Clinical Neurophysiology
2nd Edition

Standard Operating Procedures
For Assistant Medical Officer in Clinical Neurophysiology

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Ministry of Health, Malaysia

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FOREWORD

It is my great pleasure to be given the opportunity to write the foreword for the second edition of Clinical Neurophysiology Standard Operating Procedures (SOP) for Assistant Medical Officers (AMO).

There have been great strides in the field of Clinical Neurophysiology since the first edition was published in 2005 and this coupled with other advances in patient-care in general medicine and specifically, neurology has necessitated this publication of an updated manual.

I am sure that this updates will continue supporting the objectives of the first edition which is to provide guidance for the Assistant Medical Officers, especially the younger ones who are undertaking the specialized Course in Clinical Neurophysiology. It will also be useful review for the seniors in this field. Ultimately it is our aim to create a good work flow and provide better services to our clients.

May I congratulate the the Technical Committee as well as the Ministry of Health, Malaysia for immense effort put into this publication. I am sure it will go a long way in improving the quality of healthcare delivery in the field of neurophysiology.

Dato' Sri Dr. Hasan bin Abdul Rahman
Director General of Health, Malaysia
August 2011

FOREWORD

A successful outcome of any task requires a structured and systematic operational policy to guide and coming out the process.

First of all, I would like to congratulate the Technical Committee for preparing this concise Standard Operating Procedures (SOP) for various clinical neurophysiology tests. I am sure that the younger Assistant Medical Officers (AMO) will find this guidebook very useful for their daily clinical practice.

Neurologically trained Assistant Medical Officers play a very important role in facilitating the diagnosis of patients with a vast number of neurological conditions. Various neurophysiology tests eg. electroencephalography (EEG), evoked potential (EPs), polysomnography (PSG), etc. require not only skill and knowledge to perform but also a meticulous approach to the procedures involved.

Lastly, I would like to express my deep appreciation to the to the Technical Committee, panel reviewers and to all those who have contributed in making this publication of the second edition of the book a reality.

Datuk Dr. Noor Hisham bin Abdullah
Deputy Director General of Health (Medical)
Ministry of Health, Malaysia
August 2011

MESSAGE

It gives me a great pleasure to write this message in the second edition of compilation of SOP (Standard Operating Procedure) for various tests in neurophysiology. We have made some editions from the first edition in 2005 to ensure its usefulness among the Assistant Medical Officer serving the various Neurophysiology Units in the Ministry of Health Malaysia.

Neurophysiological testing is one of the important diagnostic studies in neurology practice. This SOP will ensure standardised techniques, accurate results and hence the interpretation derived from such procedures. This is crucially important for further management of the patients with wide range of neurological disorders.

I would like to express my sincere appreciation and gratitude to all Assistant Medical Officer involved in the dynamic discussions, ideas, and references in preparing of this work manual. Finally, I would like to thank the Consultant Neurologists for their valuable input as the reviewers of this SOP.

Thank You

Dato' Dr. Md. Hanip bin Rafia
Advisor of Technical Committee
Senior Consultant Neurologist, and
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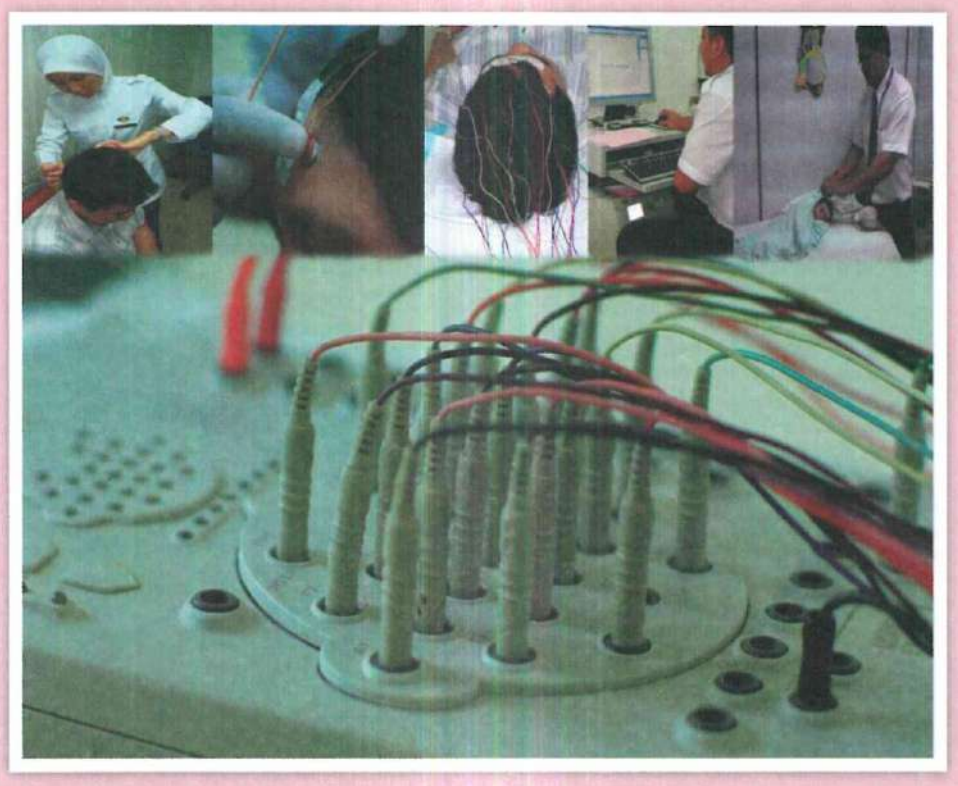


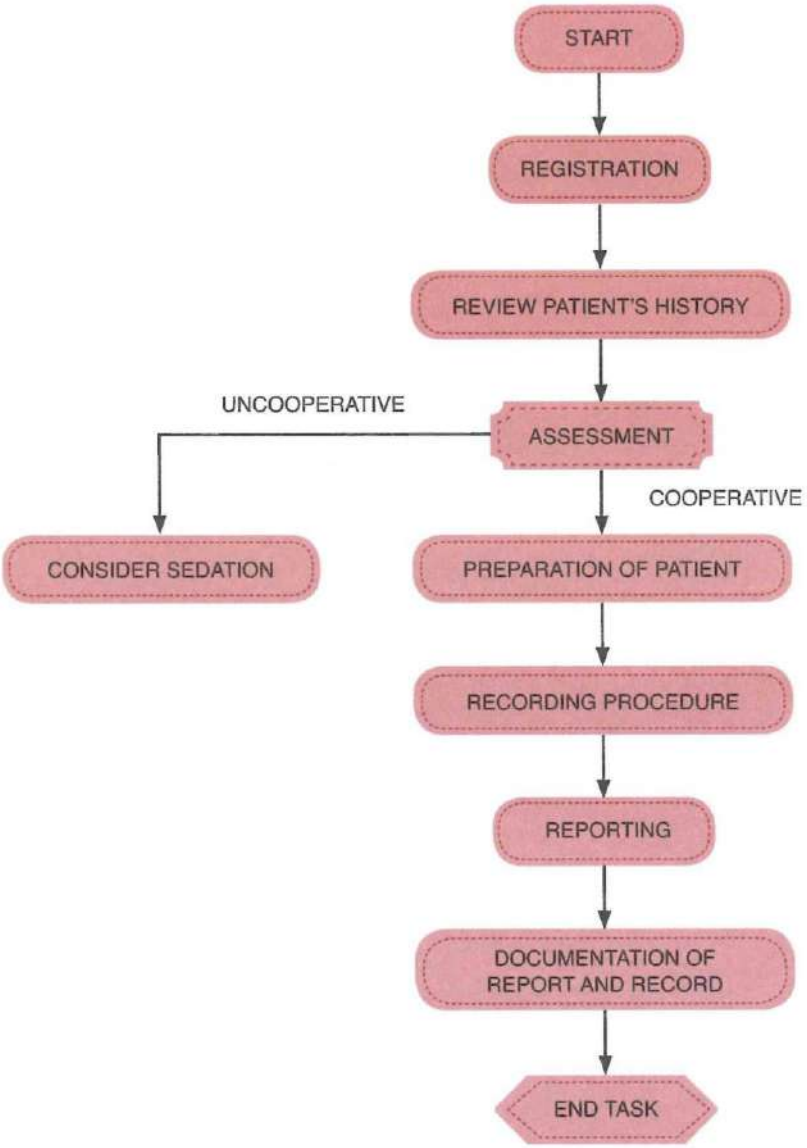
ELECTROENCEPHALOGRAPHY (EEG)

