbles); follows objects	5
	Confused, disoriented	Cries, irritable	4
	Inappropriate words	Cries to pain	3
	Incomprehensible sounds	Moans to pain	2
	None	None	1
Motor response	Obeys commands	Spontaneous movements (obeys verbal commands)	6
	Localizes pain	Withdraws to touch (localizes pain)	5
	Withdraws	Withdraws pain	4
	Abnormal flexion to pain	Abnormal flexion to pain (decorticate posture)	3
	Abnormal extension to pain	Abnormal extension to pain (decerebrate posture)	2
	None	None	1
Best total score			15

Annexure 14

PAEDIATRIC NIH STROKE SCALE (PedNIHSS)

Date of Interview/Examination (MM/DD/YYYY): _____

1a. Level of Consciousness: The investigator must choose a response, even if a full evaluation is prevented by such obstacles as an endotracheal tube, language barrier, or tracheal trauma/bandages

Alert; keenly responsive.	**0**
Not alert, but arousable by minor stimulation to obey, answer, or respond.	+1
Not alert, requires repeated stimulation to attend, or is obtunded and requires strong or painful stimulation to make movements (not stereotyped).	+2
Responds only with reflex motor or autonomic effects or totally unresponsive, flaccid, areflexic.	+3

1b. LOC Questions:
Modified for children, age 2years and up. A familiar Family Member must be present for this item:

Ask the child "how old are you?" Or "How many years old are you?" for question number one. Give credit if the child states the correct age, or shows the correct number of fingers for his/her age.

For the second question, ask the child "where is XX?", XX referring to the name of the parent or other family member present.

Answers both questions correctly.	**0**
Answers one question correctly.	+1
Answers neither question correctly.	+2

1c. LOC Commands:

For children one may substitute the command to grip the hand with the command "show me your nose" or "touch your nose". Substitute another one step command if the hands cannot be used. Credit is given if an unequivocal attempt is made but not completed due to weakness. If the patient does not respond to command, the task should be demonstrated to them and score the result (i.e., follows none, one or two commands). Patients with trauma, amputation, or other physical impediments should be given suitable one-step commands. Only the first attempt is scored.

Performs both tasks correctly	**0**
Performs one task correctly	+1
Performs neither task correctly	+2

2. Best Gaze:

Only horizontal eye movements will be tested. Voluntary or reflexive (oculocephalic) eye movements will be scored but caloric testing is not done.

if the patient has a conjugate deviation of the eyes that can be overcome by voluntary or reflexive activity, the score will be 1. If a patient has an isolated peripheral nerve paresis (CN III, IV or VI) score a 1

Gaze is testable in all aphasic patients. Patients with ocular trauma, bandages, pre-existing blindness or other disorder of visual acuity or fields should be tested with reflexive movements and a choice made by the investigator. Establishing eye contact and then moving about the patient from side to side will occasionally clarify the presence of a partial gaze palsy.

Normal	0
Partial gaze palsy. This score is given when gaze is abnormal in one or both eyes, but where forced deviation or total gaze paresis are not present.	+1
Forced deviation, or total gaze paresis not overcome by the oculocephalic maneuver.	+2

3. Visual: Visual fields (upper and lower quadrants) are tested by confrontation, using finger counting ***(for children > 6 years)*** or visual threat ***(for children age 2 to 6 years)*** as appropriate. Patient must be encouraged, but if they look at the side of the moving fingers appropriately, this can be scored as normal.

If there is unilateral blindness or enucleation, visual fields in the remaining eye are scored. Score 1 only if a clear-cut asymmetry, including quadrantanopia is found. If patient is blind from any cause score 3. Double simultaneous stimulation is performed at this point. If there is extinction patient receives a 1 and the results are used to answer question 11.

No visual loss	0
Partial hemianopia	+1
Complete hemianopia	+2
Bilateral hemianopia (blind including cortical blindness)	+3

4. Facial Palsy: Ask, or use pantomime to encourage the patient to show teeth or raise eyebrows and close eyes. Score symmetry of grimace in response to noxious stimuli in the poorly responsive or non-comprehending patient. If facial trauma/bandages, orotracheal tube, tape or other physical barrier obscures the face, these should be removed to the extent possible.

