CLS

Course Guideline:

General Comprehensive Life Support for Practitioners 2016

The Thai Association for Emergency Medicine

Supported by Department of Medical Services,
Ministry of Public Health of Thailand

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Cover Design, Artworks and all Paintings: Somchai Kanchanasut M.D.

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National Library of Thailand

Cataloging in Publication Data

CLS Course Guideline: General Comprehensive Life Support for Practitioners 2016

NP Press 2016

-- Nonthaburi, Thailand--

120 p.

I. The Thai Association for Emergency Medicine, supported by Department of Medical Services

II. Somchai Kanchanasut M.D. Sant Hathirat M.D.

ISBN 978-616-11-3051-0

Printed in Thailand by NP. Press

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General Comprehensive Life Support for Practitioners 2016

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The Thai Association for Emergency Medicine

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The Thai Association for Emergency Medicine
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Foreword

The Thai Association for Emergency Medicine has been established for the prompt and proper care of emergency patients. Life-threatening conditions in various situations have caused significant losses in lives and permanent disabilities. However, several attempts including life-support courses have successfully achieved outstanding results, but they consume much time and extra resources for the overlapping procedures among different courses.

Accordingly, the Thai Association for Emergency Medicine initiated The Thai Advanced Life Support (TALS) course, which has been approved by the Thai Medical Council since 2003. TALS has been used to train emergency personnel (both physicians and nurses) and continuously revised for up-to-date improvement according to internationally accepted standards. TALS has recently been revised as "Comprehensive Life Support (CLS)" course for the expanded target groups from laypersons up to emergency personnel with systematic approach. Hopefully, these CLS courses will be beneficial to all emergency patients in all situations.

The purpose of this published course guideline is for facilitating training course of General CLS for the practitioners. We hope that the certified students will be able to deal with daily life-threatening conditions (General-CLS) successfully.

Special CLS (e.g. mass casualty incidents, major incidents and disasters) is not included in this course guideline and will be separately published.

Preface

Preventable death is one major factor in global health problem. Strategies to reduce death involved prevention of the occurrences of diseases (primary prevention), early detection and treatment (secondary prevention) and medical cares to reduce mortality (tertiary prevention) are essential to minimize the health problem.

Nowadays, emergency medicine and emergency care are well recognized as tools to achieve the above objectives. Both have been recently established as a specialty and a system since 1960's. They have been continuously developed to further advance knowledge, skills, holistic attitude to optimize all cares under the existing resources and culture of each locale.

Department of Medical Services, Ministry of Public Health of Thailand (DMS), always concerns about and works toward for the appropriate and up-to-date tools to reduce the preventable death. CLS is a system with series of training courses for several levels of providers initiated by the Thai Association for Emergency Medicine. CLS is intended to promote general adherence to the daily life of every peoples in Thailand and international communities.

We hope that this first published CLS course guideline in English, "CLS Course Guideline: General Comprehensive Life Support for Practitioners 2016" supported by DMS will be significantly beneficial for saving lives and losses of humanity.

Suphan Srithamma, M.D.

Director General of Department of Medical Services,

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Part I

General CLS

Introduction

At present, there are many established life-support courses by many specialties in which the emergency personnel can hardly fulfil the trainings of all of them.

Those life-support courses contain many contents overlapping each other e.g. airway management, emergency assessment, cardio-pulmonary resuscitation, fluid management; and omitting some life-threatening conditions in other specialties e.g. no scene safety and no bleeding control before cardiopulmonary resuscitation (CPR).

Therefore, the Thai Association for Emergency Medicine supported by the Department of Medical Services, Ministry of Public Health, has created the Comprehensive Life Support (CLS) course in order to facilitate the learning and practicing of life supports for all emergency conditions regardless of specialties.

CLS is unique by using 4 steps of approaches: Detection, Determination, Deed and Destination as the main concepts of performances. CLS is confined to life-threatening conditions only. Comparing to other life-support courses, CLS is more comprehensive, more concise, less time consuming, less resources for training, more practical and more inclusive for all life-threatening emergency patients. CLS will help emergency personnel completely avoiding stepwise mistakes in detection and managing all life-threatening conditions.

CLS is not only for emergency doctors and nurses, but also for laypersons, first responders and out-of-hospital emergency medical services (EMS) personnel, by different levels of training. For doctors, there are two levels, one for general practitioners and the other for emergency physicians.

CLS comprises of two parts: one is General CLS for daily emergency conditions and the other is Special CLS for special situations e.g. mass casualties, disaster, epidemics. CLS includes both in- and out-of hospital portions.

Principles of CLS

The four Principles of CLS are unique for a systemic and concise approach to all critically ill patients in all emergency situations (see figure 1).

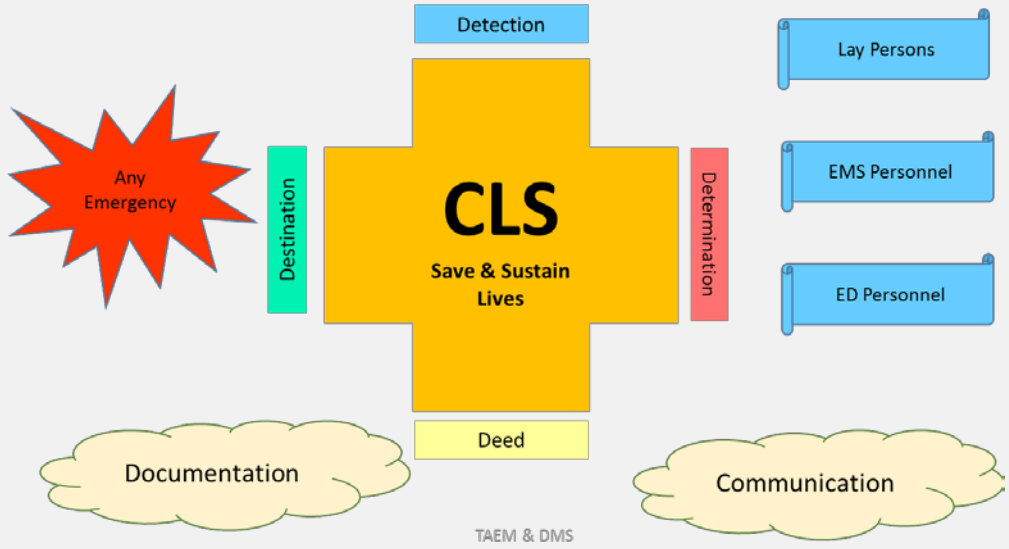


Figure 1: Principles of Comprehensive Life Support

1. **Detection** means the scene size-up for **safety** of the incidents and the recognition of **life-threatening conditions** of the patients including the need for help.
2. **Determination** means the processes of **triage** and **assessments** for appropriate cares in that circumstance:
    - **Triage** means the categorization of patients into priorities for successively immediate cares. This may differ in different circumstances and resources.
    - **Assessment** means determining the clinical conditions of the patients and the appropriate cares in that circumstance including scene safety.
3. **Deed** means actions or procedures to **provide emergency cares** with prior safety precautions by stepwise approaches according to the appropriate algorithm.
4. **Destination** means the processes of sorting and carrying out the **most appropriate transportation** and **definitive care** or disposition after the above "Deed".

CLS Emergency Level

CLS is designed for only life-threatening conditions. This may be comparable to Emergency Severity Index (ESI) level 1 and may include some critical patients of level 2 (see figure 2).

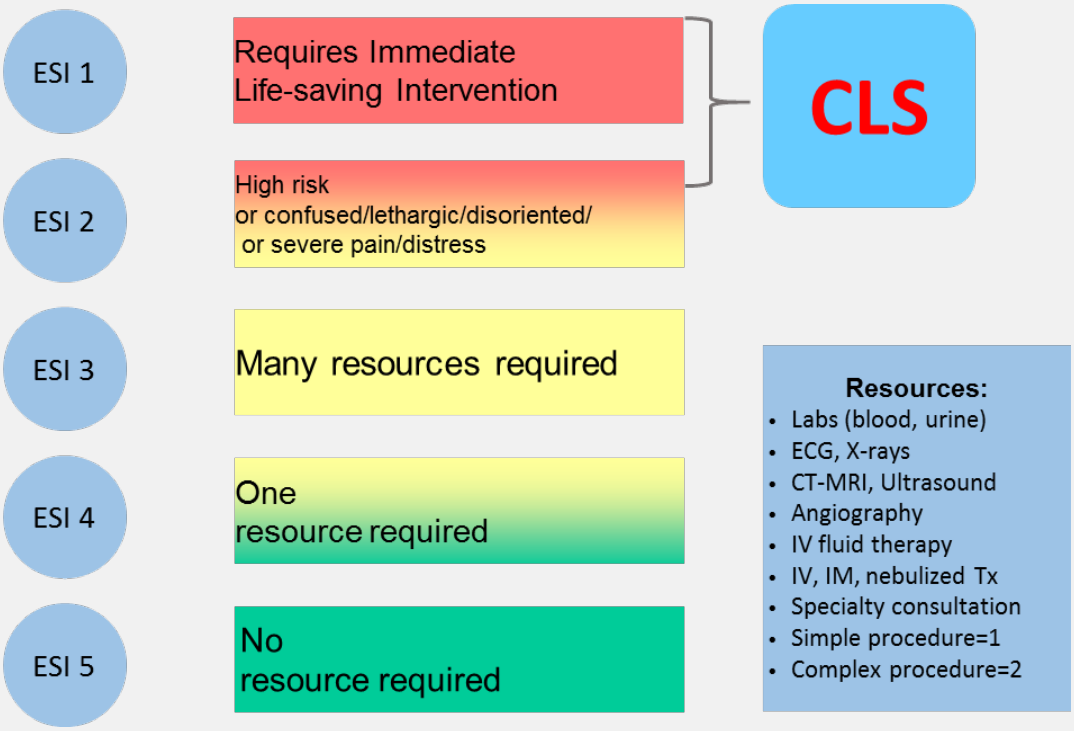


Figure 2: CLS Emergency Level compared to Emergency Severity Index

Symbols

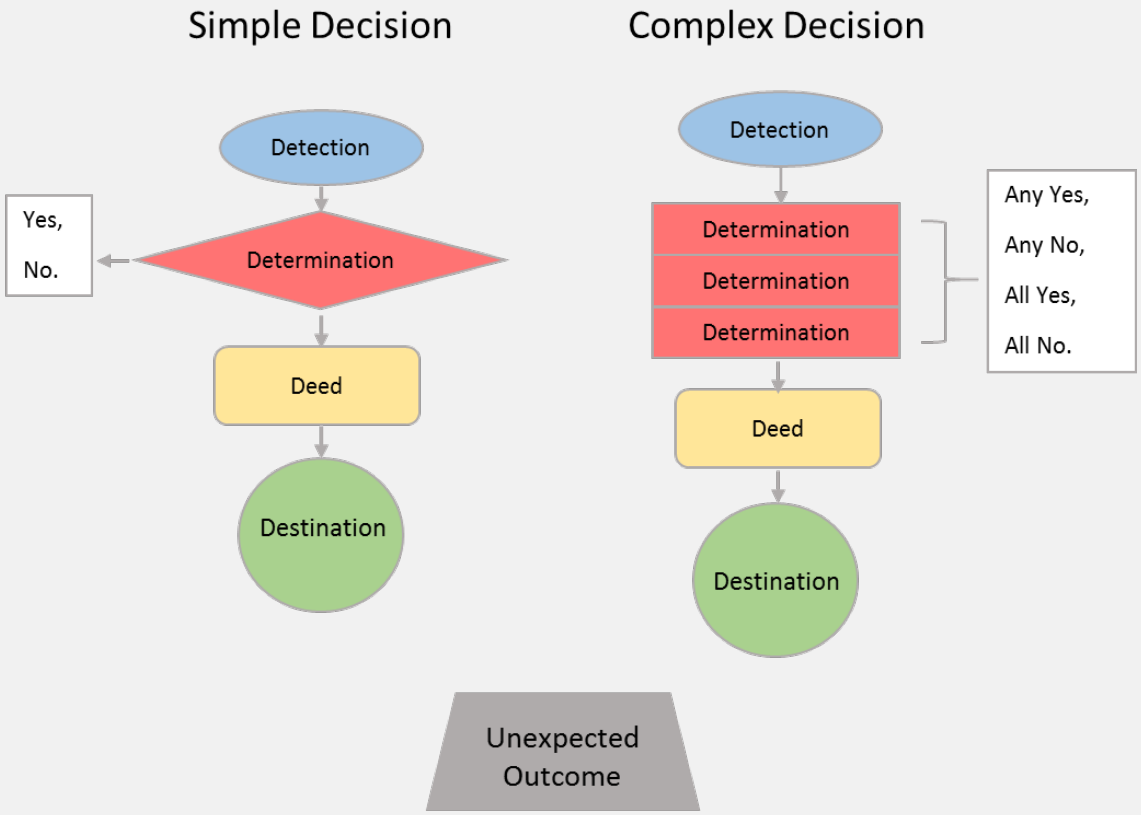


Figure 3: Symbols used in CLS algorithm

Symbols used in CLS algorithm are as follows (see figure 3): -

- The oval in light blue means the step of "**Detection**".
- The acute angled quadrangles in red means the step of "**Determination**".
  - The rhombus in red means "**single Determination**" or
  - The rectangle in red means "Determination in the group of Determinations".
- The round angled quadrangles in yellow means the step of "**Deed**".
- The circle in green means the step of "**Destination**".
- The acute angled trapezium in grey means the status of **unexpected outcome**

The General CLS

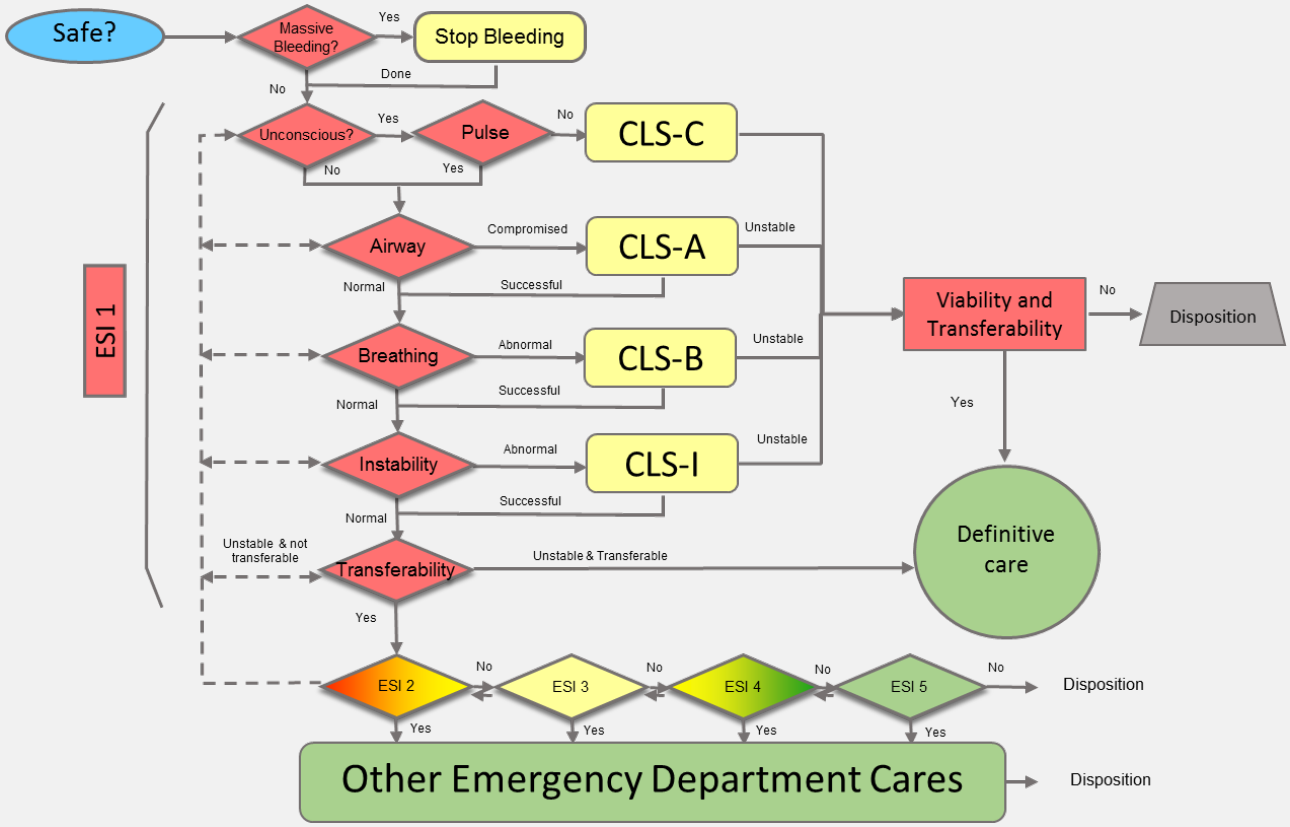


Figure 4: General CLS Algorithm

For any severe condition (emergency or not), the general CLS begins with the detection and determination whether the scene is safe for emergency care and the patient is not contaminated or contagious or not.