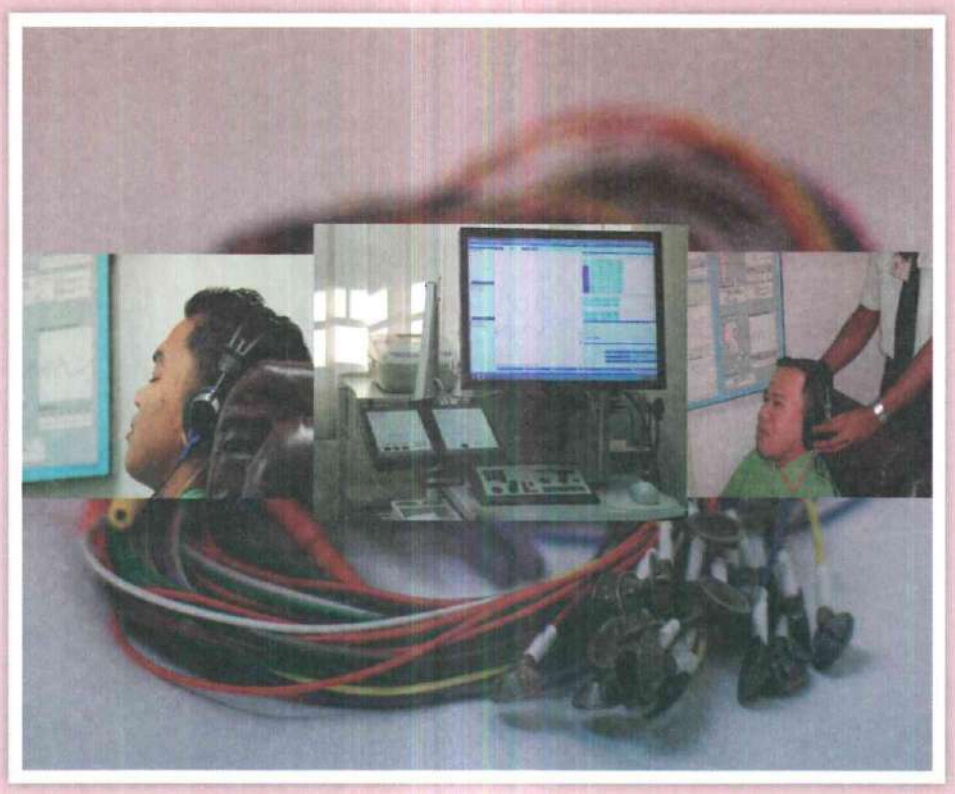
1. ELECTROENCEPHALOGRAPHY (EEG)

ACTIVITY	WORK PROCESS	STANDARD	REQUIREMENT
1. Registration	1. Receive appointment form 2. Confirm patient schedule / appointment	1. Name 2. I/C number 3. R/N 4. Age 5. Sex 6. Race 7. Address 8. Phone number 9. Diagnosis 10. Date	1. EEG request card
	3. Register in the standard registration system		1. Registration book / system
2. Review Patient's History	1. Date of onset 2. Last seizure 3. Family history 4. Medical/Surgical history 5. Medication 6. Previous EEG	Trace old report (if any exist)	
3. Assessment	1. Patient's general appearance & mental status	1. Normal 2. Alert 3. Uncooperative 4. Mentally challenged 5. Confused 6. Comatose 7. Drowsy / Sleepy 8. Sedated 9. Aphasic	**Drugs Available (sedative):** 1. Syrup Chloral Hydrate 2. Cap. Melatonin 3. Dormicum (IM / IV)
4. Preparation of Patient	1. Self - introduction (if applicable) 2. Explain the procedure (if applicable) 3. Obtain verbal consent (if applicable) 4. Position and ensure the patient is comfortable 5. Enter patient's demographic data in the system 6. Measure, mark and gently degrease site with abrasive prepping gel 7. Attach electrodes correctly and securely	Introduce yourself to patient/relative (if applicable) With chaperone (if required) 10 - 20 International System	1. Measuring tape 2. Dermatograph 3. pencil 4. Skin conditioner 1. Gauze / Cotton 2. EEG electrodes 3. Micropore Paste
5. Recording Procedure	1. Perform Calibration (mechanical & biological)	1. Sensitivity 100 μV 2. HFF 70 Hz 3. LFF 0.5 Hz 4. Time base 30mm/sec 5. 10 mm deflection at 100 μV sensitivity	**Equipments:** 1. EEG machine
	2. Impedance check 3. Record with appropriate montage	< 5 kΩ Minimum 20 minutes' recording	

ACTIVITY	WORK PROCESS	STANDARD	REQUIREMENT
	4. Activation Procedures	1. Eyes open /Eyes close 2. Hyperventilation (minimum 3 mins HV and 2 mins post HV) 3. Photic stimulation with appropriate flashes 4. Sleep deprived (if required)	
	5. Annotation of events 6. Identify and eliminate or minimize biological and physical artifacts		
	7. Perform Calibration (biological & mechanical)	1. Sensitivity 100 μV 2. HFF 70 Hz 3. LFF 0.5 Hz 4. Time base 30mm/sec 5. 10 mm deflection at 100 μV sensitivity	
	8. Remove all electrodes and paste, gently from patient's scalp		
	9. Clean the electrodes		1. Water 2. Sodium Hypochloride 5% (if infectious cases suspected)
6. Reporting	1. Compile EEG record 2. Fill up the comment slip	AMO 1. Patient name 2. Patient IC 3. Patient RN 4. Patient age 5. Patient sex 6. Purpose 7. History 8. Hyperventilation 9. Photic stimulation 10. Medication 11. Type of procedure 12. EEG number 13. Date 14. Name of Physician 15. Name of AMO 16. AMO's comment 17. Patient's apparent and mental status 18. Skull defect 19. Old report (Y/N) 20. Old graph (Y/N)	1. Comment Slip
	3. Prepare factual report (if required) 4. Send EEG record for reporting	Neurologist	
7. Documentation of report and record	1. Archive EEG record in the system 2. Despatch and file the report	Despatch book	

FLOW CHART ELECTROENCEPHALOGRAPHY (EEG)





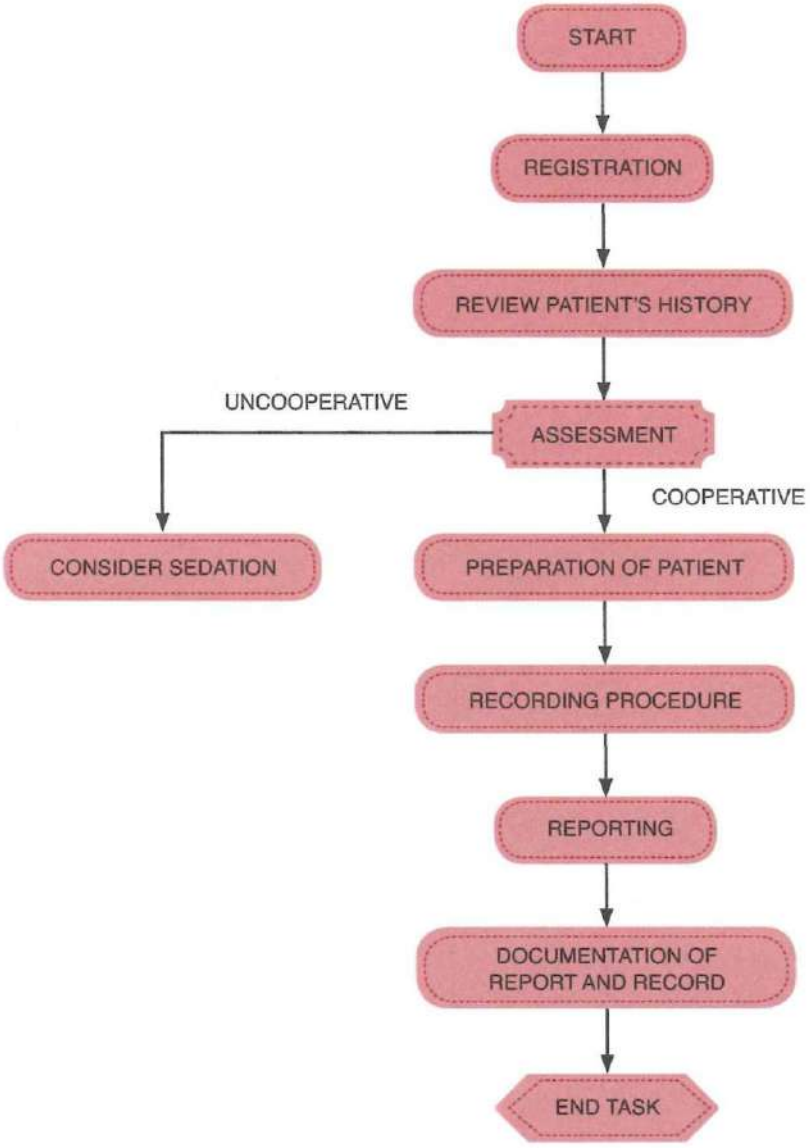
BRAINSTEM AUDITORY EVOKED POTENTIAL (BAEP)

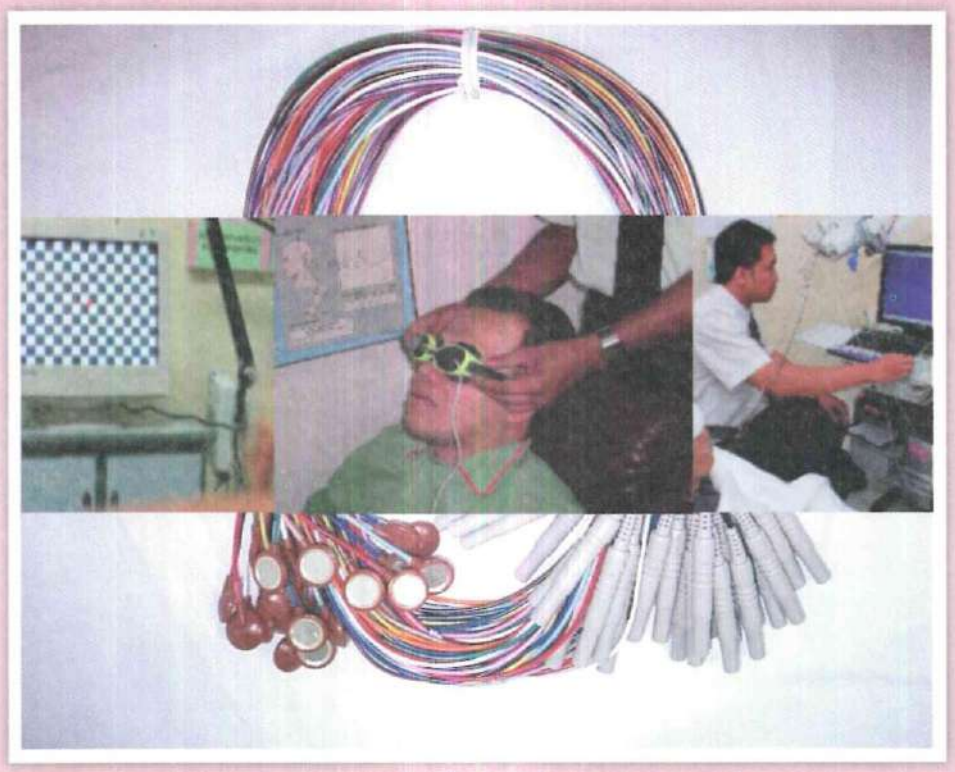
2. BRAINSTEM AUDITORY EVOKED POTENTIAL (BAEP)