Normal symmetrical movement	0
Minor paralysis (flattened nasolabial fold, asymmetry on smiling)	+1
Partial paralysis (total or near total paralysis of lower face)	+2
Complete paralysis of one or both sides (absence of facial movement in the upper and lower face)	+3

5 & 6. Motor Arm and Leg: The limb is placed in the appropriate position: extend the arms (palms down) 90 degrees (if sitting) or 45 degrees (if supine) and the leg 30 degrees (always tested supine). Drift is scored if the arm falls before 10 seconds or the leg before 5 seconds. ***For children too immature to follow precise directions or uncooperative for any reason, power in each limb should be graded by observation of spontaneous or elicited movement according to the same grading scheme, excluding the time limits.***

The aphasic patient is encouraged using urgency in the voice and demonstration but not noxious stimulation. Each limb is tested in turn, beginning with the non- paretic arm.

Only in the case of amputation or joint fusion at the shoulder or hip, ***or immobilization by an IV board,*** may the score be "9" and the examiner must clearly write the explanationforscoringasa"9". Score each limb separately.

5a. Left Arm 5b. Right Arm No drift, limb holds 90 (or 45) degrees for full 10 seconds.	0
Drift, Limb holds 90 (or45) degrees, but drifts down before full 10 seconds; does not hit bed or other support.	+1
Some effort against gravity, limb cannot get to or maintain (if cued) 90 (or 45) degrees, drifts down to bed, but has some effort against gravity.	+2
No effort against gravity, limb falls.	+3
No movement	+4
Amputation, joint fusion explain:	+9

6a. Left Leg 6b. Right Leg	
No drift, leg holds 30 degrees position for full 5 seconds.	**0**
Drift, leg falls by the end of the 5 second period but does not hit bed.	+1
Some effort against gravity; leg falls to bed by 5 seconds, but has some effort against gravity.	+2
No effort against gravity, leg falls to bed immediately.	+3
No movement	+4
Amputation, joint fusion explain:	+9

7. Limb Ataxia: This item is aimed at finding evidence of a unilateral cerebellar lesion. Test with eyes open. In case of visual defect, ensure testing is done in intact visual field. The finger- nose-finger and heel-shin tests are performed on both sides, and ataxia is scored only if present out of proportion to weakness. ***In children, substitute this task with reaching for a toy for the upper extremity, and kicking a toy or the examiner's hand, in children too young (< 5 years) or otherwise uncooperative for the standard exam item.*** Ataxia is absent in the patient who cannot understand or is paralyzed. Only in the case of amputation or joint fusion may the item be scored "9", and the examiner must clearly write the explanation for not scoring. In case of blindness test by touching nose from extended arm position.

Absent	0
Present in one limb	+1
Present in two limbs	+2

8. Sensory: Sensation or grimace to pin prick when tested, or withdrawal from noxious stimulus in the obtunded or aphasic patient. ***For children too young or otherwise uncooperative for reporting gradations of sensory loss, observe for any behavioral response to pin prick, and score it according to the same scoring scheme as a "normal" response, "mildly diminished" or "severely diminished" response*.** Only sensory loss attributed to stroke is scored as abnormal and the examiner should test as many body areas [arms (not hands), legs, trunk, face] as needed to accurately check for hemisensory loss. A score of 2, "severe or total," should only be given when a severe or total loss of sensation can be clearly demonstrated. Stuporous and aphasic patients will therefore probably score 1 or 0.

Normal; no sensory loss.	**0**
Mild to moderate sensory loss; patient feels pinprick is less sharp or is dull on the affected side; or there is a loss of superficial pain with pinprick but patient is aware he/she is being touched.	+1
Severe to total sensory loss; patient is not aware of being touched in the face, arm, and leg.	+2

9. Best Language: A great deal of information about comprehension will be obtained during the preceding sections of the examination. ***For children age 6 years and up with normal language development before onset of stroke: The patient is asked to describe what is happening in the attached picture, to name the items on the attached naming sheet, to repeat words from the attached list, and to read from the attached list of sentences (Table S1; Fig 1, 2, 3).*** Comprehension is judged from responses here as well as to all of the commands in the preceding general neurological exam. If visual loss interferes with the tests, ask the patient to identify objects placed in the hand, repeat, and produce speech. The intubated patient should be asked to write. The patient in coma (question 1a=3) will arbitrarily score 3 on this item. The examiner must choose a score in the patient with stupor or limited cooperation but a score of 3 should be used only if the patient is mute and follows no one step commands. ***For children age 2 yrs to 6 yrs (or older children with premorbid language skills < 6 yr level), score this item based on observations of language comprehension and speech during the examination.***