If no, then safety precautions should be established first.

If yes, then treat the patient according to the algorithm in figure 4.

If there is massive bleeding (in CLS means life-threatening bleedings e.g. pulsating bleeding, bleeding from severed limbs or large vessels) then stop the bleeding first if possible. (Detection time $\leq$ 2 sec, Doing time $\leq$ 30 sec)

If not possible, ask for special definitive care and give bolus IV fluid. Then go to the next step.

If the patient is unconscious and the carotid pulse is absent, then go to the CLS-C step. If the patient is conscious or unconscious with pulse present, then go to the next step. (Detection time $\leq$ 10 sec)

If the patient has difficulty in breathing or noisy breathing or any of the following inset, go to CLS-A step. If the patient is breathing easily or without noise, then go to the next step. (Detection time $\leq$ 5 sec)

- Agitation/panic/confusion/coma.
- Cyanosis.
- Breathing difficulty/gasping/apnea.
- Breath sounds: absent or noisy e.g. stridor, wheeze.

If the patient is breathing difficultly or with rate less than 10 per minute or over 30 per minute with signs or symptoms in the following inset, go to CLS-B step. If the patient is breathing well then go to the next step. (Detection time $\leq$10 sec)

- Labored and/or rapid ventilation.
- Discolored skin, lips or nails.
- Restlessness/confusion.
- Profuse sweating/hypotension.
- Persistent, dry and hacking cough.
- Generalized fatigue and weakness.

Examine the patient's general appearance and vital signs. If there are evidences of shock, coma/seizure, and/or time-sensitive emergency illness then go to CLS-I step. If there are none of the above, then go to the next step. (Detection time $\leq$ 30 sec)

If the patient needs further definitive care, then refer to the appropriate channel. If there is no appropriate channel, then the whole process of this algorithm should be repeated. If the patient is improved to a better emergency level, then go to the next steps (ESI 2- 5) i.e. other appropriate emergency care in emergency department.

At any time, if the patient becomes unstable, the whole process of the algorithm should be repeated (the dotted lines in the algorithm).

CLS-C (CLS-Cardiac arrest)

Definition:

Cardiac arrest in CLS means sudden cessation of effective blood circulation due to failure of cardiac pumping function.

Objectives:

After completion of this session, the student should be able to:

1. Recognize the cardiac arrest condition.
2. Identify treatable causes that may lead to cardiac arrest.
3. Explain the principles of CLS cardiac arrest resuscitation protocol.
4. Identify the conditions to withhold and terminate the resuscitation procedure.

Detection:

Signs of cardiac arrest:

- Sudden collapse.
- No or gasping respiration.
- No palpable carotid pulse.
- All of these should be detected within ten seconds, if not then assume the condition as cardiac arrest.

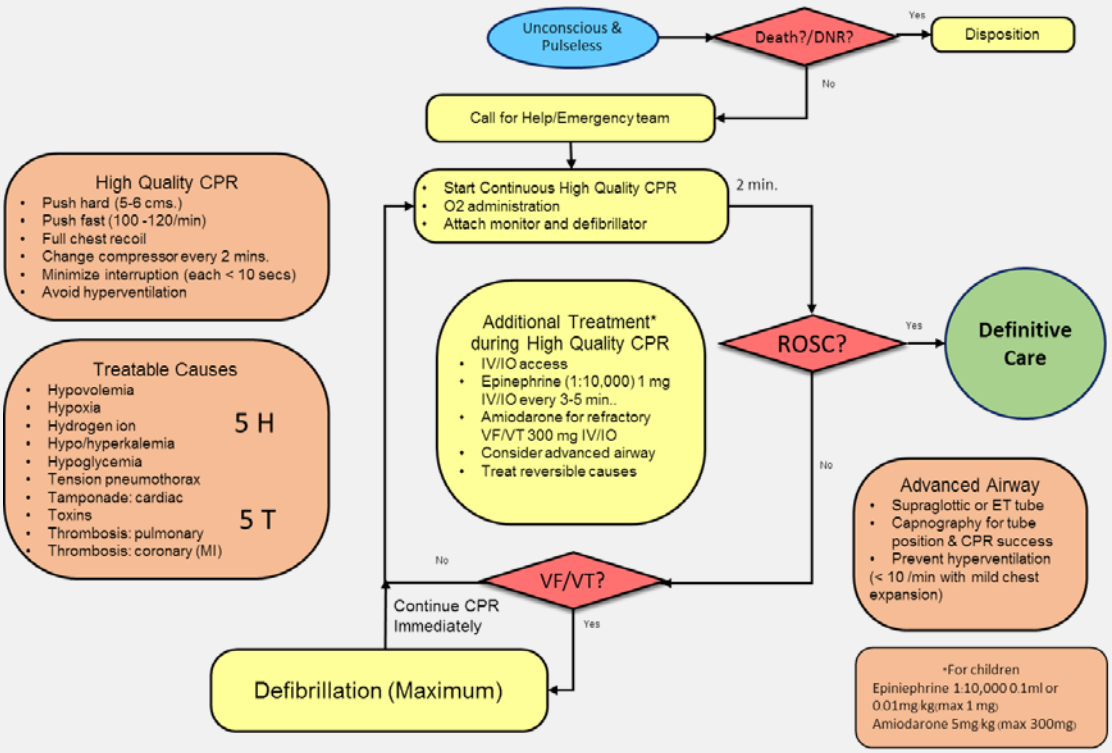


Figure 5: CLS-C Algorithm

Determination:

After detection, start "Deed" immediately.

Deeds:

(see CLS-C algorithm for cardiac arrest in figure 5)

1. Ensure scene and personnel safety. Then consider whether to withhold CPR. CPR should not be attempted in the following conditions:

   1. Scene and personnel safety cannot be guaranteed.
   2. There is any evidence of "Do Not Resuscitate (DNR)" order.
   3. Terminally ill cases.
   4. Unsalvageable cases.
   5. Severely contagious cases.

2. Call for help (from nearby persons, emergency call center, defibrillator etc. according to availability).
3. Start chest compressions:
   a. If there are two persons: One does the calling and the other starts chest compression.
   b. Give 30 chest compressions (to a depth of 5 to 6 cm in adults or 1/3 of chest thickness in small children for each compression and 30 chest compressions within 14-15 seconds i.e. 100 -120 times/min) followed by 2 ventilations (1-2 sec for each ventilation). The whole process is called CPR (Cardio-Pulmonary Resuscitation).

   High quality CPR means:

   - Push hard (5-6 cm in adult).
   - Push fast (100-120/min).
   - Full chest recoil.
   - Minimized interruption (<10 sec each time).
   - Change compressors every 2 mins.
   - Avoid hyperventilation.

4. Oxygen administration if available.

5. Evaluate the response to CPR every 2 minutes, if the patient starts to breathe spontaneously or move or have palpable carotid pulse, then the patient has the return of spontaneous circulation (ROSC).

6. When a defibrillator is available, attach the defibrillator and do the defibrillation if indicated (for automated external defibrillator, AED, the machine will decide when to do the defibrillation; for other defibrillators, defibrillation will be done when the ECG monitoring shows ventricular fibrillation or ventricular tachycardia).
7. Start chest compressions immediately after defibrillation (do not try to analyze the cardiac rhythm after defibrillation, the rhythm should be analyzed after 2 minutes of CPR while changing the compressor).
8. Find treatable causes that lead to cardiac arrest (see inset below) and treat them if possible.
9. During the high quality CPR, do the additional treatments,
    a. Start IV/IO access as soon as possible.
    b. Epinephrine 1:10,000, 1 mg. IV/IO push followed by 10 ml. NSS IV push. In children: 0.01 mg/kg (max 1 mg). This should be repeated every 3-5 minutes if there is no ROSC.

Treatable Causes (5H – 5T)

- Hypovolemia
- Hypoxia
- Hydrogen ion
- Hypo/hyperkalemia
- Hypoglycemia
- Tension Pneumothorax
- Tamponade: Cardiac
- Toxins
- Thrombosis: Pulmonary
- Thrombosis: Coronary (MI)

    c. Amiodarone 300 mg. IV/IO push followed by 10 ml. NSS IV push. If there is no ROSC in 2 minutes another dose of 150 mg. of Amiodarone may be repeated. In children: 5 mg/kg (max 300 mg)
    d. Endotracheal intubation with Ambu bag ventilation.
    e. Continuous chest compressions (without interruption while ventilating through the endotracheal tube <10 times/min).

f. Continue the whole process of CPR until ROSC or there is any indication for the termination of CPR (see inset below).

Termination of CPR:

Consider termination of CPR in:

- Patients who remain in asystole or PEA for greater than 20-30 minutes of proper CPR except patients with drug overdoses, hypothermic arrest, or other special situations.
- Intubated patients with capnography, failure to achieve an $ETCO_2$ of greater than 10 mm. Hg after 20 minutes of proper CPR may be considered as another criterion in addition to the above.
- If there is any evidence of "Do Not Resuscitate (DNR)" at any time.

Destination:

After resuscitation effort, the patient will eventually have either ROSC or unsuccessful resuscitation.

After ROSC, the patient should go to Post-cardiac arrest protocol. The cause of arrest should be identified and treated. For example, the patient suspected to have coronary thrombosis should have primary percutaneous coronary intervention (PCI) if possible.

Immediate post-cardiac arrest treatment consists of

1. Intensive monitoring and cares.
2. Stabilization of vital signs.
3. Targeted Temperature Management (TTM) or Therapeutic hypothermia if available.

After the step of CLS-C is fulfilled, go to step CLS-A.

CLS-A (CLS-Airway)

Definition:

CLS-A in CLS at this step means the process to manage the problem of airway compromise in order to save and sustain life.

Airway Compromise in CLS at this step means a life-threatening failure of ventilation caused by partial or total obstruction of the airway without cardiac arrest.

Objectives:

After completion of this session, the student should be able to:

1. Recognize symptoms and signs of airway compromise.
2. Be able to identify causes and properly open the airway.

Detection:

Airway compromise may be detected from the following symptoms and signs:

- Agitation/panic/confusion/coma.
- Cyanosis.
- Breathing difficulty/gasping/apnea.
- Breath sounds: absent or noisy e.g. stridor, wheeze.

Determination:

The patient with airway compromise should be determined according to the simplicity and the time constraint of the management (see CLS-A algorithm in figure 6).

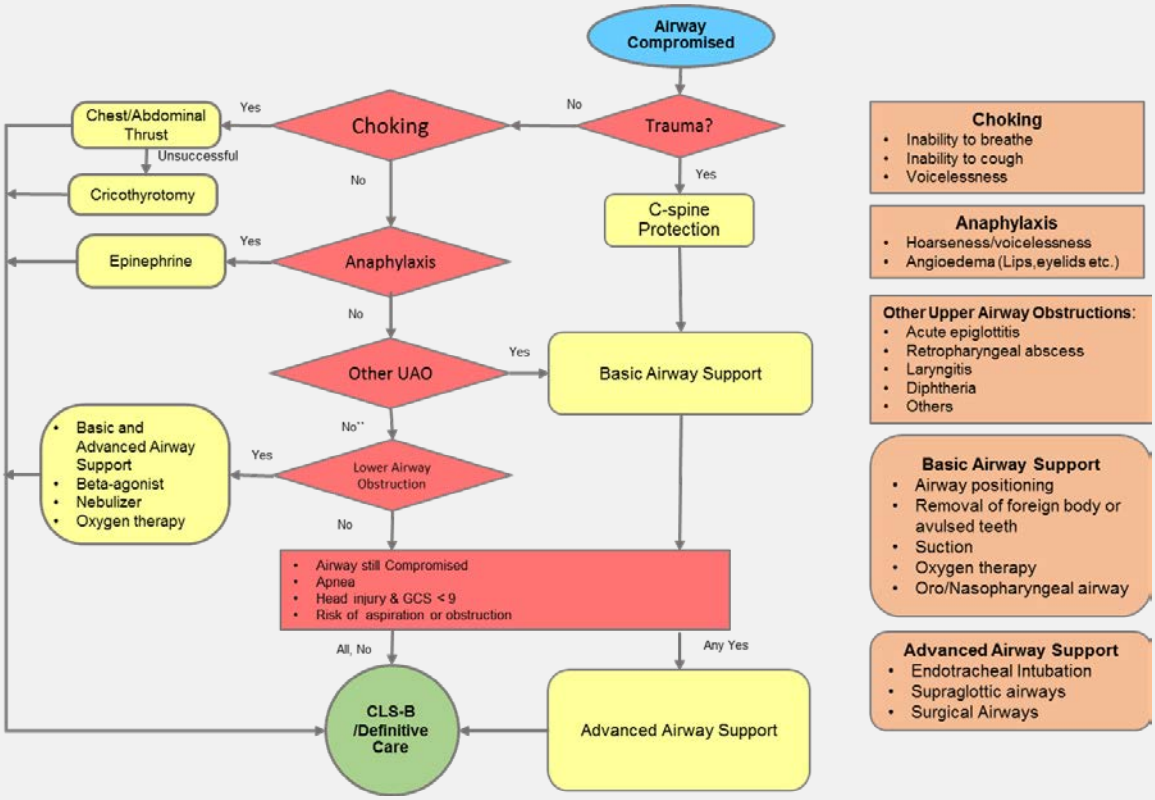


Figure 6: CLS-A Algorithm

Deeds:

- When a patient with airway compromise is detected, the first step is to determine whether it is caused by trauma or not.
- If yes, then C-spine protection should be performed followed by basic airway support (see inset below).