ACTIVITY	WORK PROCESS	STANDARD	REQUIREMENT
1. Registration	1. Receive appointment form 2. Confirm patient schedule / appointment 3. Register in the standard registration system	1. Name 2. I/C number 3. R/N 4. Age 5. Sex 6. Race 7. Address 8. Phone number 9. Diagnosis 10. Date	1. Evoked Potential (BAEP) request form 1. Registration book / system
2. Review Patient's History	1. Date of onset 2. Family history 3. Medical/Surgical history 4. Medication 5. Previous BAEP	Trace old report (if any exist)	
3. Assessment	1. Patient's general appearance & mental status	1. Normal 2. Alert 3. Uncooperative 4. Mentally challenged 5. Confused 6. Comatose 7. Drowsy /Sleepy 8. Sedated 9. Aphasic	**Drugs Available (sedative):** 1. Syrup Chloral Hydrate 2. Cap. Melatonin
4. Preparation of Patient	1. Self - introduction (if applicable) 2. Explain the procedure (if applicable) 3. Obtain verbal consent (if applicable) 4. Position and ensure the patient is comfortable 5. Enter patient's demographic data in the system 6. Measure, mark and gently degrease site with abrasive prepping gel	Introduce yourself to patient/relative (if applicable) With chaperone (if required) 10 - 20 International System	 1. Measuring tape 2. Dermatograph pencil 3. Skin conditioner 4. Gauze / Cotton

ACTIVITY	WORK PROCESS	STANDARD	REQUIREMENT
	7. Attach electrodes correctly and securely		1. BAEP electrodes 2. Micropore 3. Paste
5. Recording Procedure	1. Perform Calibration	1. Sensitivity 20 μV 2. HFF 100 Hz 3. LFF 1 Hz	**Equipments:** 1. EP machine
	2. Impedance check	< 5kΩ
	3. Record with appropriate montage	Check hearing threshold Start stimulation at 50dB above hearing threshold
	4. Identify and eliminate or minimize biological and physical artifacts	
	5. Identify and mark waveform	Minimum two identical responses required for each ear
	6. Perform Calibration	1. Sensitivity 20 μV 2. HFF 100 Hz 3. LFF 1 Hz
	7. Remove all electrodes and paste, gently from patient's scalp	
	8. Clean the electrodes		1. Water 2. Sodium Hypochloride 5% (if infectious cases suspected)
6. Reporting	1. Compile BAEP record 2. Prepare factual report (if required)	AMO
	3. Send BAEP record for reporting	Neurologist
7. Documentation of report and record	1. Archive BAEP record in the system	
	2. Despatch and file the report	Despatch book

FLOW CHART BRAINSTEM AUDITORY EVOKED POTENTIAL (BAEP)





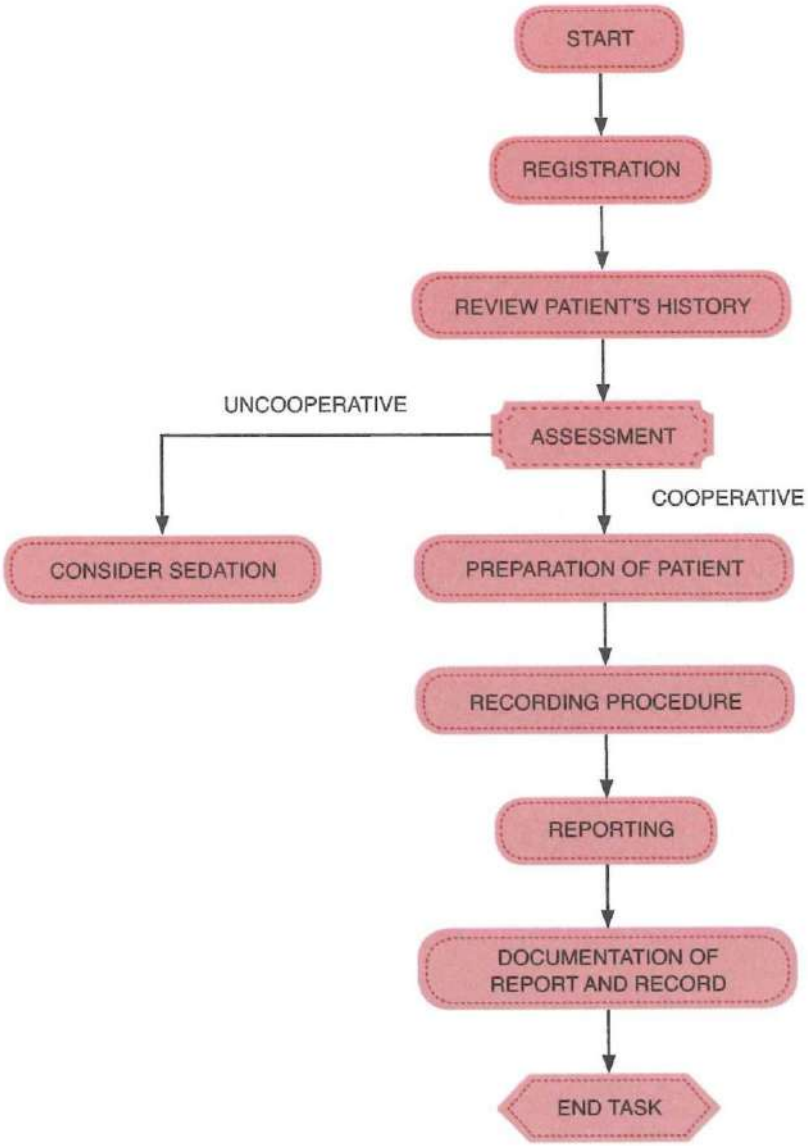
VISUAL EVOKED POTENTIAL (VEP)

3. VISUAL EVOKED POTENTIAL (VEP)

ACTIVITY	WORK PROCESS	STANDARD	REQUIREMENT
1. Registration	1. Receive appointment form 2. Confirm patient schedule / appointment 3. Register in the standard registration system	1. Name 2. I/C number 3. R/N 4. Age 5. Sex 6. Race 7. Address 8. Phone number 9. Diagnosis 10. Date	1. Evoked Potential (VEP) request form 1. Registration book / system
2. Review Patient's History	1. Date of onset 2. Family history 3. Medical/Surgical history 4. Medication 5. Previous VEP	Trace old report (if any exist)	
3. Assessment	1. Patient's general appearance & mental status	1. Normal 2. Alert 3. Uncooperative 4. Mentally challenged 5. Confused 6. Comatose 7. Drowsy /Sleepy 8. Sedated 9. Aphasic	**Drugs Available (sedative):** 1. Syrup Chloral Hydrate 2. Cap. Melatonin
4. Preparation of Patient	1. Self - introduction (if applicable) 2. Explain the procedure (if applicable) 3. Obtain verbal consent (if applicable) 4. Position and ensure the patient is comfortable 5. Enter patient's demographic data in the system 6. Measure, mark and gently degrease site with abrasive prepping gel 7. Attach electrodes correctly and securely	Introduce yourself to patient/relative (if applicable) With chaperone (if required) 10 - 20 International System	 1. Measuring tape 2. Dermatograph pencil 3. Skin conditioner 4. Gauze / Cotton 1. VEP electrodes 2. Micropore 3. Paste

ACTIVITY	WORK PROCESS	STANDARD	REQUIREMENT
5. Recording Procedure	1. Perform calibration	1. Sensitivity 20 μV 2. HFF 100 Hz 3. LFF 1 HZ	**Equipments:** 1. EP machine
	2. Impedance check	< 5kΩ	
	3. Distance of patient's eyes to stimulus monitor / screen	1.5 meter	
	4. Use appropriate stimulus pattern	1. Full field 2. Flash 3. Hemifield 4. Start stimulation and record with appropriate side.	
	5. Identify and eliminate or minimize biological and physical artifacts		
	6. Identify and mark waveform	Minimum two identical responses required for each eye	
	7. Perform Calibration	1. Sensitivity 20 μV 2. HFF 100 Hz 3. LFF 1 Hz	
	8. Remove all electrodes and paste, gently from patient's scalp.		
	9. Clean the electrode		1. Water 2. Sodium Hypochloride 5% (if infectious cases suspected)
6. Reporting	1. Compile VEP record	AMO	
	2. Prepare factual report (if required)		
	3. Send VEP record for reporting	Neurologist	
7. Documentation of report and record	1. Archive VEP record in the system		
	2. Despatch and file the report	Despatch book	