No aphasia, normal	**0**
Mild to moderate aphasia; some obvious loss of fluency or facility of comprehension, without significant limitation on ideas expressed or form of expression. Reduction of speech and/or comprehension, however, makes conversation about provided material difficult or impossible. For example, in conversation about provided materials examiner can identify picture or naming card from patient's response.	+1
Severe aphasia; all communication is through fragmentary expression; great need for inference, questioning, and guessing by the listener. Range of information that can be exchanged is limited; listener carries burden of communication. Examiner cannot identify materials provided from patient response.	+2
Mute, global aphasia; no usable speech or auditory comprehension.	+3

The patient with brain stem stroke who has bilateral loss of sensation is scored 2. If the patient does not respond and is quadriplegic score 2. Patients in coma (item 1a=3) are arbitrarily given a 2 on this item.

10. Dysarthria: If patient is thought to be normal an adequate sample of speech must be obtained by asking patient to read or repeat words from the attached list. If the patient has severe aphasia, the clarity of articulation of spontaneous speech can be rated. Only if the patient is intubated or has other physical barrier to producing speech, may the item be scored "9", and the examiner must clearly write an explanation for not scoring. Do not tell the patient why he/she is being tested.

Normal	0
Mild to moderate; patient slurs at least some words and, at worst, can be understood with some difficulty.	+1
Severe; patient's speech is so slurred as to be unintelligible in the absence of or out of proportion to any dysphasia, or is mute / anarthric.	+2
Intubated or other physical barrier, explain:	+9

11. Extinction and Inattention (formerly Neglect): Sufficient information to identify neglect may be obtained during the prior testing. If the patient has a severe visual loss preventing visual double simultaneous stimulation, and the cutaneous stimuli are normal, the score is normal. If the patient has aphasia but does appear to attend to both sides, the score is normal. The presence of visual spatial neglect or anosagnosia may also be taken as evidence of abnormality. Since the abnormality is scored only if present, the item is never untestable.

No abnormality.	0
Visual, tactile, auditory, spatial, or personal inattention or extinction to bilateral simultaneous stimulation in one of these sensory modalities.	+1
Profound hemi-inattention or hemi- inattention to more than one modality. Does not recognize own hand or orients to only one side of space.	+2

Table S1. Language testing items for PedNIHSS:

Repetition	Each of 4 word-repetition tasks is presented: a. Stop b. Stop and go c. If it rains we play inside d. The President lives in Washington
Reading	Each of 3 items is presented for the child to read in **Fig 1.** Adjust expectations according to child's age/ school level
Naming	Pictures are presented and of a clock, pencil, skateboard, shirt, baseball, bicycle **(Fig 2)**
Fluency and word	The picture **(Fig 3)** is presented and the child is asked to describe what he/she sees.