Basic Airway Support

- Airway positioning
- Removal of FB or avulsed teeth
- Suction
- Oxygen therapy
- Oro/Nasopharyngeal airway

- If there is any indication for advanced airway support and without any contraindication, then give advanced airway support (see insets below).

Indications for Advanced Airway Support:

- Airway still compromised.
- Apnea.
- Head injury & GCS < 9.
- Risk of aspiration and obstruction.

Contraindications for non-surgical advanced airways:

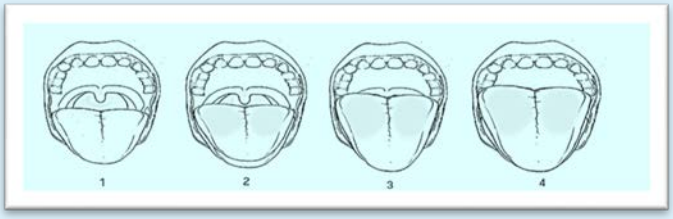
1. Threatening complete obstruction of upper airway e.g. acute laryngeal spasm, acute epiglottitis, severe narrowing of the throat by inflammations.
2. Threatening hemorrhage or more injuries e.g. acute maxillofacial injuries.
3. Threatening aspiration of blood, pus or others.
4. Other risks e.g. LEMON (Look, Evaluate, Mallampati score, Obstruction, Neck).

LEMON

1. **L**ook for difficulties in intubation.
2. **E**valuate by using 3 fingers to measure the width between:
    - upper and lower front teeth.
    - mentum and hyoid bone.

(If the width is narrower, intubation is risky)

3.**M**allampati classification: Ask the patient (standing position is preferred) to open the mouth with the tongue sticking out and say "Ahh". If the tonsillar pillars are visible, then it is Mallampati class 1 (easiest). If only the palate is visible, it is Mallampati class 4 (most difficult). For details, see figure below



4. **O**bstruction: e.g. soft tissue swelling from smoke inhalation burns, broken neck, foreign bodies.
5. **N**eck: e.g. stiff neck, broken neck.

Advanced Airway Support

- Endotracheal Intubation
- Supraglottic airways
- Surgical Airways

Then transfer to the trauma specialist or the definitive care.

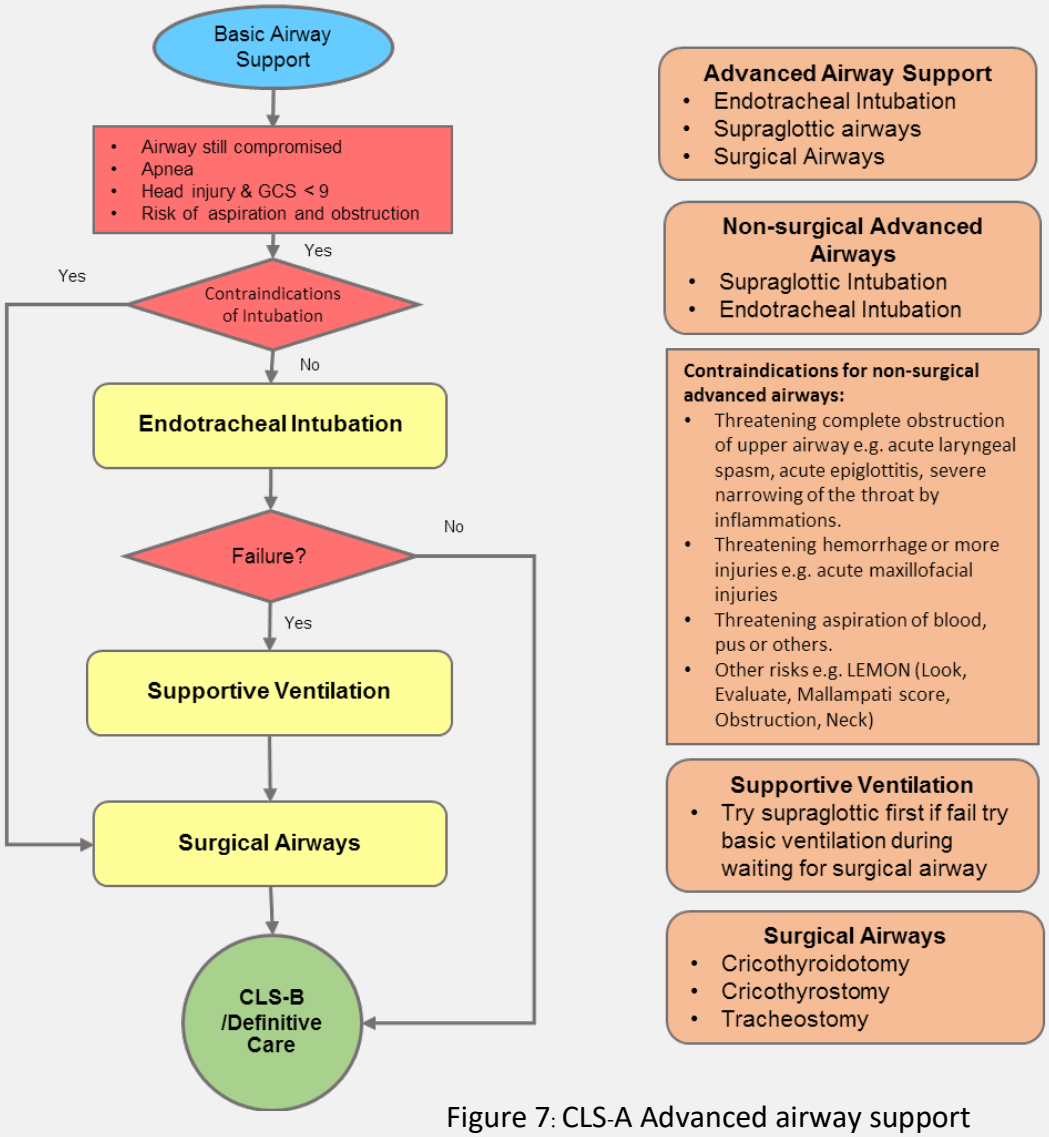


Figure 7: CLS-A Advanced airway support

If the condition of the patient is not caused by trauma, the patient should be examined whether the patient has choking or not.

Sign of Choking:

- Inability to breathe
- Inability to cough
- Voicelessness

If yes, then chest/abdominal thrust should be performed. If successful, the patient should be transferred to the definitive care. If not, cricothyroidotomy or any surgical airway may be considered. If the patient is unconscious, start CPR.

If the patient has no choking, determine whether there is any evidence of anaphylaxis (e.g. history, angioedema of lips/eyelids). If yes, adrenaline should be administrated, then transfer to the definitive care.

If no, determine whether there is other kinds of obstruction (e.g. diphtheria, laryngitis, epiglottitis, peri-tonsillar abscess, retropharyngeal abscess, chemical burns) or not. If yes, give basic airway support, then determine whether there is contraindication for endotracheal intubation or not. If no, then insert the endotracheal tube (see figure 6). If fail or there is any contraindication for endotracheal intubation, then consider supportive ventilation and surgical airway (see figure 7).

Surgical Airways

- Needle Cricothyroidotomy
- Surgical Cricothyroidotomy
- Tracheostomy

If no other causes of airway obstruction, consider whether there is lower airway obstruction or not. If yes, treat with beta-agonist nebulizer, oxygen therapy and intubation (see figure 6).

If no, determine whether there is any contraindication for non-surgical advanced airway or not. If yes, do the surgical airway (see figure 7).

Destination:

Every patient with airway compromise after having managed with CLS-A should be transferred to the definitive care or special care.

If the step in CLS-A is fulfilled, then go to the step CLS-B.

CLS-B (CLS-breathing)

Definition:

CLS-B in CLS at this step means the process to manage respiratory distress in order to save and sustain life.

Respiratory distress in CLS at this step means a life-threatening failure of respiration without cardiac arrest and airway compromise.

Objectives:

After completion of this session, the student should be able to:

1. Recognize the respiratory distress conditions.
2. Identify causes and properly manage each cause/condition.

Detection:

Respiratory distress can be detected from the following symptoms and signs:

- Labored and/or rapid ventilation.
- Discolored skin, lips or nails.
- Restlessness/confusion.
- Profuse sweating/hypotension.
- Persistent, dry and hacking cough.
- Generalized fatigue and weakness.

Some investigations may help to confirm the condition:

- Peripheral oxygen saturation/blood gas study.
- Chest X-ray.

Determination:

The patient with respiratory distress should be determined according to the simplicity and the time-constraint of the management (see CLS-B algorithm in figure 8).

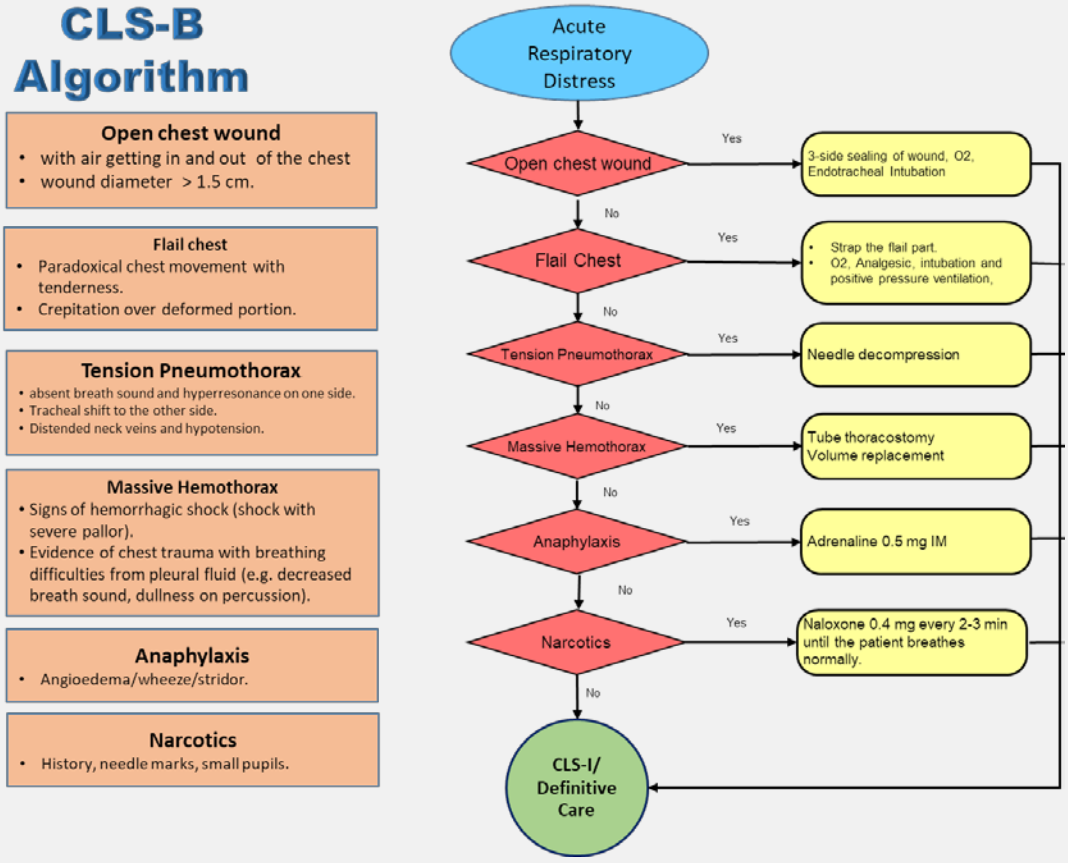


Figure 8: CLS-B algorithm

Deeds:

- When respiratory distress is detected, the first step is to determine whether the patient has an open chest wound with air getting in and out of the chest or the wound diameter >1.5 cm. or not. If yes, rapidly apply 3-side sealing of the wound, give oxygen and consider intercostal drainage and endotracheal intubation with assisted ventilation if necessary. Then, transfer to the definitive care.

Flail chest

- Paradoxical chest movement with tenderness.
- Crepitation over deformed portion.

- If no, then determine whether the patient has flail chest or not. If yes, strap the flail portion, give oxygen and analgesic if no contraindication, and then consider endotracheal intubation with positive pressure ventilation if necessary. Then, transfer to the definitive care.
- If flail chest is not found, determine whether the patient has tension pneumothorax or not. If yes, needle decompression should be performed (see page 78). Then transfer to the definitive care.

Tension pneumothorax
- Absent breath sound and hyperresonance on one side.
- Tracheal shift to the other side.
- Distended neck veins and hypotension.

- If tension pneumothorax is not present, determine whether the patient has any massive hemothorax or not. If massive hemothorax is present, chest tube insertion with drainage and volume replacement should be performed.

Massive hemothorax
- Signs of hemorrhagic shock (shock with severe pallor).
- Evidence of chest trauma with breathing difficulties from pleural fluid (e.g. decreased breath sound, dullness on percussion).

- If no massive hemothorax is found, then consider whether the patient has any anaphylactic cause or not (i.e. wheezy, angioedema). If any anaphylactic cause is identified, then adrenaline should be drug of choice to administrate. Then, transfer to the definitive care.

Anaphylaxis
Angioedema/wheeze/stridor.

- If no evidence of anaphylaxis and there is history of narcotic usage, needle marks and small pupils then consider narcotic overdose. Give naloxone 0.4 mg IV every 2-3 min until the breathing returns to normal. Beware that overdoses of naloxone will cause withdrawal symptoms and/or respiratory depression. Then, transfer to the definitive care.

Destination:

Every patient with breathing difficulties, after having managed with CLS-A, should be transferred to the definitive care or special care.

If the step in CLS-B is fulfilled, then go to the step CLS-I.

CLS-I (CLS-Instabilities)

Definition:

CLS-I at this step means comprehensive life support in life-threatening conditions other than the above conditions (CLS-C, CLS-A and CLS-B)

Objectives

After completion of this session, the student should be able to:

1. Know the components of CLS-I.
2. Manage life-threatening instabilities according to CLS-I algorithm as in figure-9.

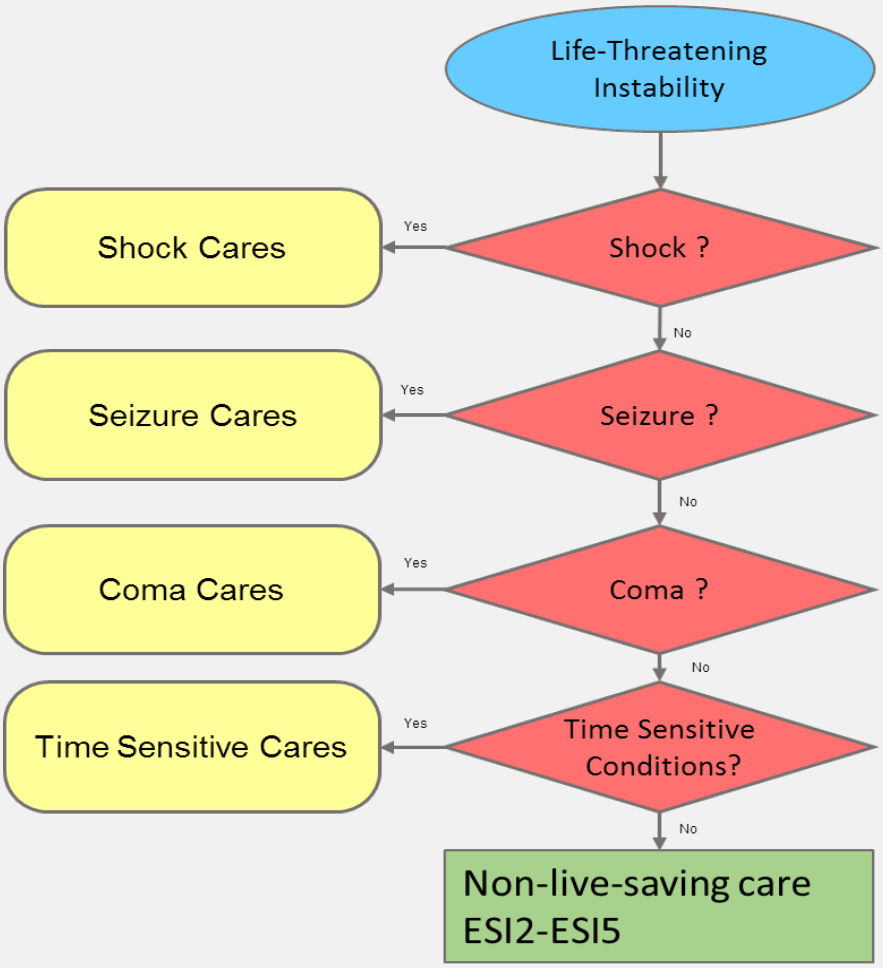


Figure 9: CLS-I Algorithm

CLS-I-Shock

Definition

Shock in CLS at this step means a state in which there is severe generalized hypoperfusion (inadequate blood supply) which is life-threatening without cardiac arrest, airway compromise and breathing difficulty.