FLOW CHART VISUAL EVOKED POTENTIAL (VEP)



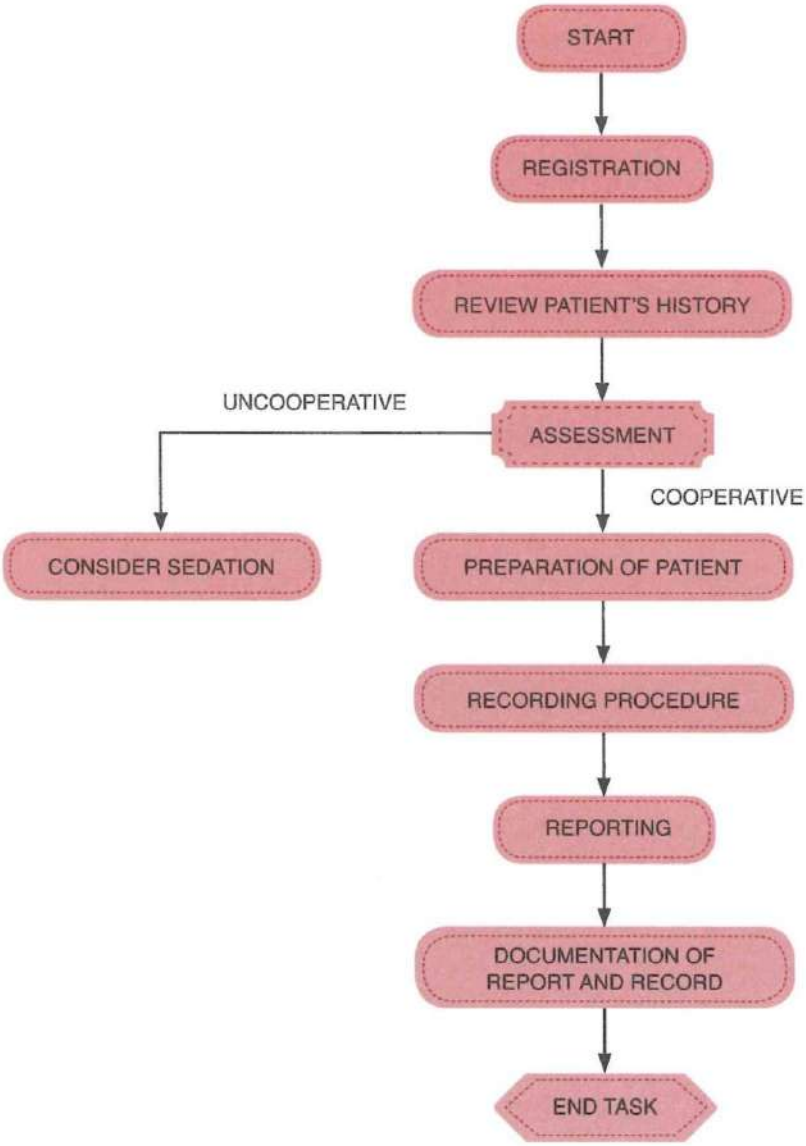
SOMATOSENSORY EVOKED POTENTIAL (SSEP – MEDIAN NERVE)

4. SOMATOSENSORY EVOKED POTENTIAL (SSEP) – MEDIAN NERVE

ACTIVITY	WORK PROCESS	STANDARD	REQUIREMENT
1. Registration	1. Receive appointment form 2. Confirm patient schedule / appointment 3. Register in the standard registration system	1. Name 2. I/C number 3. R/N 4. Age 5. Sex 6. Race 7. Address 8. Phone number 9. Diagnosis 10. Date	1. Evoked Potential (SSEP – Median Nerve) request form 1. Registration book / system
2. Review Patient's History	1. Date of onset 2. Family history 3. Medical/Surgical history 4. Medication 5. Previous SSEP – Median Nerve	Trace old report (if any exist)	
3. Assessment	1. Patient's general appearance & mental status	1. Normal 2. Alert 3. Uncooperative 4. Mentally challenged 5. Confused 6. Comatose 7. Drowsy /Sleepy 8. Sedated 9. Aphasic	**Drugs Available (sedative):** 1. Syrup Chloral 2. Hydrate Cap. Melatonin
4. Preparation of Patient	1. Self - introduction (if applicable) 2. Explain the procedure (if applicable) 3. Obtain verbal consent (if applicable) 4. Position and ensure the patient is comfortable 5. Enter patient's demographic data in the system 6. Measure, mark and gently degrease site with abrasive prepping gel	Introduce yourself to patient/relative (if applicable) With chaperone (if required) 10 - 20 International System	1. Measuring tape 2. Dermatograph pencil 3. Skin conditioner 4 Gauze / Cotton

ACTIVITY	WORK PROCESS	STANDARD	REQUIREMENT
	7. Attach electrodes correctly and securely		1. SSEP electrodes 2. Micropore 3. Paste
5. Recording Procedure	1. Perform calibration	1. Sensitivity 20 μV 2. HFF 100 Hz 3. LFF 1 Hz	**Equipments:** 1. EP machine
	2. Impedance check	< 5kΩ	
	3. Activation Procedures	Start recording by stimulating Median Nerve	
	4. Identify and eliminate or minimize biological and physical artifacts		
	5. Identify and mark waveform	Minimum two identical responses required for each limb	
	6. Perform Calibration	1. Sensitivity 20 μV 2. HFF 100 Hz 3. LFF 1 Hz	
	7. Remove all electrodes and paste, gently from patient's scalp and limbs		
	8. Clean the electrodes		1. Water 2. Sodium Hypochloride 5% (if infectious cases suspected)
6. Reporti	1. Compile SSEP record 2. Prepare factual report (if required) 3. Send SSEP record for reporting	AMO Neurologist	
7. Documentation of report and record	1. Archive SSEP tracing in the system 2. Despatch and file the report	 Despatch book	

FLOW CHART SOMATOSENSORY EVOKED POTENTIAL (SSEP) – MEDIAN NERVE



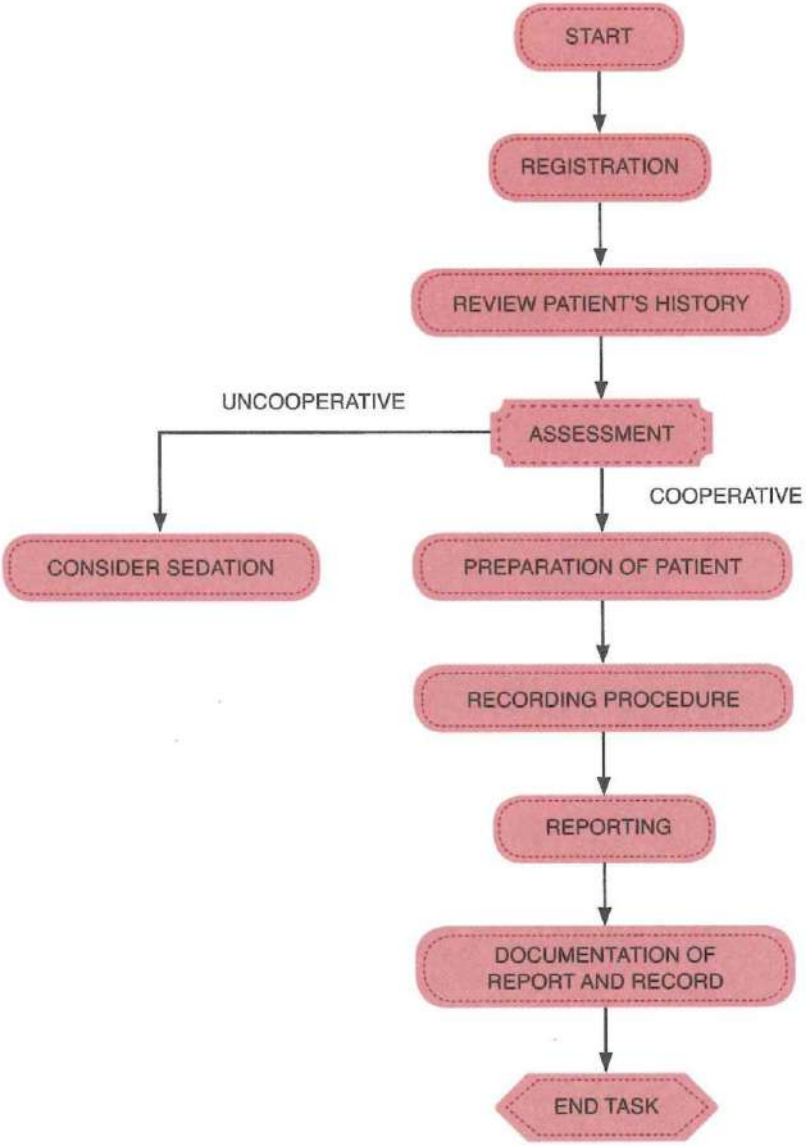
SOMATOSENSORY EVOKED POTENTIAL (SSEP – POSTERIOR TIBIAL NERVE)