Stop
See the dog run
Little children like to play outdoors

Fig. 1 Reading items for PedNIHSS

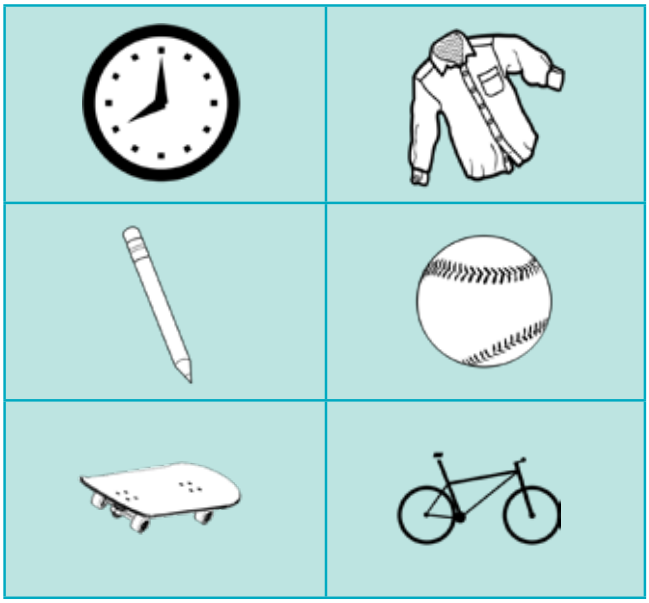


Fig. 2 Pictures to test naming for Item 9 Best Language of PedNIHSS

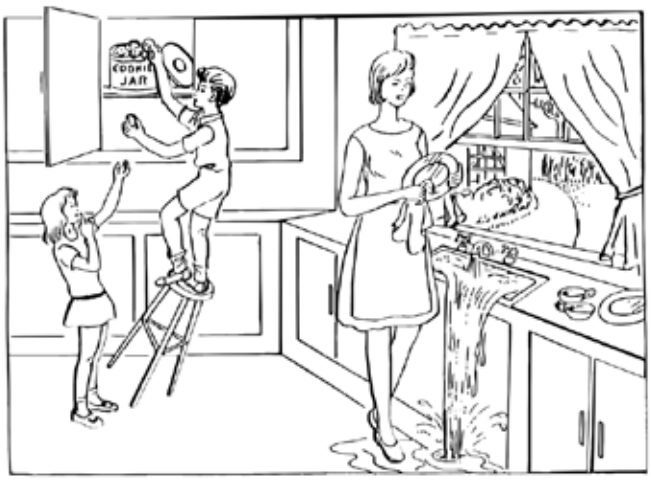


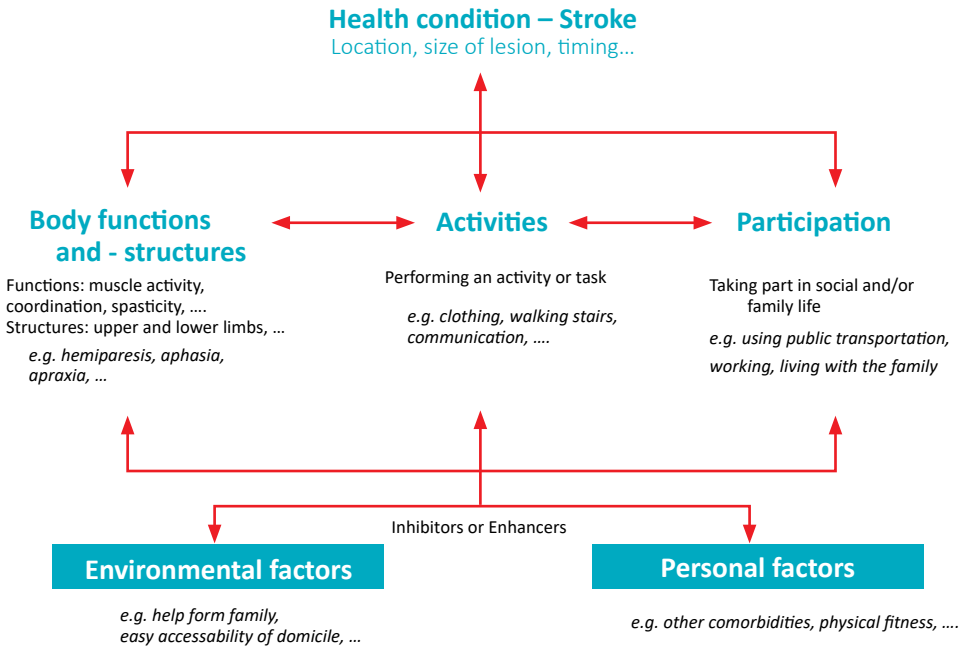
Fig. 3 Picture to test story-telling for Item 9 Best Language of PedNIHSS

Ichord RN, Bastian R, Abraham L, et al. Interrater reliability of the Pediatric National Institutes of Health Stroke Scale (PedNIHSS) in a multicenter study. Stroke. 2011;42(3):613-617. DOI: https://doi.org/10.1161/STROKEAHA.110.607192

Annexure 15

WORLD HEALTH ORGANIZATION - ICF- CY CLASSIFICATION

World Health Organization. International Classification of Functioning, Disability, and Health: Children & Youth Version: ICF-CY. World Health Organization; 2007Neque venectibus et velesti berum estionsed ut aut porum rectiis totaque int,Ilit eum



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