Objectives

After completion of this session, the student should be able to:

- Recognize life-threatening signs of hypoperfusion.
- Know the causes of life-threatening hypoperfusion.
- Approach any life-threatening hypoperfusion properly.
- Stabilize patient before transferring to appropriate care.

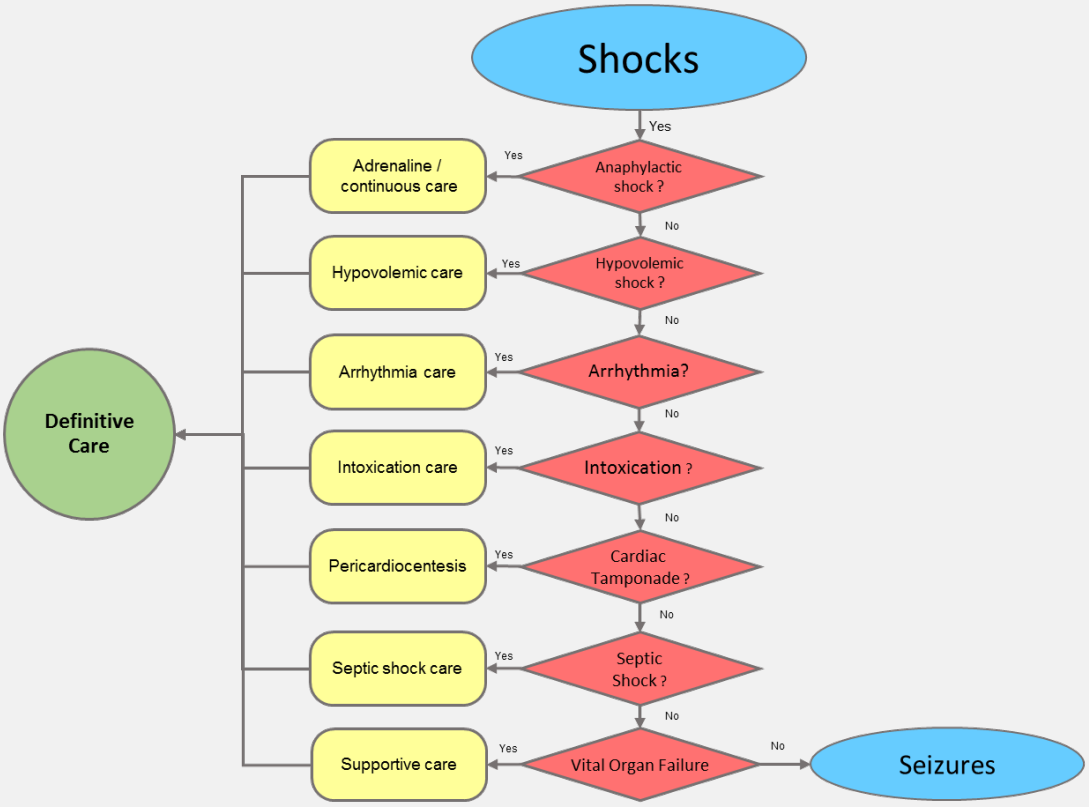


Figure 10: CLS-I-Shock Algorithm

Detection

Signs of hypoperfusion

1. Altered mental status e.g .somnolence, confusion, stupor.
2. Hyper-adrenergic status e.g .tachycardia, pallor, diaphoresis, cold clammy skin, delayed capillary refill, mottled cyanosis.
3. Vital signs e.g .tachycardia, tachypnea, hypotension.

Determination

The causes of shock (generalized hypoperfusion) may be due to:

1. Hypovolemia e.g .massive bleeding or fluid loss.
2. Obstructive shock e.g .tension pneumothorax, cardiac tamponade.
3. Neurogenic shock e.g .spinal shock.
4. Anaphylactic shock.
5. Septic shock.
6. Cardiogenic shock.
7. Metabolic shock e.g .hypoglycemia, Addisonian crisis, myasthenic crisis.
8. Drug interaction/intoxication.

Deed

Shock should be approached in a stepwise order as follow:

- Stop active bleeding (see "Hemorrhage Control" page 88)
- Treat anaphylactic shock (Adrenaline 0.5 mg IM, antihistamine and corticosteroid).
- Volume resuscitation for hypovolemia (fluid challenge).
- Treat life-threatening tachy-brady arrhythmias according to algorithms in figures 11-12.
- Consider antidote or supportive treatment for intoxications (see page 112-113).
- Treat cardiac tamponade (see page 79-82) or tension pneumothorax which may cause indirect cardiac tamponade (see page 78).
- Treat septic shock (IV antibiotic, fluid, vasopressor if necessary).
- Supportive care for vital organ failure.

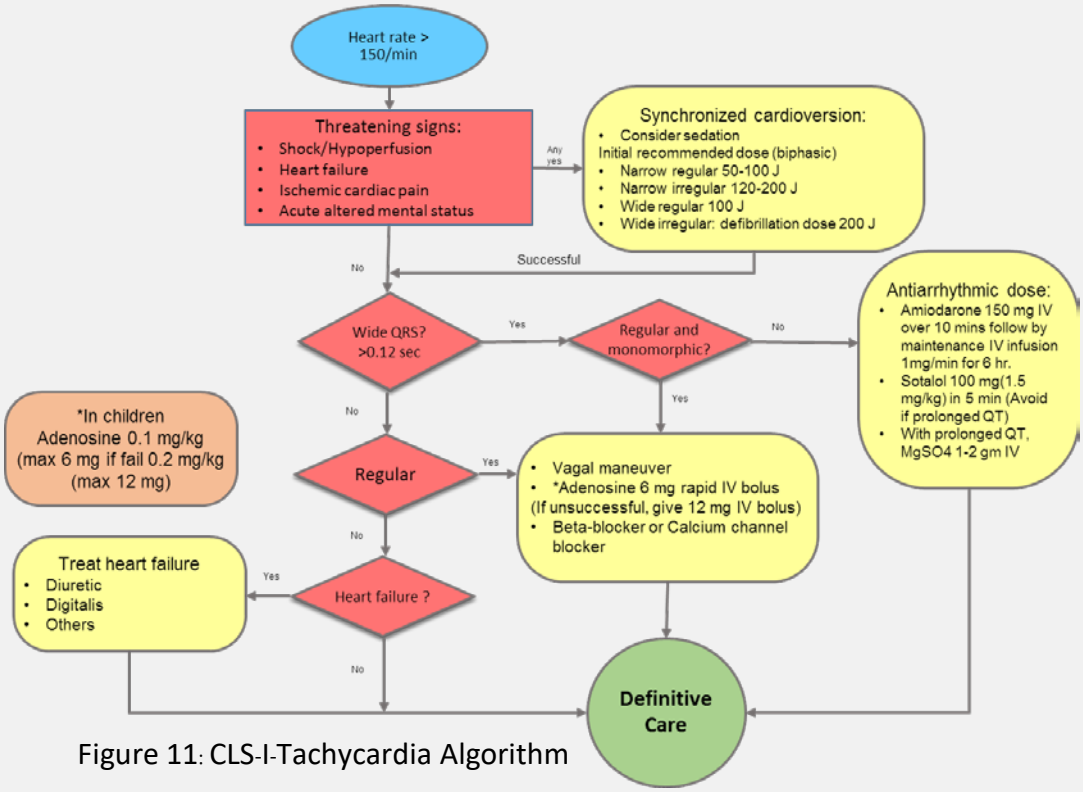


Figure 11: CLS-I-Tachycardia Algorithm

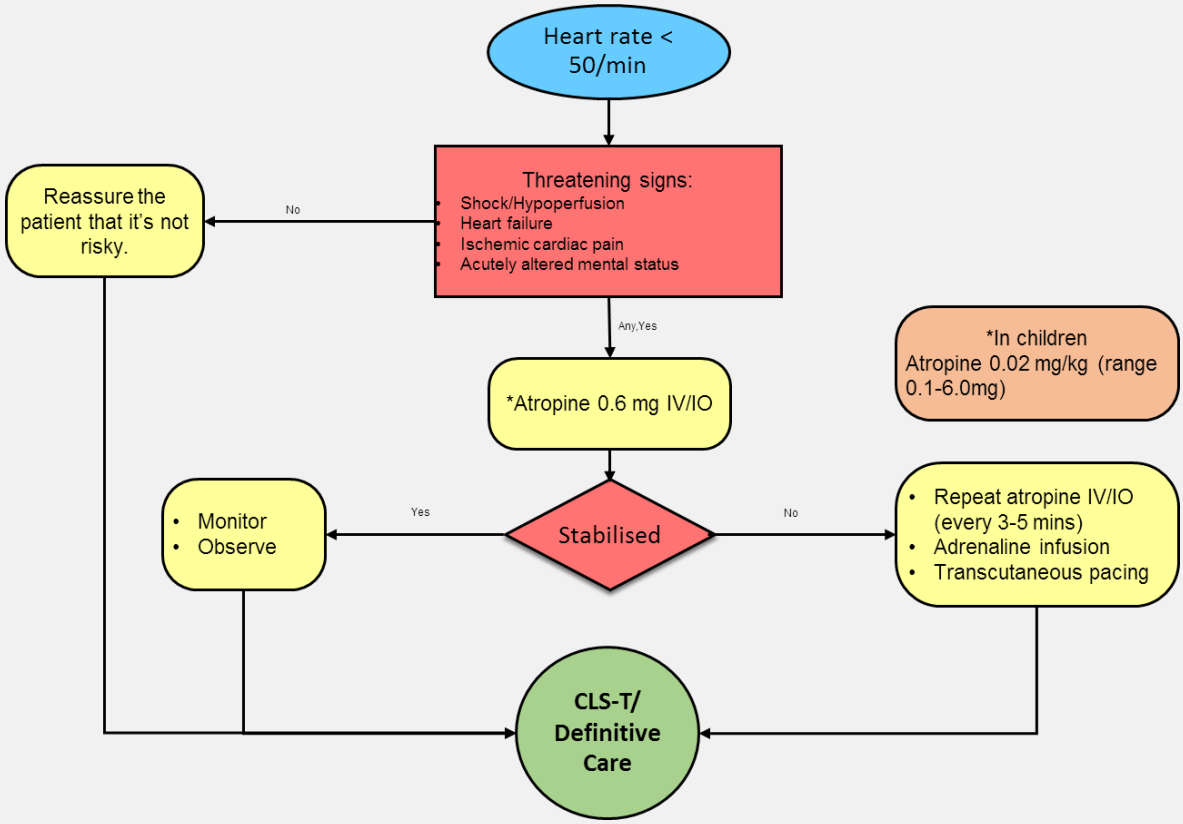


Figure 12: CLS-I-Bradycardia Algorithm

Destination:

Every patient with shock, after having managed with CLS-I-Shock, should be transferred to the definitive care or special care.

If the step in CLS-I-Shock is fulfilled, then go to the step CLS-I-Seizure.

CLS-I-Seizures

Definition:

Seizure in CLS at this step means generalized life-threatening abnormal motor movement without cardiac arrest, airway compromise, breathing difficulty, and shock.

Objectives:

After completion of this session, the student should:

1. Know life-threatening conditions in generalized seizures.
2. Approach conditions in No. 1 properly.

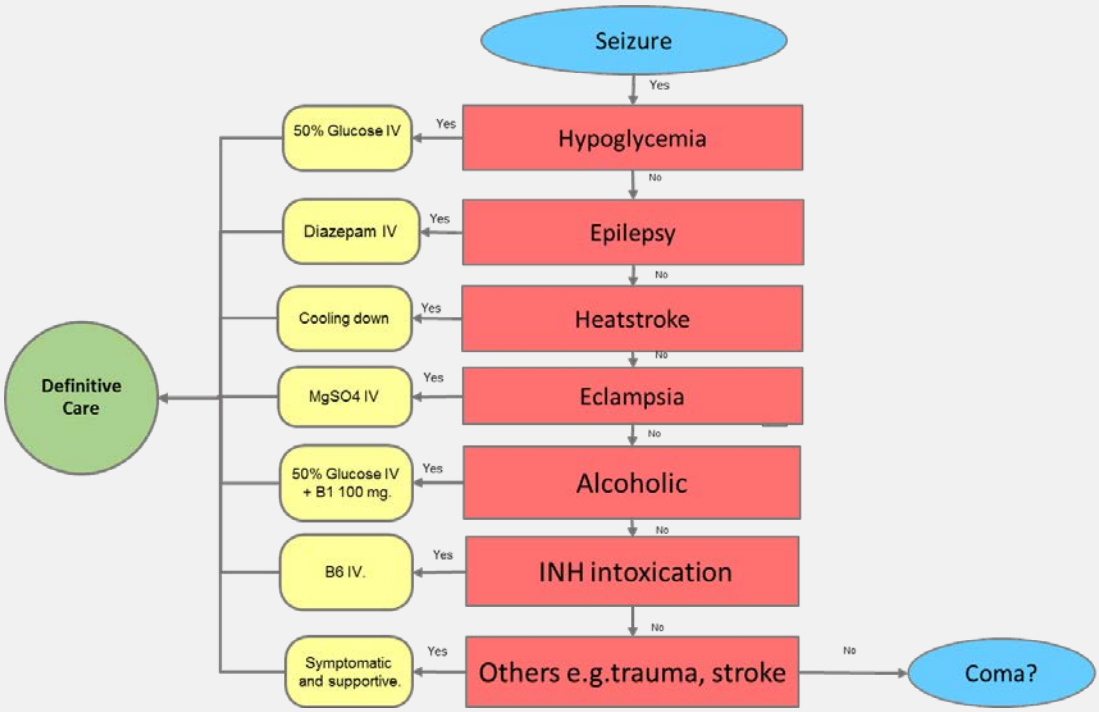


Figure 13: CLS-I-Seizures Algorithm

Detection

Signs of seizure:

1. Tonic and clonic motor movements with or without coma.
2. Signs and Symptoms of life-threatening conditions.

Determination

- Approach the seizure condition according to its severity and treatment simplicity according to algorithm in figure 13.