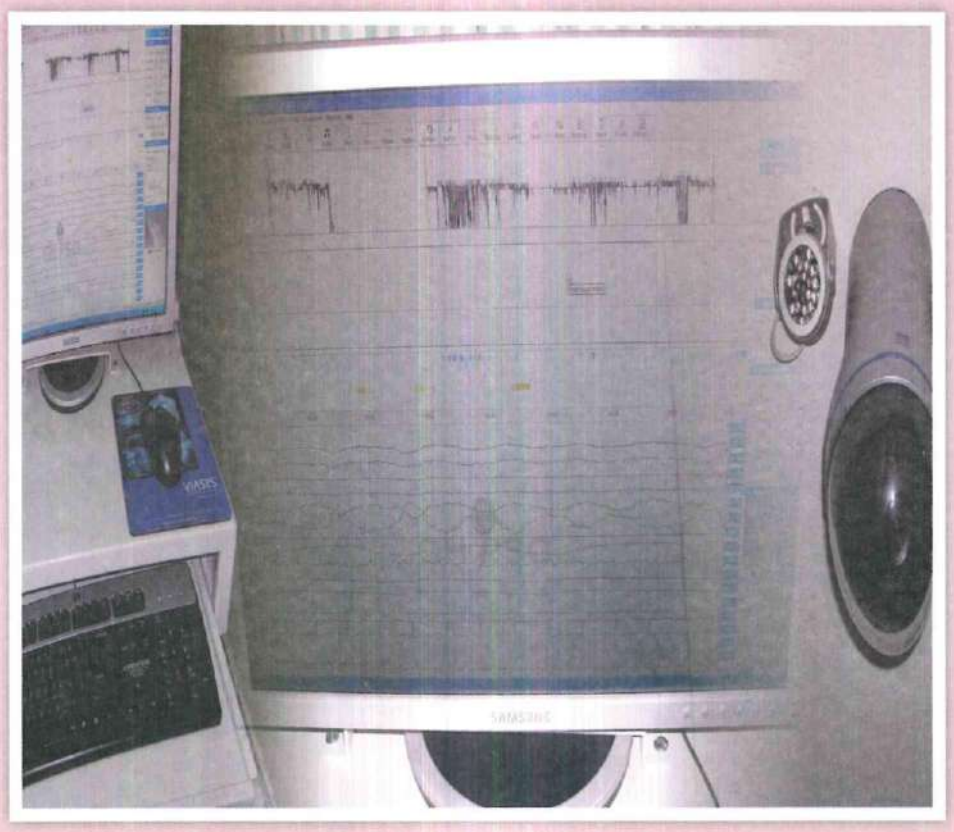
5. SOMATOSENSORY EVOKED POTENTIAL (SSEP) – POSTERIOR TIBIAL NERVE

ACTIVITY	WORK PROCESS	STANDARD	REQUIREMENT
1. Registration	1. Receive appointment form 2. Confirm patient schedule / appointment 3. Register in the standard registration system	1. Name 2. I/C number 3. R/N 4. Age 5. Sex 6. Race 7. Address 8. Phone number 9. Diagnosis 10. Date	1. Evoked Potential (SSEP – Posterior Tibial Nerve) request form 1. Registration book / system
2. Review Patient's History	1. Date of onset 2. Family history 3. Medical/Surgical history 4. Medication 5. Previous SSEP – Posterior Tibial Nerve	Trace old report (if any exist)	
3. Assessment	1. Patient's general appearance & mental status	1. Normal 2. Alert 3. Uncooperative 4. Mentally 5. challenged 6. Confused 7. Comatose 8. Drowsy / 9. Sleepy Sedated Aphasic	**Drugs Available (sedative):** 1. Syrup Chloral Hydrate 2. Cap. Melatonin
4. Preparation of Patient	1. Self - introduction (if applicable) 2. Explain the procedure (if applicable) 3. Obtain verbal consent (if applicable) 4. Position and ensure the patient is comfortable 5. Enter patient's demographic data in the system 6. Measure, mark and gently degrease site with abrasive prepping gel 7. Attach electrodes correctly and securely	Introduce yourself to patient/relative (if applicable) With chaperone (if required) 10 - 20 International System	 1. Measuring tape 2. Dermatograph pencil 3. Skin conditioner 4. Gauze / Cotton 1. SSEP electrodes 2. Micropore 3. Paste

ACTIVITY	WORK PROCESS	STANDARD	REQUIREMENT
5. Recording Procedure	1. Perform calibration	1. Sensitivity 20 μV 2. HFF 100 Hz 3. LFF 1 Hz	**Equipments:** 1. EP machine
	2. Impedance check	< 5kΩ	
	3. Activation Procedures	Start recording by stimulating Posterior Tibial Nerve	
	4. Identify and eliminate or minimize biological and physical artifacts		
	5. Identify and mark waveform	Minimum two identical responses required for each limb	
	6. Perform Calibration	1. Sensitivity 20 μV 2. HFF 100 Hz 3. LFF 1 Hz	
	7. Remove all electrodes and paste, gently from patient's scalp and limbs		
	8. Clean the electrodes		1. Water 2. Sodium Hypochloride 5% (if infectious cases suspected)
6. Reporting	1. Compile SSEP record 2. Prepare factual report (if required)	AMO	
	3. Send SSEP record for reporting	Neurologist	
7. Documentation of report and record	1. Archive SSEP record in the system		
	2. Despatch and file the report	Despatch book	

FLOW CHART SOMATOSENSORY EVOKED POTENTIAL (SSEP) – POSTERIOR TIBIAL NERVE





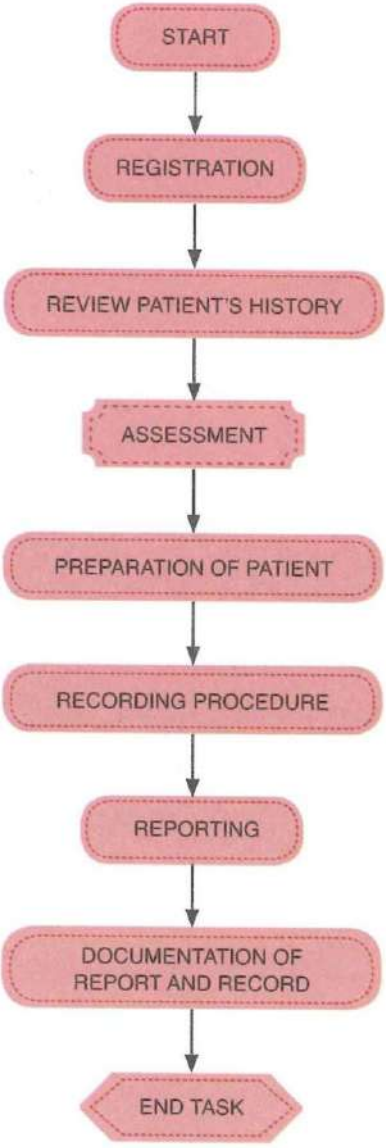
POLYSOMNOGRAPHY (PSG)

6. POLYSOMNOGRAPHY (PSG)

ACTIVITY	WORK PROCESS	STANDARD	REQUIREMENT
1. Registration	1. Receive appointment form 2. Confirm patient schedule / appointment 3. Register in the standard registration system	1. Name 2. I/C number 3. R/N 4. Age 5. Sex 6. Race 7. Address 8. Phone number 9. Diagnosis 10. Date	1. PSG request form 1. Registration book / system
2. Review Patient's History	1. History of sleep disorder 2. Family history 3. Medical/Surgical history 4. Medication 5. Previous PSG	Trace old report (if any exist)	
3. Assessment	1. Patient's general appearance & mental status	1. Normal 2. Alert 3. Uncooperative 4. Mentally challenged 5. Confused 6. Aphasic	Test to be done under natural / spontaneous sleep
4. Preparation of Patient	1. Self - introduction (if applicable) 2. Explain the procedure (if applicable) 3. Obtain verbal consent (if applicable) 4. Position and ensure the patient is comfortable 5. Enter patient's demographic data in the system 6. Measure, mark and gently degrease site with abrasive prepping gel 7. Attach electrodes correctly and securely 8. Fix and apply other required sensors	Introduce yourself to patient/relative (if applicable) With chaperone (if required) 10 - 20 International System	1. Measuring tape 2. Dermatograph pencil 3. Skin conditioner 4. Gauze / Cotton 1. EEG electrodes 2. Airflow,Snore, EOG,EMG,(Chin & Leg), Chest, Abdomen and ECG 1. Micropore 2. Paste

ACTIVITY	WORK PROCESS	STANDARD	REQUIREMENT
5. Recording Procedure	1. Perform calibration (mechanical & biological)	<table><tr><th></th><th>HFF</th><th>LFF</th></tr><tr><td>1. EEG</td><td>70Hz</td><td>0.5Hz</td></tr><tr><td>2. EOG</td><td>70Hz</td><td>0.5Hz</td></tr><tr><td>3. Chin EMG</td><td>100Hz</td><td>10Hz</td></tr><tr><td>4. ECG</td><td>70Hz</td><td>0.5Hz</td></tr><tr><td>5. Air Flow</td><td>15Hz</td><td>0.1Hz</td></tr><tr><td>6. Snoring</td><td>100Hz</td><td>10Hz</td></tr><tr><td>7. Chest</td><td>100Hz</td><td>25Hz</td></tr><tr><td>8. Abdomen</td><td>100Hz</td><td>25Hz</td></tr><tr><td>9. Leg EMG</td><td>100Hz</td><td>10Hz</td></tr><tr><td>10. Oximetry</td><td>15Hz</td><td>DC</td></tr><tr><td>11. CPAP Flow</td><td>15Hz</td><td>0.01-0.03 Hz</td></tr></table> 12. Sensitivity 100 μV 13. Time base 30 deflection at 100 μV sensitivity 14. Saturation calibration	1. **Equipments:** PSG machine
	2. Impedance 3. Recording 4. Annotation of events 5. Identify and eliminate or minimize biological and physical artifacts	<5kΩ Minimum 6 hours	
	6. Perform calibration (biological & mechanical)	<table><tr><th></th><th>HFF</th><th>LFF</th></tr><tr><td>1. EEG</td><td>70Hz</td><td>0.5Hz</td></tr><tr><td>2. EOG</td><td>70Hz</td><td>0.5Hz</td></tr><tr><td>3. Chin EMG</td><td>100Hz</td><td>10Hz</td></tr><tr><td>4. ECG</td><td>70Hz</td><td>0.5Hz</td></tr><tr><td>5. Air Flow</td><td>15Hz</td><td>0.1Hz</td></tr><tr><td>6. Snoring</td><td>100Hz</td><td>10Hz</td></tr><tr><td>7. Chest</td><td>100Hz</td><td>25Hz</td></tr><tr><td>8. Abdomen</td><td>100Hz</td><td>25Hz</td></tr><tr><td>9. Leg EMG</td><td>100Hz</td><td>10Hz</td></tr><tr><td>10. Oximetry</td><td>15Hz</td><td>DC</td></tr><tr><td>11. CPAP Flow</td><td>15Hz</td><td>0.01-0.03 Hz</td></tr></table> 12. Sensitivity 100 μV 13. Time base 30 deflection at 100 μV sensitivity 14. Saturation calibration	
	7. Remove all electrodes, sensor and paste, gently from patient's scalp and limb 8. Clean the electrode		1. Water 2. Sodium Hypochloride 5% (if infectious cases suspected)
6. Reporting	1. Analyze PSG record and scoring 2. Compile PSG record 3. Send PSG record for reporting	AMO Neurologist	
7. Documentation of report and record	1. Archive PSG record in the system 2. Despatch and file the report	 Despatch book	

FLOW CHART POLYSOMNOGRAPHY (PSG)



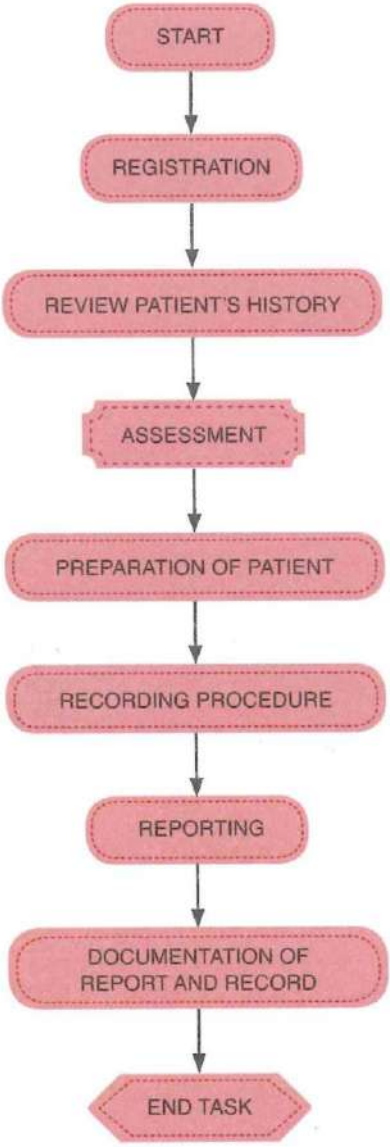
NERVE CONDUCTION STUDY
(NCS – CARPAL TUNNEL SYNDROME)

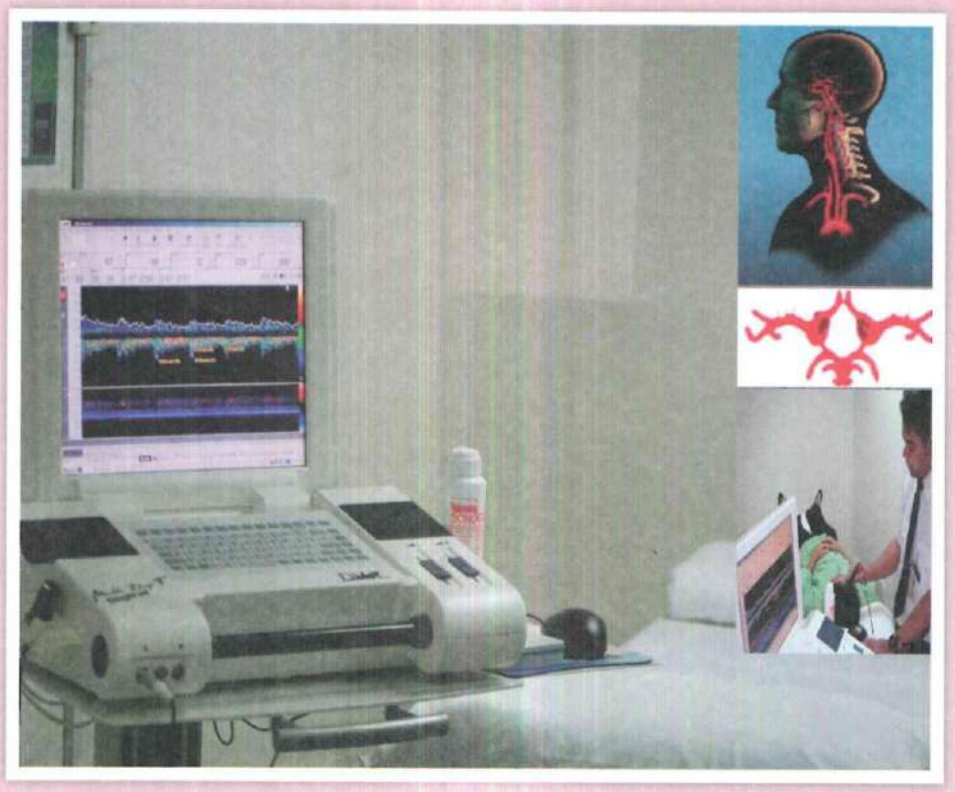
7. NERVE CONDUCTION STUDY (NCS) – CARPAL TUNNEL SYNDROME

ACTIVITY	WORK PROCESS	STANDARD	REQUIREMENT
1. Registration	1. Receive appointment form 2. Confirm patient schedule / appointment	1. Name 2. I/C number 3. R/N 4. Age 5. Sex 6. Race 7. Address 8. Phone number 9. Diagnosis 10. Date	1. Nerve Conduction Study request form
	3. Register in the standard registration system		1. Registration book / system
2. Review Patient's History	1. Date of onset 2. Family history 3. Medical/Surgical history 4. Medication 5. Previous NCS for CTS	Trace old report (if any exist)	
3. Assessment	1. Patient's general appearance		
4. Preparation of Patient	1. Self - introduction	Introduce yourself to patient/relative	
	2. Explain the procedure 3. Obtain verbal consent 4. Position and ensure the patient is comfortable	With chaperone (if required)	
	5. Enter patient's demographic data in the system		
	6. Measure, mark and gently degrease site with Methylated spirit		1. Measuring tape 2. Dermatograph pencil / skin marker 3. Methylated Spirit 4. Gauze / Cotton
	7. Attach electrodes correctly and securely		1. NCS electrodes 2. Recording Electrode 3. Micropore

ACTIVITY	WORK PROCESS	STANDARD	REQUIREMENT
5. Recording Procedure	1. Perform calibration	1. Sensitivity 20 μV 2. Duration 0.1 m/sec 3. Time base 2 m/sec	**Equipments:** 1. NCS machine
	3. Start procedures by stimulating the appropriate nerve	Motor, F wave and Sensory nerve for both hands	1. Stimulator 2. Normal Saline 0.9%
	4. Identify and mark waveform		
	5. Identify and eliminate or minimize biological and physical artifacts		
	6. Measure the distance between distal and proximal stimulation		1. Measuring tape
	7. Remove all electrodes gently from patient's limb		
6. Reporting	1. Compile NCS record 2. Prepare factual report (if required) 3. Send NCS record for reporting	AMO Neurologist	
7. Documentation of report and record	1. Archive NCS record in the system 2. Despatch and file the report	Despatch book	

FLOW CHART NERVE CONDUCTION STUDY (NCS) CARPAL TUNNEL SYNDROME





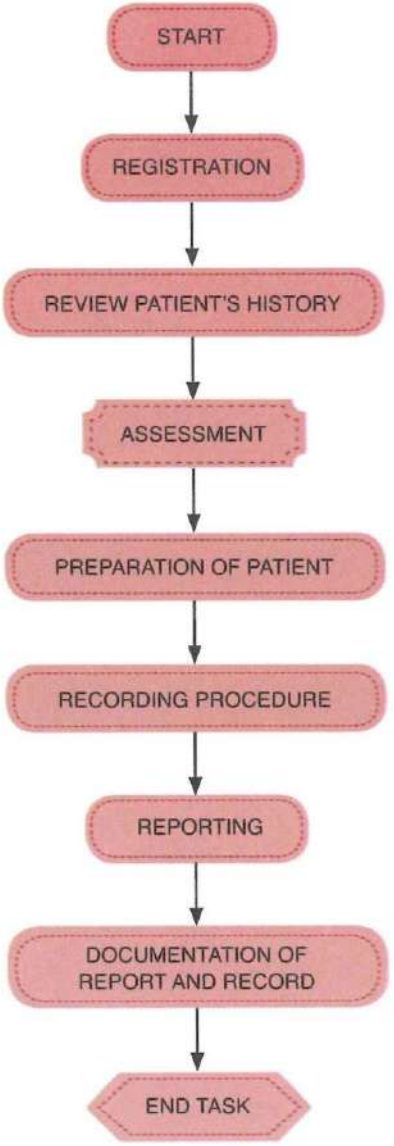
TRANSCRANIAL DOPPLER (TCD)