Deeds

- If seizure is detected, the first step is to determine whether there is hypoglycemia or not. If yes, give 50% glucose 50 ml IV push slowly; if the patient is improved, continue with glucose infusion.
- If not, consider whether the patient has epilepsy or not. If yes, give diazepam 10 mg IV; if the patient is improved consider other anticonvulsants or transfer to the definitive care.
- If no evidence of epilepsy and there is history of exposure to hot environment, then consider heat stroke and rapidly apply cooling techniques. If the patient is improved, transfer to the definitive care.
- If no evidence of heat stroke and the patient is pregnant in the last trimester, then consider eclampsia and rapidly give $MgSO_4$ 4 gm IV push followed by 10 gm IM. If the patient is improved, transfer to the definitive care.
- If no evidence of eclampsia and there is alcoholic smell or history, then consider alcoholic seizure. Give 50% glucose 50 ml plus Vitamin B1 100 mg IV push slowly. If the patient is improved, transfer to the definitive care.
- If no evidence of alcoholic problem and there is history of taking INH, then consider INH intoxication. Give Vitamin B6 (dosage is equal to the amount of INH ingested)
- If no evidence of INH intoxication, then consider other causes (e.g. trauma, stroke), give supportive and symptomatic treatment.

Destination:

Every patient with seizure, after having managed with CLS-I-Seizure, should be transferred to the definitive care or special care.

If the step in CLS-I-Seizure is fulfilled, then go to the step CLS-I-Coma.

CLS-I-Coma

Definition:

Coma in CLS at this step means suddenly and severely altered mental states that may be life-threatening without cardiac arrest, airway compromise, breathing difficulty, shock and seizure.

Objectives:

After completion of this session, the student should be able to:

1. Know the different levels of consciousness e.g. AVPU (Alert, Verbal responsive, Pain responsive, Unconscious), Glasgow coma scores (GCS).
2. Know life-threatening conditions in suddenly and severely altered mental states.
3. Approach conditions in No. 2 properly.

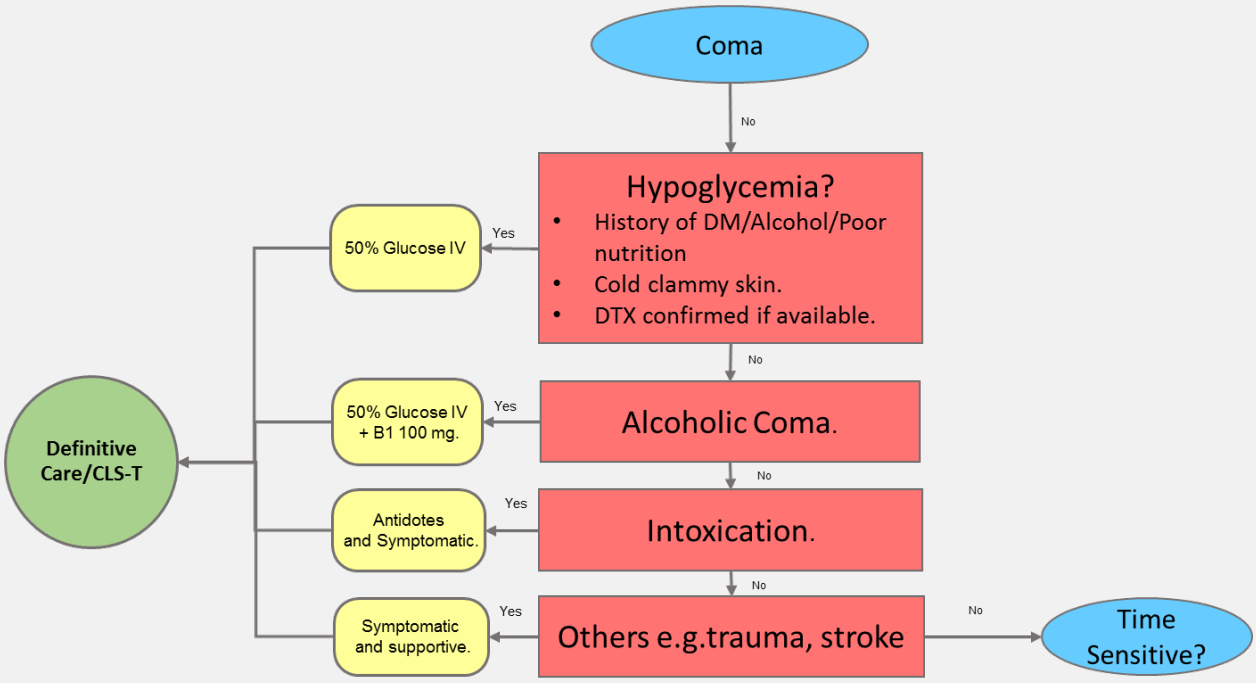


Figure 14: CLS-I-Coma Algorithm

Detection:

Any patient with GCS less than 9 or only pain responsive (in AVPU) should be treated as life-threatening coma.

Determination:

The coma patient should be managed according to CLS-I-Coma Algorithm in figure 14.

Deeds:

- If coma is detected, the first step is to determine whether there is evidence of hypoglycemia or not. If yes, give 50% glucose 50 ml IV push slowly. If the patient is improved, continue with glucose infusion.
- If not and there is alcoholic history or smell, give 50% glucose 50 ml plus Vitamin B1 100 mg IV push slowly. If improved transfer to the definitive care.
- If not, consider other intoxication. Give support and symptomatic treatment including antidote if available (see table in page 112).
- If no evidence of intoxication, consider other causes (e.g. trauma, stroke), treat accordingly and transfer to the definitive care.

Destination:

Every patient with coma, after having managed with CLS-I-Coma, should be transferred to the definitive care or special care.

If the step in CLS-I-Coma is fulfilled, then go to the step CLS-I-Time-sensitive.

CLS-I-Time-Sensitive

Definition:

Time-sensitive conditions in CLS at this step mean the conditions (without cardiac arrest, airway compromise, breathing difficulties, shock, seizure and coma) requiring prompt detection and cares in order to save life and avoid permanent disability.

Objectives:

After completion of this session, the student should be able to:

- Detect time-sensitive conditions.
- Manage and stabilize the conditions.
- Refer to appropriate care after stabilization.

Determination

The time-sensitive conditions in CLS include:

- Acute stroke
- Acute ST-elevation myocardial infarction (STEMI)
- Sepsis
- Multiple trauma

Stroke Fast Track

Definition

Stroke fast track in CLS means rapid interventions to relief cerebral ischemia within the signified time limit unless there are contraindications.

Objectives:

After completion of this session, the student should be able to:

- Detect stroke immediately.
- Manage and stabilize the conditions.
- Refer to appropriate care after stabilization.

Detection:

Stroke can present with a variety of symptoms, depending on the part of the brain that is affected. Clinical features include:

- Unilateral weakness of the body.
- Unilateral numbness/tingling sensation of the body.
- Slurred speech.
- Facial asymmetry.
- Dizziness.
- Imbalance gait.
- Blurred vision.

Cincinnati Stroke Scale for Laypersons:

- F - Facial asymmetry
- A - Arm drift
- S - Speech slurred
- T - Time to call for help

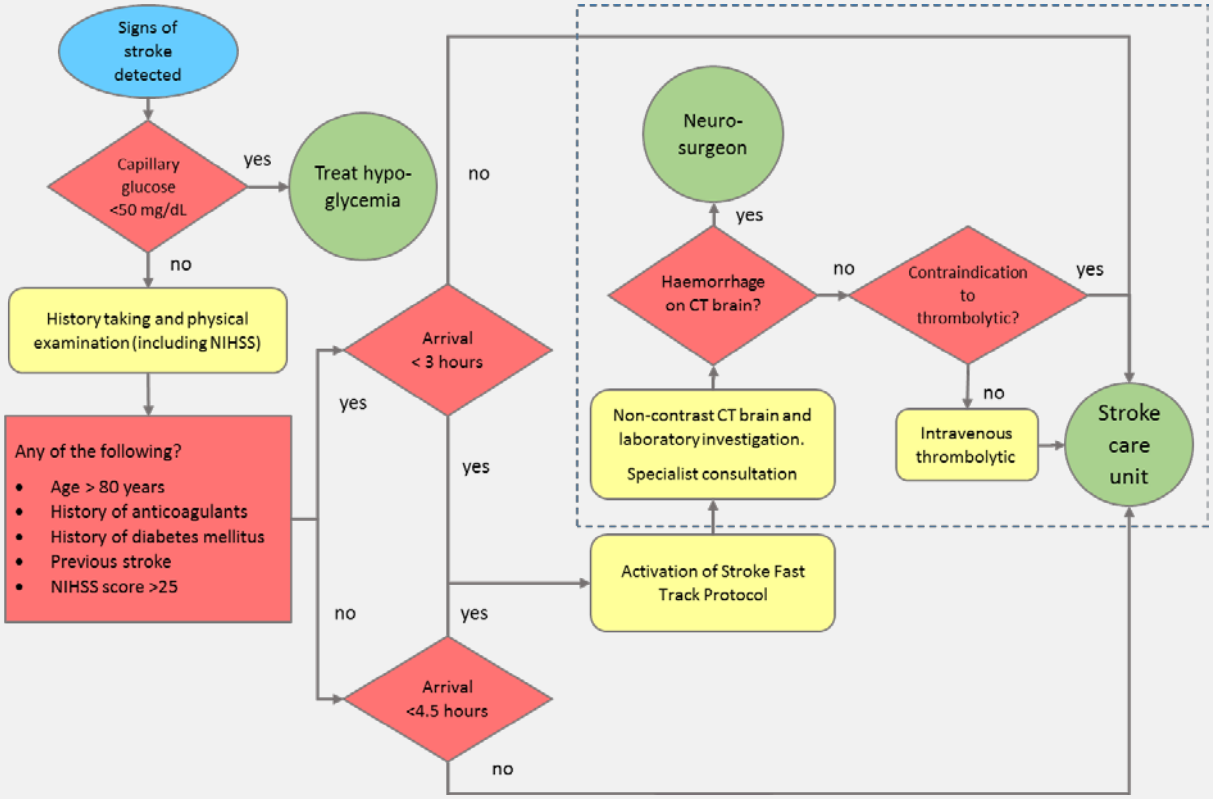


Figure 15: Stroke fast track algorithm (the processes in dotted boundary is for the specialists' care).

Determination:

The acute stroke patient should be managed according to CLS-I-time-sensitive-stroke fast track algorithm in figure 15.

Deed:

When stroke is detected, the first step is to determine whether there is hypoglycemia or not. If yes, 50% glucose 50 ml IV push slowly. If the patient is improved, transfer to the definitive care.

If no hypoglycemia is detected, then assess the followings:

- 80 years of age or over.

- Anticoagulant use.
- Diabetes mellitus.
- Previous stroke.
- NIHSS > 25. (NIHSS means National Institute of Health Stroke Scale in page 114)

The stroke fast track is activated if the onset of symptoms is within 4.5 hours (if the time of onset is not known e.g. in the case that the patient has fallen asleep or is unable to tell; then the time of "last seen normal" is used), except patients with the above conditions of which the stroke fast track may be activated if the patient arrives within 3 hours.

After the stroke fast track is activated, further steps should be the responsibility of the specialists (as shown by the dotted boundary in figure 15)

Destination:

Every patient with acute stroke, after the steps with CLS-I-time-sensitive-stroke fast track have been fulfilled up to the stroke fast track activation, further steps will be the responsibility of the definitive cares

STEMI Fast Track

Definition

STEMI or ST-Elevation Myocardial Infarction in CLS means a clinical syndrome with signs and symptoms of myocardial ischemia associated with acute ST segment elevation suggestive of myocardial injury.

Detection:

Patient with chest discomfort or dyspnea should be evaluated for clinical features of acute coronary syndrome (ACS). If positive, electrocardiography (ECG) should be done. If ECG shows ST-segment elevation by using the elevation of J point in two contiguous leads of ≥0.1 mV in all leads except V2 and V3 (≥0.15 mV in women, ≥0.20 mV in men ≥ 40 years old and ≥0.25 mV in men < 40 years old).

Determination:

Characteristics of ischemic cardiac pain include:

Non-pleuritic substernal chest pain, pressing in nature, worsen with exertion, no tenderness, may radiate to shoulders, arms, jaws, upper abdomen etc. (the pain position may be over the upper abdomen instead of the chest). Associated symptoms may include nausea, vomiting, fainting, palpitations, dyspnea etc. Patients usually prefer sitting than supine position.

(Characteristic symptoms may not be present in elderly or mentally impaired and diabetic patients).

The acute ST-elevation myocardial infarction patient should be managed according to CLS-I-time-sensitive-STEMI-algorithm in figure 16.

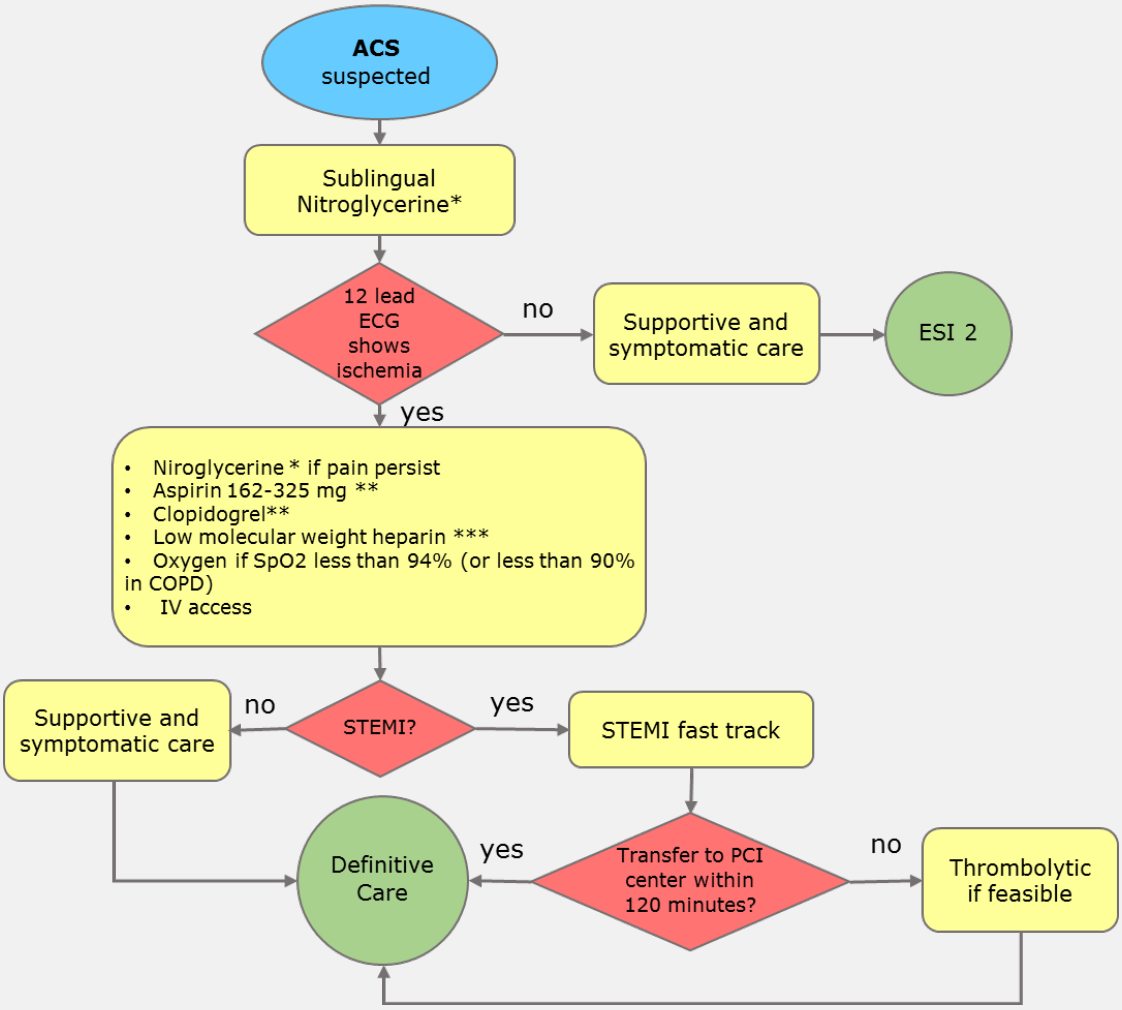


Figure 16: CLS-I-STEMI Algorithm

(* see contraindication before usage)

Deed:

If acute coronary syndrome (ACS) is suspected, give sublingual nitroglycerine except in patient with hypotension, usage of 5'phosphodiesterase (PDE) inhibitors (e.g. sildenafil, tadalafil, vardenafil) within 48-72 hours.