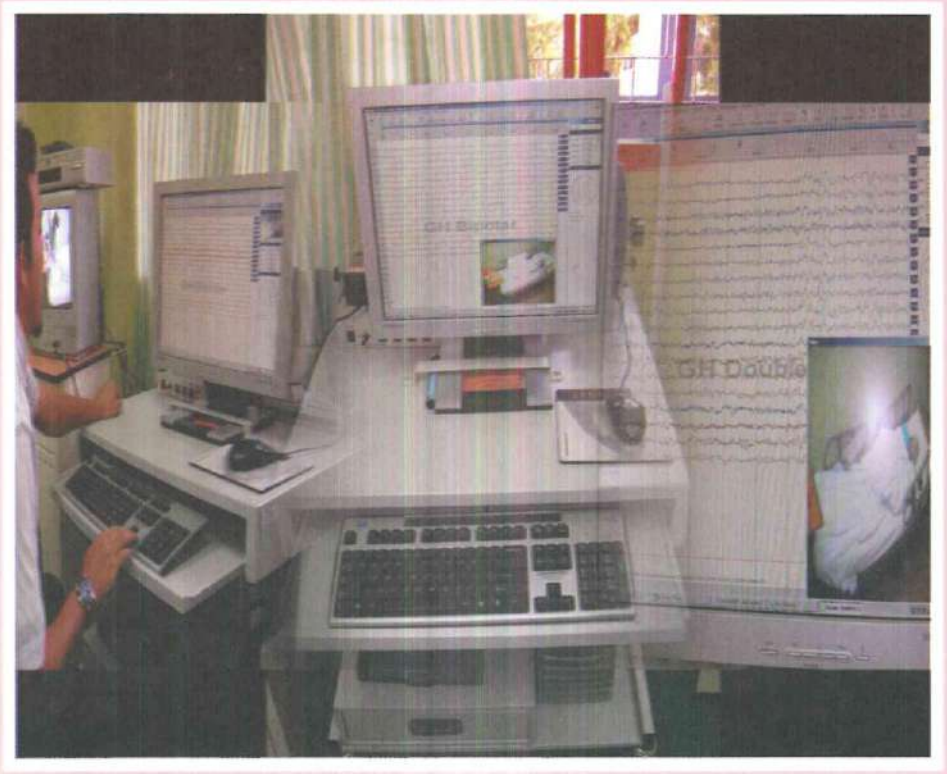
8. TRANSCRANIAL DOPPLER (TCD)

ACTIVITY	WORK PROCESS	STANDARD	REQUIREMENT
1. Registration	1. Receive appointment form 2. Confirm patient schedule / appointment 3. Register in the standard registration system	1. Name 2. I/C number 3. R/N 4. Age 5. Sex 6. Race 7. Address 8. Phone number 9. Diagnosis 10. Date	1. TCD request form 1. Registration book / system
2. Review Patient's History	1. History of Cerebrovascular Accident (CVA) / stroke 2. Family history 3. Medical/Surgical history 4. Medication 5. Previous TCD	Trace old report (if any exist)	
3. Assessment	1. Patient's general appearance		
4. Preparation of Patient	1. Self - introduction 2. Explain the procedure 3. Obtain verbal consent 4. Position and ensure the patient is comfortable 5. Enter patient's demographic data in the system	Introduce yourself to patient/relative With chaperone (if required)	

ACTIVITY	WORK PROCESS	STANDARD	REQUIREMENT
5. Recording Procedure	1. Perform calibration 2. Choose appropriate probe 3. Locate TCD windows 4. Identify and eliminate or minimize artifacts 5. Wipe gel off from patient after procedure completed	1. Flat baseline 2. 2MHz / 4 MHz / 8 MHz 1. Middle Cerebral Artery (MCA) 2. Posterior Cerebral Artery (PCA) 3. Anterior Cerebral Artery (ACA) 4. Basilar Artery (BA) 5. Vertebral Artery (VA)	**Equipments:** 1. TCD machine 2. Conductive gel 3. Gauze
6. Reporting	1. Compile TCD record 2. Send record for reporting	AMO Neurologist	
7. Documentation of report and record	1. Archive TCD record in the system 2. Despatch and file the report	Despatch book	

FLOW CHART TRANSCRANIAL DOPPLER (TCD)





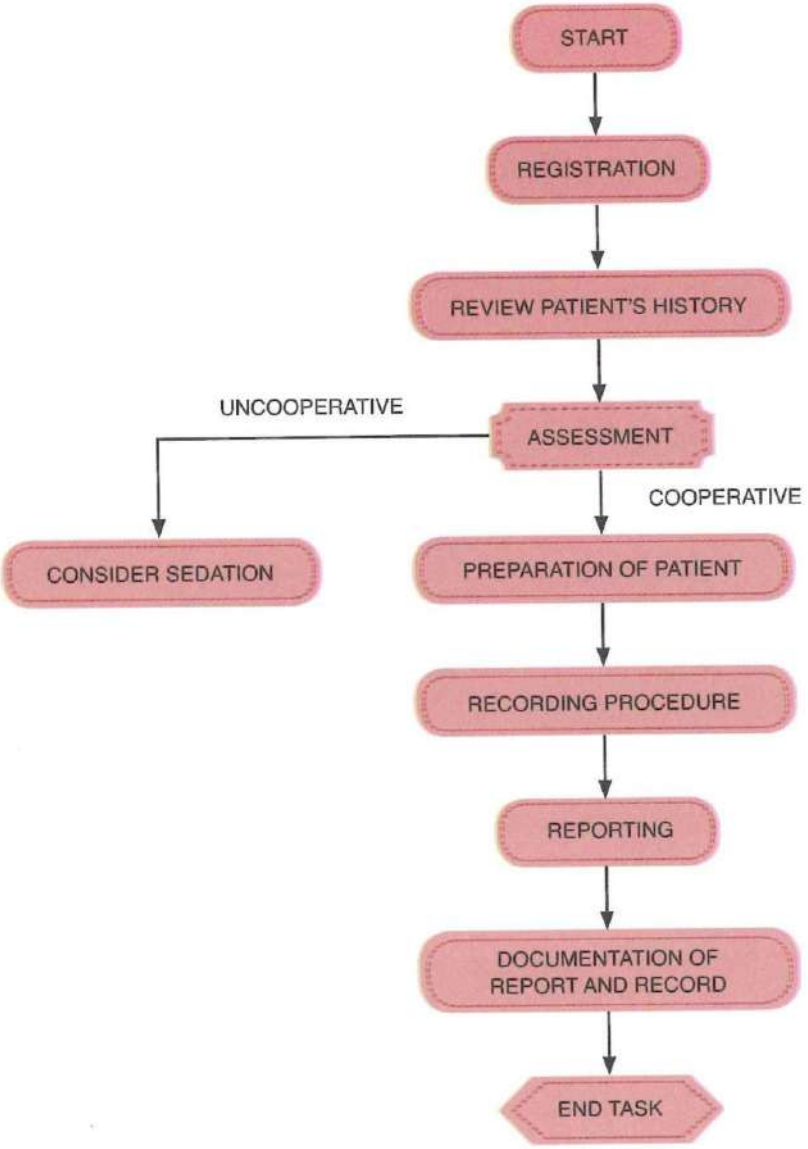
VIDEO TELEMETRY RECORDING (VTR)

9. VIDEO TELEMETRY RECORDING (VTR)

ACTIVITY	WORK PROCESS	STANDARD	REQUIREMENT
1. Registration	1. Receive appointment form 2. Confirm patient schedule / appointment	1. Name 2. I/C number 3. R/N 4. Age 5. Sex 6. Race 7. Address 8. Phone number 9. Diagnosis 10. Date	1. EEG for VTR request card
	3. Register in the standard registration system		1. Registration book / system
2. Review Patient's History	1. History of Sleep interference 2. Last seizure 3. Family history 4. Medical/Surgical history 5. Medication 6. Previous VTR	Trace old report (if any exist)	
3. Assessment	1. Patient's general appearance & mental status	1. Normal 2. Alert 3. Uncooperative 4. Mentally challenged 5. Confused 6. Comatose 7. Drowsy /Sleepy 8. Sedated 9. Aphasic	
	3. Prepare IV line		1. Branula 2. Stopper 3. Alcohol Swab 4. Plaster 5. Kidney Dish
4. Preparation of Patient	1. Self- introduction (if applicable) 2. Explain the procedure (if applicable) 3. Obtain verbal consent (if applicable) 4. Position and ensure the patient is comfortable 5. Enter patient's demographic data in the system 6. Measure, mark and gently degrease site with abrasive prepping gel	Introduce yourself to patient/relative (if applicable) With chaperon (if required) 10 - 20 International System	1. Measuring tape 2. Dermatograph pencil 3. Skin conditioner 4. Gauze / Cotton