If electrocardiography shows ST-T changes of ischemia, give sublingual nitroglycerine if pain persists without the above contraindications.

Consider aspirin 162-250 mg orally after chewing if there are no contraindications e.g. GI ulcer or bleeding, history of recent operation and bleeding, hypersensitivity to aspirin.

Consider clopidogrel or related substances if there are no contraindications e.g. hypersensitivity, recent operation and bleeding.

Consider low molecular weight heparin if there are no contraindications e.g. hypersensitivity, recent operation and bleeding.

Give oxygen if SpO_2 < 94% (or <90% in COPD).

IV access and keep vein opened with NSS or 5%D/W.

If the STEMI is present, consider the transferability to a coronary intervention center (PCI center) within 120 min. If it is possible, then transfer the patient, if not, consider giving thrombolytic (streptokinase) if feasible (feasibility means continuous monitoring of vital signs, ECG and SpO_2 including close observation and ability to treat reperfusion arrhythmias and other complications of thrombolysis). After thrombolysis, whether successful or not, consider transferring to the definitive care.

Destination:

Every patient with acute coronary syndrome, after going through the steps in figure 16 the patient should be transferred to the definitive care (PCI center).

Sepsis Fast Track

Definition

Sepsis in CLS means life-threatening conditions with signs of infection and/or high fever.

Detection:

Life-threatening conditions can be detected according to general CLS algorithm. Signs of infection may be detected from infected wound, inflammatory organs of no definite causes, and should be suspected in immuno-compromised persons when there is fever, shock of unknown origin, during epidemics or others.

Determination:

If life-threatening sepsis is suspected from the above findings, then the following deeds should be started immediately.

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Deed:

When life-threatening sepsis is suspected, all tests to determine organ damages should be performed. All available cultures should be obtained (blood, secretion, urine, feces, exudates, transudate etc.) then start IV broad-spectrum antibiotic to cover the suspected causal micro-organisms together with IV fluid and other supportive and symptomatic treatments

Destination:

After adequate initial resuscitation has been taken, specialist consultation should be done if available, if not, the patient should be hospitalized with close observation or transferred to the definitive care.

Multiple Trauma Fast Track

Definition

Multiple trauma in CLS means life-threatening injury involving several organs or systems.

Detection:

Focused history and physical examination (primary survey) will detect the life-threatening symptoms and signs in the multiple injury patient.

Determination:

Multiple traumatic injuries can be suspected from many aspects. It includes unstable vital signs and decreased level of consciousness, significant anatomical injuries received, and a high mechanism of injuries. It can be described as follows:

- Unstable conditions in the previous CLS-C, CLS-A, CLS-B and other CLS-I.
- Significant anatomical injuries e.g.
    - Penetrating injuries to the head, neck, torso, and extremities proximal to elbow and knee.
    - Two or more proximal long bone fractures.
    - Crushed, deformed, or pulseless extremity.
    - Amputation proximal to wrist or ankle.
    - Painful and deformed pelvis.
    - Open or depressed skull fracture.
    - Suspected spine or spinal cord injury.
    - Paralysis.
    - Suspected airway injury.
    - Burn injuries of more than 20% total body surface area or third degree burn of important area.
- Mechanisms of severe injuries e.g.
    - Falls in elderly or disabled.
    - Falls from height:
        - Adults: more than 6 meters or 2 stories.
        - Children: more than 3 meters or more than 2 to 3 times the height of the children.

- High-speed vehicle crash.
  - Intrusion of passenger compartment of more than 30 cm.
  - Ejection of any passenger from the compartment.
  - Death in the same passenger compartment.
  - Vehicle rollover.
  - Prolonged extrication of more than 20 minutes.
  - Pedestrian or bicycle accident with victim thrown, run over, or with impact of more than 35 km/hr.
  - Motorcycle accident of more than 35 km/hr.

Deed:

Emergency personnel must detect life-threatening conditions and start activating the trauma team (composed of trauma surgeon and other related specialists) while stabilizing the patient according to general CLS algorithm.

Destination:

If a trauma team is available, destination of the patient will be determined by that trauma team. If not, then the patient should be referred to a proper hospital or the definitive care as soon as possible after stabilization.

CLS-T (CLS-Transferability)

Definition

Transferability in CLS means the steps to determine the feasibility of transferring the patient for a better definitive care unit or hospital.

Objective:

After completion of this session, the student should be able to:

1. Know whether the patients are stable or safe for transfer (after the stabilization of life-threatening conditions) or not.
2. Know the destinations of the patients after the stabilization of life threatening conditions.
3. Know the means and cares for the transfer.

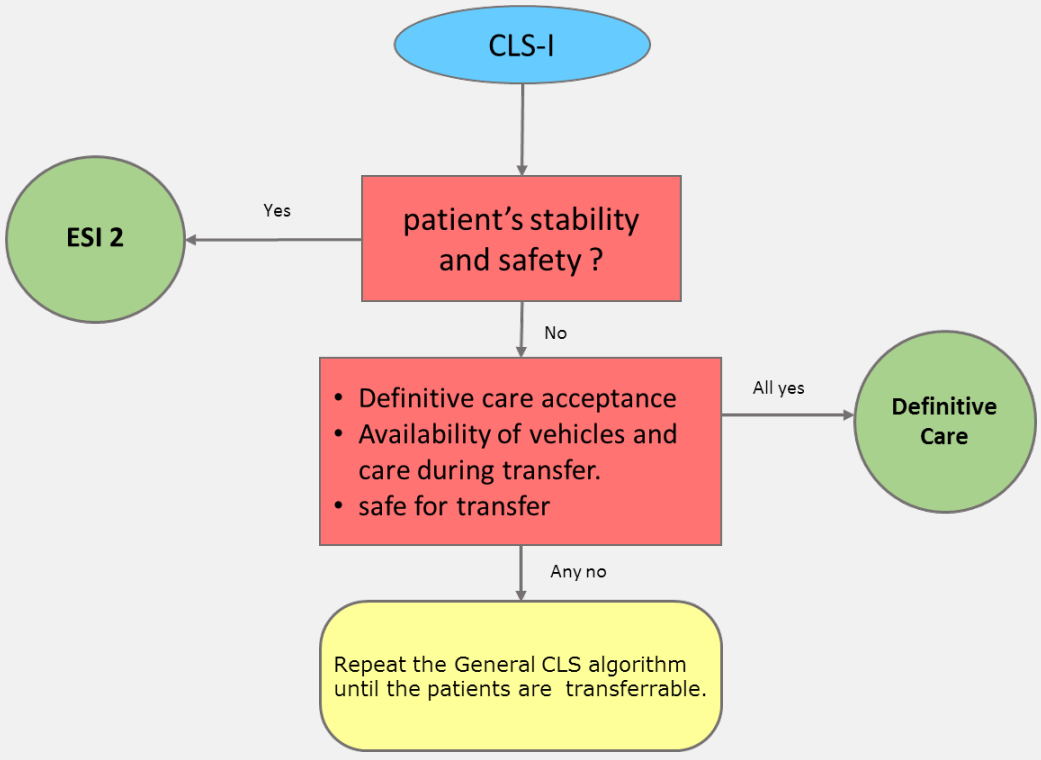

Figure 17: CLS-T Algorithm

Detection:

Patients' stability and safety can be identified by the vital signs, SpO_2, general appearance and no contraindication for the transferring means.

Determination & Deed:

The patients that pass the steps of CLS-I are assumed to have less severity and may be classified as:

- Those without any detected life-threatening conditions and required no life-saving cares from previous steps should be regarded as ESI 2-5.
- Those with any detected life-threatening conditions and required life-saving cares from previous steps should be reassessed.
    - If the patients are obviously stable, they should be regarded as ESI 2-5.
    - If the patients are unstable, they should be transferred to the definitive care if possible. If not possible and there is no better definitive care or higher-level care, they should be reassessed and General CLS Algorithm should be repeated.

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Destination:

The patients should be transferred to:

- The definitive or higher-level care if the patients are unstable and transferable.
- ESI 2-5 cares if the patients are stable and safe.

Special CLS in addition to General CLS

Special CLS means CLS that is designed for providing care to the life-threatening patients in special conditions e.g. mass casualty, major incident or in disaster. In such conditions, need for emergency care usually overwhelming the concurrent resources. Detection, Determination, Deed and Destination are need to be adjusted according to the conditions. Special CLS is one of the two parts in Comprehensive Life Support i.e. General CLS and Special CLS. There are two main operations in Special CLS:

Special CLS for in-hospital emergency response.

When there is a mass casualty occurs and large volume of injured patients are brought to the hospital in a very short period. In such condition, the need is obviously overwhelming the resource to provide care at that time, the hospital needs to recruit all the existing resources to cope with the situation and emergency care also need to be adjusted to be suitable to the condition. Special CLS provides guidelines for helping in management of the emergency care with the purpose of saving lives as much.

Special CLS for out-of-hospital response.

When a big incident or a disaster occurs, transportation may be obstructed or insufficient and/or the incident is still threatening or progressing, the hospital may need to send a team of emergency personnel to operate at the site. Special CLS provides guidelines for these responding teams to set up advance medical post and management for the sick and injured in those conditions.

Part II

Essential Procedures

Cardiac Resuscitation

Definition:

Cardiac resuscitation in CLS means the restoration of cardiac functions in cardiac arrest (sudden collapse with no pulse and no respiration or gasping respiration).

Objectives:

After completion of this session, the student should be able to:

1. Do according to the CLS-C algorithm.
2. Perform high quality CPR.
3. Give adjunct treatments.
4. Detect ROSC.
5. Decide cessation of CPR or referral to specialist care.

Deeds:

Do according to CLS-C algorithm in a stepwise order and correctly.

Destination

If ROSC or there is still a chance of ROSC, then consult/refer to specialist care.

If not or there is any indication for cessation of CPR, then give moral support to the patient's family and personnel involved.

Figure 18: Positions for Quality CPR

Airway Support

Definition:

Airway support is the process to prevent or relieve airway obstruction and to ensure a patent airway to provide adequate ventilation.

Airway support can be divided into basic and advanced airway supports.

Objectives:

After completion of this session, the students should be able to:

1. Do according to the CLS-A and CLS-B algorithm
2. Perform different methods of Basic and Advanced airway supports properly.
3. Confirm the opening and clearing of airways.
4. Detect and manage any complications associated with the life-supports.
5. Transfer the patient to the proper definitive care.

Deeds:

1. Basic airway support.
2. Advanced airway support.

Destination:

According to CLS-A algorithm in figure 6.

Basic Airway support

Definition:

Basic airway support in CLS means the process of using simple techniques and devices to open and maintain the airway.

Deed:

1. Maneuvers without equipment:
    - Head tilt - Chin lift maneuver.
    - Jaw thrust maneuver.
    - Recovery position.
    - Sniffing position.
    - Relief of choking:
        - Heimlich's maneuver (chest/abdominal thrusts).
        - Back blows.
2. Maneuvers with equipment:
    - Oropharyngeal airway insertion.
    - Nasopharyngeal airway insertion.
    - Suction.
    - Bag-valve-mask (BVM) Ventilation.

Head tilt-Chin lift maneuver

The patient should be in supine position and the helper should stay beside the patient's head.

Figure 19: Head tilt-Chin lift maneuver

Step 1 Place one hand on the patient's forehead, and apply firm, backward pressure with the palm of the hand to tilt the head back. Place the tips of the fingers of the other hand underneath the bony part of the lower jaw under the chin.

Step 2 With the head tilted backward, lift the jaw upward to bring the patient's chin forward. Do not compress the soft tissues underneath the chin; they might obstruct the airway.

Step 3 Continue to press the other hand on the patient's forehead to keep the head tilted backward.

Step 4 Lift the chin and jaw so that the patient's mouth slightly opens, if necessary use your thumb to depress or retract the lower lip.

Step 5 If the patient has loose dentures, hold them in position, making obstruction by the lips less likely. A seal is easier to form when the dentures are in place. If the dentures cannot be managed, remove them.

Jaw thrust maneuver

If a spinal injury is suspected, the patient's head and neck must be brought into and maintained in neutral, in-line position. This means that the head is not turned to the side, tilted forward (flexed), or tilted backward (extended)

Figure 20: Jaw thrust maneuver

Step 1 Kneel at the top of the patient's head. Place your elbows on the surface on which the patient is lying, putting your hands at the side of the patient's head.

Step 2 Grasp the angles of the patient's lower jaw on both sides. Move the jaw forward with both hands. This will move the tongue forward, away from the airway. If no spinal injury is suspected, the head could be tilted backward.

Step 3 Retract the lower lip with your thumb if the lips close.

Recovery position

The recovery position is used for unresponsive patient who clearly have normal breathing and effective circulation. This position is designed to maintain a patent airway and reduces the risk of airway obstruction and aspiration. The patient is placed on his or her side with the lower arm in front of the body. (see figure 21)

There are several variations of the recovery position, each with its own advantages. Putting someone in the recovery position will keep their airway clear and open. It also ensures that any vomit or fluid won't cause them to choke.

Figure 21: Recovery Position

The steps of recovery position

Step 1 With the patient lying on his/her back, kneel on the floor at his/her side.

Step 2 Place the arm nearest you at a right angle to his/her body with his/her hand upwards, towards the head.

Step 3 Tuck his/her other hand under the side of their head, so that the back of his/her hand is touching his/her cheek.

Step 4 Bend the knee farthest from you to a right angle.

Step 5 Carefully roll the person onto his/her side by pulling on the bent knee and the farthest shoulder.

Step 6 The top arm should be supporting the head and the bottom arm will stop you rolling him/her too far.