ACTIVITY	WORK PROCESS	STANDARD	REQUIREMENT
	7. Attach electrodes correctly and securely		1. EEG electrodes 2. Micropore 3. Paste 4. Crepe Bandage 5. Stockinet
5. Recording Procedure	1. Perform calibration (mechanical & biological)	1. Sensitivity 100 μV 2. HFF 70 Hz 3. LFF 0.5 Hz 4. Time base 30mm/sec 5. 10mm deflection at 100 μV sensitivity	**Equipments:** 1. VTR machine
	2. Impedance check	< 5 kΩ	
	3. Recording Duration	Minimum 3 days / 3 seizures	
	4. Record with appropriate montage		
	5. Activation Procedures	1. Eyes open / Eyes close (if applicable) 2. Hyperventilation (minimum 3 mins HV and 2 mins post HV) 3. Photic stimulation with appropriate flashes	
	6. Annotation of events		
	7. Identify and eliminate or minimize biological and physical artifacts		
	8. Perform Calibration (biological & mechanical)	1. Sensitivity 100 μV 2. HFF 70 Hz 3. LFF 0.5 Hz 4. Time base 30mm/sec 5. 10 mm deflection at 100 μV sensitivity	
	9. Remove all electrodes and paste, gently from patient's scalp		
	10. Clean the electrodes		1. Water 2. Sodium Hypochloride 5% (if infectious cases suspected)
6. Reporting	1. Compile VTR record	AMO	
	2. Prepare factual report (if required)		
	3. Send VTR record for reporting	Neurologist	
7. Documentation of report and record	1. Archive VTR record in the system		
	2. Despatch and file report	Despatch book	

FLOW CHART VIDEO TELEMETRY RECORDING (VTR)



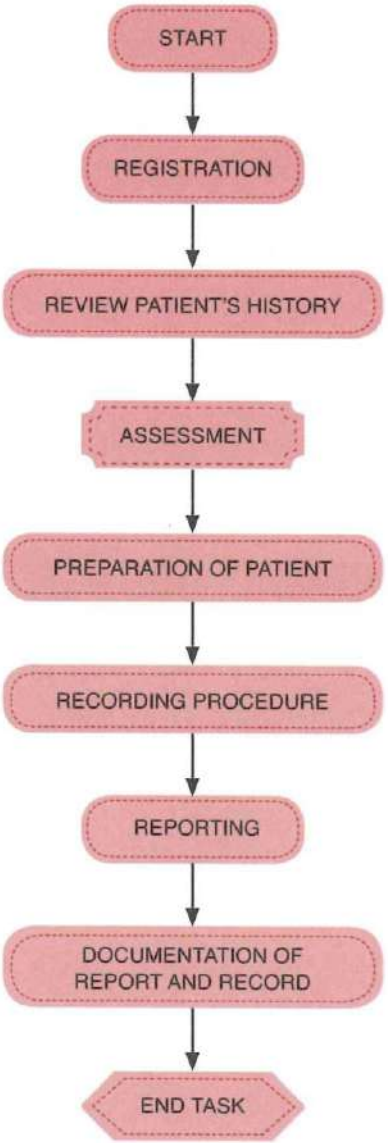
ELECTROCEREBRAL INACTIVITY (ECI)

10. ELECTROCEREBRAL INACTIVITY (ECI)

ACTIVITY	WORK PROCESS	STANDARD	REQUIREMENT
1. Registration	1. Receive appointment form	1. Name 2. I/C number 3. R/N 4. Age 5. Sex 6. Race 7. Address 8. Phone number 9. Diagnosis 10. Date	1. EEG request card
	2. Register in the standard registration system		1. Registration book / system
2. Review Patient's History	1. Date of coma onset 2. Medical/Surgical history 3. Medication 4. Previous EEG	Trace old report (if any exist)	
3. Assessment	1. Patient's general appearance		
4. Preparation of Patient	1. Self - introduction	Introduce yourself to patient's relative With chaperone (if required)	
	2. Explain the procedure 3. Enter patient's demographic data in the system 4. Measure, mark and gently degrease site with abrasive prepping gel	10 - 20 International System	1. Measuring tape 2. Dermatograph pencil 3. Skin conditioner 4. Gauze / Cotton
	5. Attach electrodes correctly and securely		1. EEG electrodes 2. Micropore 3. Paste
5. Recording Procedure	1. Record patient's body temperature 2. Perform calibration (mechanical & biological)	1. Sensitivity 100 μV 2. HFF 70 Hz 3. LFF 0.5 Hz 4. Time base 30mm/sec 5. 10 mm deflection at 100 μV sensitivity	**Equipments:** 1. EEG machine 2. Thermometer

ACTIVITY	WORK PROCESS	STANDARD	REQUIREMENT
	3. Impedance check 4. Activation Procedures	< 5kΩ **Stimulation** 1. Pinching 2. Clapping 3. Open patient's eyes manually	
	5. Record with appropriate montage	Bipolar montage minimum 20 minutes with a minimum sensitivity of 2 μV/mm	
	6. Annotation of events 7. Identify and eliminate or minimize biological and physical artifacts		
	8. Perform calibration (biological & mechanical)	1. Sensitivity 100 μV 2. HFF 70 Hz 3. LFF 0.5 Hz 4. Time base 30mm/sec 5. 10 mm deflection at 100 μV sensitivity	
	9. Record patient's body temperature 10. Remove all electrodes and paste, gently from patient's scalp 11. Clean the electrodes		1. Water 2. Sodium Hypochloride 5% (if infectious cases suspected)
6. Reporting	1. Compile EEG record 2. Prepare factual report (if required) 3. Send EEG record for reporting	AMO Neurologist	
7. Documentation of report and record	1. Archive EEG record in the system 2. Despatch and file the report	 Despatch book	

FLOW CHART ELECTROCEREBRAL INACTIVITY (ECI)



APPENDIX

NEUROPHYSIOLOGY PROCEDURES STANDARD REQUEST FORM

Example

HKL / NEUR / AK-04-01

UNIT NEUROFISIOLOGI
UJIAN EEG

1. NAMA_____ 2. UMUR_____ 3. JANTINA_____ 4. NO. EEG_____

5. TARIKH_____ 6. NO. DAFTAR_____ 7. NO. K.P_____

8. DIAGNOSIS_____

9. SEJARAH (PEMBEDAHAN, KECEDERAAN KEPALA, UMUR MULA SAWAN, POLA KEKERAPAN, TARIKH KEJADIAN SEREBROVASKULAR, KECEDERAAN ATAU PEMBEDAHAN)

_____

_____

_____

_____

_____

10. TARIKH INSIDEN TERAKHIR_____

11. PENEMUAN KLINIKAL POSITIF (PEMERIKSAAN FIZIKAL NEUROLOGI)_____

12. PENEMPATAN KLINIKAL_____ 13. PENGIRI ATAU PENGANAN_____

14. PENGUBATAN_____ 15. TARIKH PENGUBATAN DIBERHENTIKAN_____

16. TARIKH EEG TERDAHULU_____ 17. TUJUAN UJIAN EEG_____

18.RANGSANGAN DIBENARKAN_____

19. HANTARKAN LAPORAN KEPADA_____ 20. WAD_____ 21. KLINIK_____

22. PAKAR PERUNDING/PAKAR_____ 23. TANDATANGAN DAN COP PAKAR_____

(SILA PENUHKAN KAD INI DENGAN JELAS)

Example

HKL/NEUR/AK-04-02

UNIT NEUROFISIOLOGI
JABATAN NEUROLOGI
HOSPITAL KUALA LUMPUR
50586 JALAN PAHANG
KUALA LUMPUR
TEL: 03-26155408 FAX: 03-26155191

EVOKED POTENTIAL (VEP / SSEP / BAEP) REQUEST FORM

DATE OF REQUEST: DATE OF APPOINTMENT:

NAME: IC NO: R/N:

WARD / CLINIC: AGE: SEX:

ADDRESS: TEL NO: RACE:

CLINICAL SUMMARY:

HEIGHT:..... CM

VISUAL ACUITY:..... RIGHT:..... LEFT:.....

HEARING:.....

DIAGNOSIS:

TEST REQUIRED:

PHYSICIAN / SURGEON INCHARGE:

SIGNATURE:
NAME:

REPORT / COMMENT

IMPRESSION:

NEUROLOGIST:

DATE:

Example

HKL/NEUR/AK-04-03

UNIT NEUROFISIOLOGI
JABATAN NEUROLOGI
HOSPITAL KUALA LUMPUR
50586 JALAN PAHANG
KUALA LUMPUR
TEL: 03-26155408 FAX: 03-26155191

NERVE CONDUCTION STUDY (NCS) & ELECTROMYOGRAPHY (EMG) REQUEST FORM

DATE OF REQUEST: DATE OF APPOINTMENT:

NAME: IC NO: R/N:

WARD / CLINIC: AGE: SEX:

ADDRESS: TEL NO: RACE:

CLINICAL SUMMARY:

MUSCLE WITH FASICULATION:

DATE OF INJURY:

DIAGNOSIS:

TEST REQUIRED:

PHYSICIAN / SURGEON INCHARGE:

SIGNATURE:
NAME:

Example

HKL/NEUR/AK-04-04

UNIT NEUROFISIOLOGI
JABATAN NEUROLOGI
HOSPITAL KUALA LUMPUR
50586 JALAN PAHANG
KUALA LUMPUR
TEL: 03-26155408 FAX: 03-26155191

TRANSCRANIAL DOPPLER (TCD) REQUEST FORM

DATE OF REQUEST: DATE OF APPOINTMENT:

NAME: IC NO: R/N:

WARD / CLINIC AGE: SEX:

ADDRESS: TEL NO: RACE:

CLINICAL FINDINGS:

SIGNATURE:

NAME:

TCD REPORT

FINDINGS:

RIGHT			LEFT	
DEPTH (mm)	MV (cm/s)	MCA	DEPTH (mm)	MV (cm/s))
		ACA		
		PCA		
		VERTEBRAL		

BASILAR	
DEPTH (mm)	MV (cm/s)

TCD WINDOW:

TCD DONE BY:

FINDINGS AND CONCLUSION:

REPORT BY:

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- The members of Technical Committee
- The panel of reviewers
- The panel of contributors
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- Medical Assistant Board, Ministry of Health Malaysia
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