Step 7 open their airway by gently tilting his/her head back and lifting his/her chin, and check that nothing is blocking his/her airway

Step 8 Stay with the person and monitor his/her condition until help arrives

The position should be stable, near a true lateral position, with the head dependent and with no pressure on the chest to impair breathing.

Sniffing position

The head of infant or child less than 2 years old is large in relation to the body, the head tends to tilt forward, flexing the neck and potentially collapsing the trachea, when the child is placed on his back for oxygenation or ventilation.

- For a child less than 2 year of age, place padding of rolled blanket or towel with 2 cm thick under the shoulders in supine position to keep the airway aligned and the trachea open.
- Hyper-extended and hyper-flexed neck may cause airway obstruction in infant but slight extension of neck of infant results in optimal airway patency for resuscitation.
- If respiratory efforts are still present i.e. no effective ventilation the airway may be obstructed. Consideration should be given to other methods to improve airway patency, including support of the lower jaw, opening of the mouth, or in some cases upper airway suction.
- For a child greater than 2 years of age, place padding under the occiput.

Sniffing position is also used in adult to yield better visualization of the vocal cords during intubation. The head is elevated by padding with blanket or towel till the ear opening is in the horizontal plane with the sternal notch. It is contraindicated in spinal precaution and when a supraglottic airway is used. The "neutral position": the ear opening is in the same plane as the middle of the clavicle, is used more often and in the condition that the sniffing position is contraindicated.

Figure 22-a: Sniffing Position for Child less than 2-year old

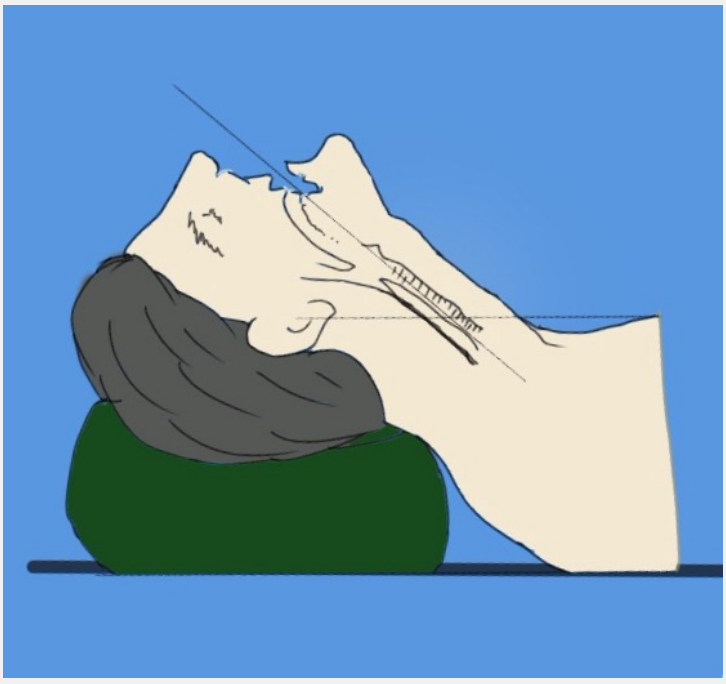

Figure 22-b: Sniffing Position for older child and adult

Heimlich's Maneuver

Heimlich maneuver is also known as abdominal thrusts. However, in patients with large protruded abdomen e.g. pregnancy, obesity: it will be performed over the anterior chest wall and called "Chest thrust".

Abdominal thrust:

Step 1 Stand behind the victim if the victim is able to stand with your legs separated, to form a "tripod".

Step 2 If you are right-handed, put your left fist with the thumb side in between the xiphoid process and the navel, and then cover the fist with your right hand. Use the strength of both arms to push your left fist upward and inward into the thoracic cavity in a rapid jerk for 4-5 jerks successively until the obstructed object is expelled. If it is not expelled, the process may be repeated. (see figure 23)

Step 3 If the patient is unconscious but pulse is still present, place the patient in the supine position. Kneel over the lower part of the victim's body, then press the left fist and the other hand in the same position as step 2, then use the strength of both arms to push your left fist upward and inward into the thoracic cavity in a rapid jerk for 4-5 jerks successively until the obstructed object is expelled. If it is not expelled, the process may be repeated.

Step 4 If the patient becomes unconscious without pulse, then perform CPR according to CLS-C algorithm, see figure 5.

Step 5 Occasionally open the mouth and check whether there is any foreign body to be removed.

Step 6 If breathing cannot be restored, emergency cricothyroidotomy should be performed (see page 71)

Figure 23 Abdominal thrust

Figure 24 Chest thrust

Chest thrust

Do the same as steps in Heimlich maneuver (abdominal thrust) but the position of the fist is over the mid sternum and try to push the fist into the thoracic cavity as hard as you can repeatedly for four to five times. (see figure 24)

Back blow

Back blow should be used in children with choking.

Step 1 Place the victim in a head and face down position either over the arm or the thigh of the helper. Give 5 back blows with the heel of one hand between the child's shoulder blades. (see figure 25)

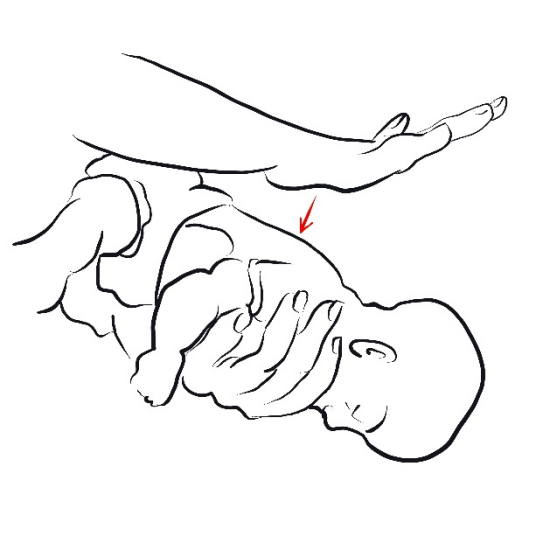

Figure 25: Back blow in infant. Helper's left hand should support the infant's head.

Figure 26: Chest thrust in infant

Step 2 If unsuccessful, give 5 chest thrusts by using the tips of 2-3 fingers in infant or the heel of one hand in larger child at the middle of the sternum. (see figure 26)

Step 3 If unsuccessful, repeat the back blow in step 1 alternating with chest thrust in step 2 until the obstructed object is expelled.

Step 4 If the patient becomes unconscious without pulse, then perform CPR in children according to CLS-C algorithm.

Back blow may be used in adult as the first step after detection of choking prior to performing the abdominal or chest thrust. Give back blows for 5 times alternating with 5 thrusts till the foreign body is expelled (see figure27)

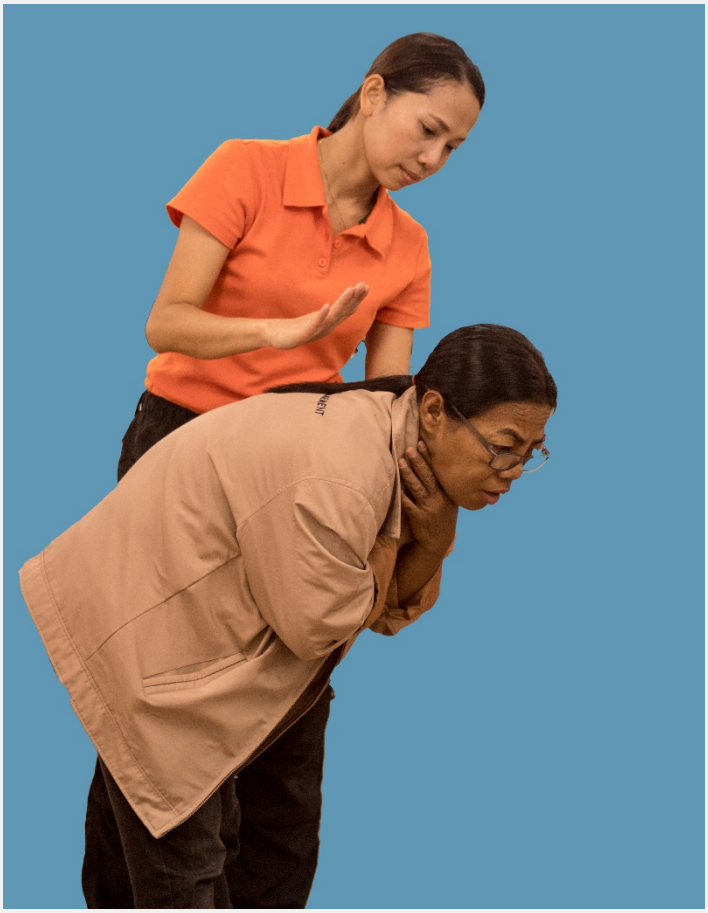

Figure 27: Back blow in adult

Oropharyngeal airway insertion

Oropharyngeal airway insertion is indicated only in unconscious patients to maintain the upper airway.

Figure 28: Oropharyngeal airways

Step 1 Select the proper oropharyngeal airway by measuring the correct size from the distance between the corner of the patient's mouth to the ear lobe.

Step 2 Open the patient's mouth using the crossed-finger technique. In adults, insert the oropharyngeal airway with the tip upward toward the roof of the mouth until contact with the soft palate. Then gently rotate it 180º while advancing until the flange rests just outside of the patient's front teeth.

Step 3 Secure the oropharyngeal airway with adhesive tape.

Nasopharyngeal airway insertion

Nasopharyngeal airway insertion can be used in both conscious and unconscious patients to maintain the upper airway. It is contraindicated if fracture of the base of skull is suspected.

Step 1 Select the proper nasopharyngeal airway by measuring the correct size from the distance between the tip of the patient's nose to the tip of the earlobe or between the tip of the nose to the angle of the jaw. The diameter of the airway must be such that it can fit inside the patient's nostril without blanching the skin of the nose.

Step 2 Lubricate the nasopharyngeal airway and inside the larger nostril with a sterile water soluble lubricant. Then insert the nasopharyngeal airway gently into the nostril close to the

midline along the floor of the nostril into the nasopharynx. If you meet resistance, rotate the device gently from side to side as you continue to insert it. If you still meet resistance, remove the airway and try the other nostril. When the device is properly inserted, the flange lies just outside the nostrils.

Step 3 Check to be sure that air is flowing through the nasopharyngeal airway.

Figure 29: Nasopharyngeal airways

Suction

Suction is indicated when there is abnormal and excess secretion or other material in the airway to clear and open the airway. Be careful not to provoke vomiting or aspiration.

Step 1 Place the patient in the comfortable position and place yourself in a position that can observe the patient's airway and performing the procedure easily.

Step 2 Turn on the suction unit.

Step 3 Select the appropriate type of catheter. Use a rigid catheter for suctioning the mouth or oropharynx. Use soft catheter for nasal suctioning. Start with low to medium suction pressure (80-120 mmHg). A rubber bulb may be used if a suction unit is not available.

Step 4 Do not insert the catheter farther than the base of the tongue to avoid vomiting and aspiration.

Step 5 Suck only while pulling the catheter out (not during the insertion).

Step 6 If possible, do suction < 15 seconds each time in adult and < 5 sec in infant and small child.

Step 7 Rinse the catheter occasionally with water to prevent obstruction.

Bag-valve-mask (BVM) Ventilation

Bag-valve-mask ventilation is indicated in unconscious or cooperative patient with inadequate ventilation. It applies positive pressure ventilation to the patient. It may be done by 1- or 2-person techniques.

a. Two-person BVM Technique

This technique need one person to hold the mask and the other to give the ventilation.

Step 1 One person stays at the top of the head and the other stay by side of the head. If spinal injury is not suspected, use the head tilt – chin lift maneuver to open the airway. If a spinal injury is suspected, use the jaw thrust to open airway instead. (see page 52).

Step 2 If the patient is unresponsive, maintain the patient's airway with oropharyngeal or nasopharyngeal airway.

Step 3 Select the correct size mask and bag-valve device such that they will fit the facial contour of the patient. Then place the mask over the patient's face according to the design of the mask such that it will fit in properly with no air leakage.

Step 4 The helper at the top of the head hold the mask with the E-C technique with pressure on the jaw bone (not the soft tissue) as in the figure 29 such that it will form an airtight position.

Figure 30: Two-person BVM Technique

Step 5 The helper at the side of the head squeezes the bag with two hands and delivers the ventilation steadily over 1 second while watching for adequate chest rise.

Step 6 Begin ventilation as soon as possible with oxygen connected to the reservoir of the BVM at the rate of 15 l/min.

Step 7 An adult with pulse should be ventilated once every 5 to 6 seconds (10-12 breaths/ minute) and infants and children once every 3 to 5 seconds (12-20 breaths/ minute). The chest should be monitored continuously for adequate rise and fall

b. One – person BVM Technique (Should not be used in suspected C-spine injury)

Step 1 Apply the mask to the patient's face with one hand using the "E-C technique" while maintaining the head tilt-chin lift.

Step 2 Squeeze the bag with the other hand while observing the chest rise to make certain the lungs are being inflated effectively.

Step 3 The bag may alternatively be compressed against your body or forearm to deliver a greater tidal volume to the patient. Ventilate the patient for approximately 1 minute and then connect the oxygen to the BVM without interruption of ventilation for >30 sec.

Figure 31: One-person BVM Technique

Advanced Airway Support

1 Non-surgical advanced airway support
2 Surgical advanced airway support

Non-surgical advanced airway support

1 Endotracheal intubation
2 Alternative airways
    a. Laryngeal mask airway
    b. Combitube airway

Endotracheal intubation

Definition:

Endotracheal intubation is the insertion of endotracheal tube via the oral or nasal route into the trachea between the vocal cords and the tracheal bifurcation.

Deed:

Steps of Endotracheal intubation

Step 1 Ensure proper functioning of equipment (e.g. the laryngoscope is properly functioning, the endotracheal tube cuff is not leaking).

Step 2 Give BVM ventilation with oxygen prior to attempts in endotracheal intubation.

Step 3 Assess the patient's airway for ease of intubation, using the LEMON mnemonic. (see inset on page 66 and figure 33)

Step 4 Direct an assistant to manually immobilize the head and neck. The patient's neck must be in neutral position (not hyperextended or hyperflexed) during the procedure.

Step 5 Hold the laryngoscope with the left hand if you are right-handed.

Step 6 Insert the laryngoscope into the right side of the patient's mouth, displacing the tongue to the left. If visibility is blocked by secretions, suction should be done to clear the airway.

Step 7 Visually identify the epiglottis and then the vocal cords without applying pressure on the teeth or oral tissues.

Step 8 Gently insert the endotracheal tube into the trachea until the cuff is below the vocal cords (see figure 32)

Step 9 Inflate the cuff with enough air to provide an adequate seal. Do not overinflate the cuff.

Step 10 Check the placement of the endotracheal tube by seeing water vapor inside the tube, then using stethoscope to listen to both chests and over the epigastrium. If there are equal breath sound on both sides of the chest and no air bubbling sound over the epigastrium, then the tube is in the trachea.

Step 11 Secure the tube with umbilical tape. Reassess the position of the endotracheal tube each time the patient is moved.

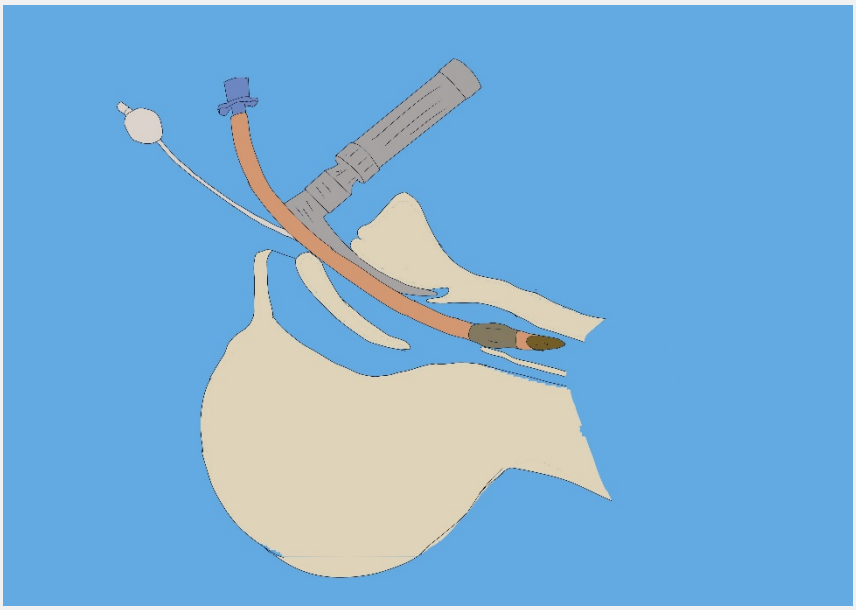

Figure 32: Endotracheal intubation

Step 12 If available, confirm the position of the tube with chest X-ray or CO_2 detector.

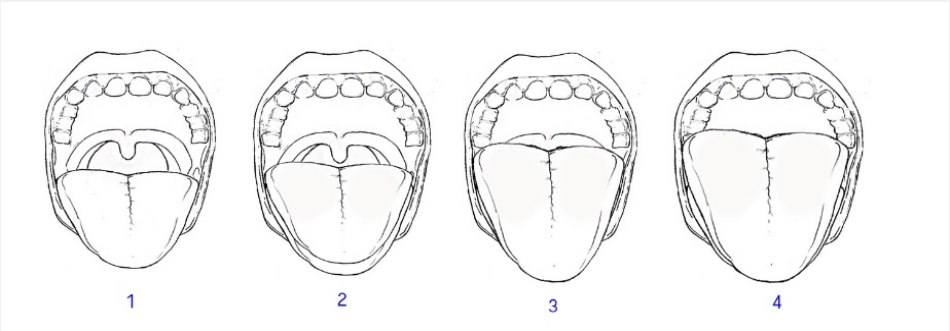

Figure 33: Modified Mallampati score:

Class 1. Visualization of soft palate, uvula, fauces, pillars.

Class 2. Visualization of soft palate, uvula, fauces.

Class 3. Visualization of soft palate, baseof uvula.

Class 4. Visualization of hard palate only.

LEMON

- **L**ook for difficulties in intubation.
- **E**valuate by using 3 fingers to measure the width between:
  - upper and lower front teeth.
  - mentum and hyoid bone. (If the width is narrower, intubation is risky)
- **M**allampati classification: Ask the patient (standing position is preferred) to open the mouth with the tongue sticking out and say "Ahh". If the tonsillar pillars are visible, then it is Mallampati class 1 (easiest). If only the palate is visible, it is Mallampati class 4 (most difficult).
- **O**bstruction: e.g. soft tissue swelling from smoke inhalation burns, broken neck, foreign bodies.
- **N**eck: e.g. stiff neck, broken neck.

Alternative airways:

Definition:

Alternative airways in CLS means advanced airways other than endotracheal intubation. The commonly used alterative airways are:

Laryngeal mask airway (LMA) and Combitube airway.

Laryngeal mask airway (LMA)

Deed:

Figure 34: Laryngeal mask airways

Step 1 Ensure proper functioning of equipment.

Step 2 Clear the oral cavity if there is secretion. Then give BVM ventilation with oxygen prior to attempts in LMA insertion.

Step 3 Direct an assistant to manually immobilize the head and neck. The patient's neck must be in neutral position (not hyperextended or hyperflexed) during the procedure.

Step 4 Choose the correct size LMA: 3 for a small female, 4 for a large female or small male, and 5 for a large male.

Step 5 Completely deflate the LMA cuff by pressing it firmly onto a flat surface, and then lubricate it before insertion.

Step 6 Hold the LMA with the dominant hand with the index finger placing along the shaft with its tip at the junction of the cuff and the shaft with the LMA opening oriented over the tongue.

Step 7 Gently pass the LMA over the tongue in to the throat until it cannot go further.

Step 8 Inflate the cuff with the correct volume of air (indicated on the shaft of the LMA).

Step 9 Check the placement of the LMA by applying bag-mask-to-tube ventilation.

Step 10 Visually observe chest excursions with ventilations. Listen with stethoscope over the chest for efficient breath sound.

Step 11 Secure the tube with umbilical tape. Reassess the position of the LMA each time the patient is moved.

Step 12 If available, confirm the position of the tube with chest X-ray or CO_2 detector.

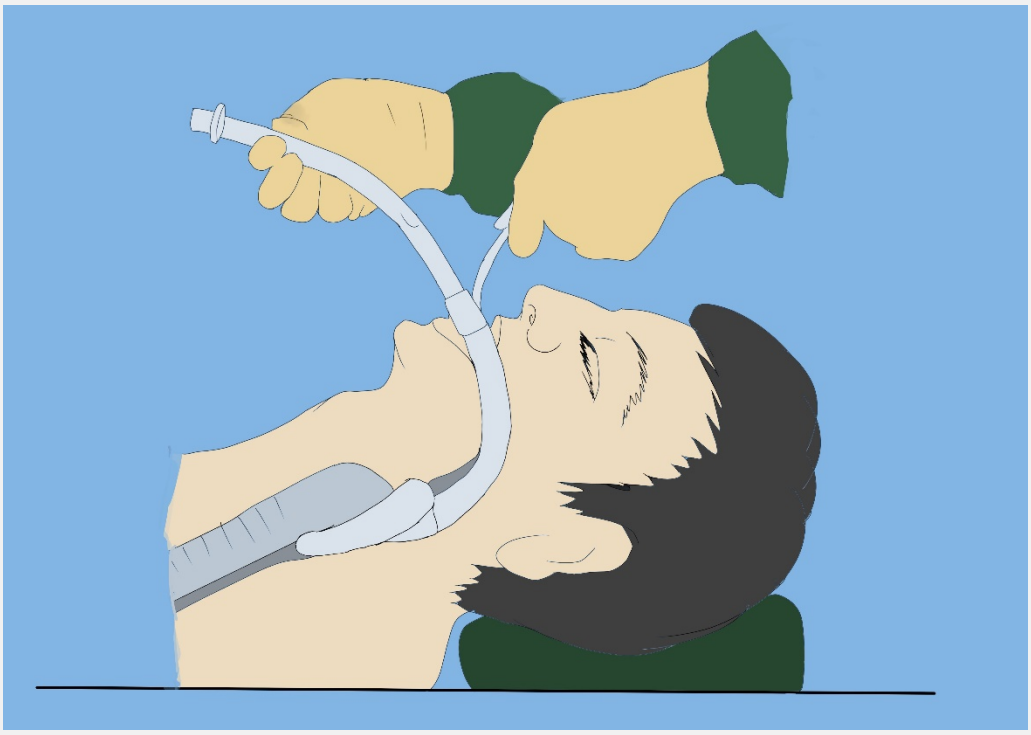

Figure 35: Laryngeal Mask Airway

Combitube airway

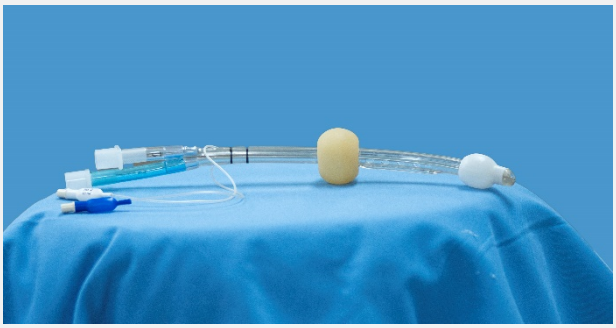

Figure 36: Combitube airway

Deed:

Step 1 Ensure proper functioning of equipment.

Step 2 Clear the oral cavity if there is secretion. Then give BVM ventilation with oxygen prior to attempts in Combitube insertion.

Step 3 Direct an assistant to manually immobilize the head and neck. The patient's neck must be in neutral position (not hyperextended or hyperflexed) during the procedure.

Step 4 Choose the correct size Combitube. (For patient taller than 152 cm use #41Fr ; for those shorter use #37Fr.

Step 5 Lift the chin with left hand while the right hand inserts the Combitube in to the esophagus. The Combitube should be inserted to such a depth that the upper incisors are between the two black guidelines on the external surface of the tube: Inflate the distal cuff with 12 ml.

Step 6 Ventilate through the white connector number 2. If breath sounds are heard over the lungs the Combitube has been placed in the trachea and can be used as a regular ETT after confirmation on the capnogram. If gurgling sounds are heard over the epigastrium, the Combitube is located in the esophagus.

Step 7 Inflate the proximal cuff with just enough air until either no leak is present or a subjective sensation of increased resistance to cuff inflation is encountered. This is usually achieved by inflating with 50-75 ml of air. This is less than the 85 ml recommended by the manufacturer but has been found to cause less upper airway trauma (1)

Step 7 Ventilate through the blue connector number 1, listen for breath sounds over the lungs and confirm ventilation on the capnogram.

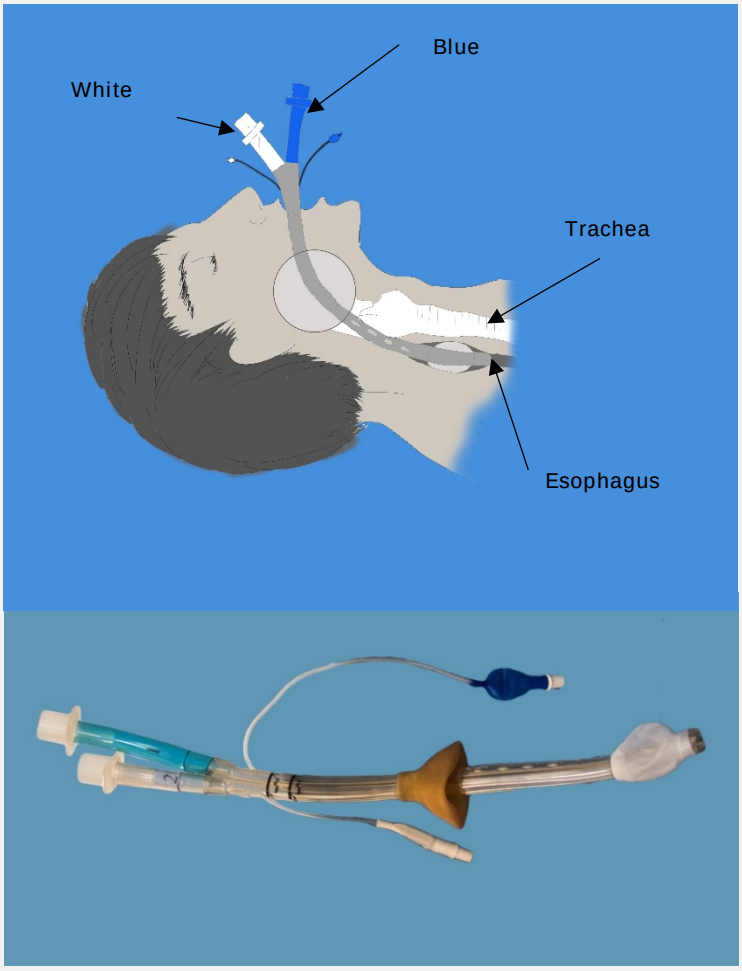

Figure 37: Combitube Airway

Troubleshooting Tips

a. Unable to ventilate patient through blue connector number 1. Attempt to ventilate through connector number 2, if breath sounds are heard over the lungs then the combitube has been placed in the trachea instead of the esophagus. Deflate the large proximal pharyngeal cuff and use the Combitube as a regular ETT.

b. Unable to ventilate patient through either connector

Confirm that the combitube has been placed in the esophagus by listening for epigastric gurgling sounds. Then withdraw the combitube 2-3 cm at a time while ventilating through connector

number 1 until breath sounds are heard over the lungs. The most common cause of this inability to ventilate through either connector is an excessive insertion depth of the combitube (relative to the patient). This will cause obstruction of the glottic opening by the large proximal pharyngeal cuff.

Surgical Airway Support

Definition:

Surgical airway support in CLS means needle cricothyroidotomy (surgical emergency cricothyroidotomy and tracheostomy are beyond the scope of general CLS).

Needle cricothyroidotomy

Step 1 Prepare the Ambu-bag with proper connecting tube to fit into the needle hub. (The connecting tube composes of normally used ET-tube connector with 5 ml syringe as in figure 39).

Step 2 Place the patient in a supine position.

Step 3 Assemble the needle catheter (#12-14) to a 10 mL syringe as in figure 38.

Step 4 Clean the cricothyroid area using antiseptic.

Step 5 Palpate the cricothyroid membrane anteriorly between the thyroid and cricoid cartilages. Stabilize the trachea with the thumb and forefinger of one hand to prevent lateral movement of the trachea during the procedure

Figure 38: Needle cricothyroidotomy

Step 6 Puncture the skin in the midline with the 12-or 14-gauge needle catheter attached to the syringe, directly over the lower half of the cricothyroid membrane.

Step 7 Direct the needle catheter at a 45-degree angle caudally, while applying negative pressure to the syringe.

Step 8 Carefully advance the needle catheter through through the lower half of the cricothyroid membrane, while aspirating.

Step 9 As soon as air is aspirated, tip of the need catheter is in the tracheal lumen.

Figure 39: Needle cricothyroidotomy with modified connector.

Step 10 Hold the syringe and needle firmly in that position. Then gently advancing the catheter inward and downward in the previously assigned direction until the catherter hub reaches the skin. Then remove the syringe and the needle leaving the catheter inside.

Step 11 Attach the assembled Ambu-bag with the connecter to the catheter hub.

Step 12 Ventilate the patient for 1 second then pause for the spontaneous expiration for 4-5 seconds (manual gentle rib cage compression may be required if spontaneous expiration is inadequate).

Step 13 Listening for adequate breath sound in both lungs

Remarks: Ventilation through cricothyrotomy catheter is only a temporary life-threatening procedure which should be followed by emergency tracheostomy and proper ventilation.

Complications of needle cricothyroidotomy

- Inadequate ventilation, leading to hypoxia and death.
- Aspiration (blood).
- Esophageal laceration.
- Hematoma.
- Perforation of the posterior tracheal wall.
- Subcutaneous and/or mediastinal emphysema.
- Thyroid perforation.
- Pneumothorax.

Intercostal Drainage (ICD)

Definition:

Intercostal drainage means the process of draining air and/or fluid from the pleural cavity by tube drainage to improve the patient's breathing particularly from massive pneumo-, hemo-, and/or hydro-thorax which may be life-threatening. It would be preferred in non-life-threatening conditions.

Objectives:

The student should have the ability to perform effective intercostal drainage.

Deed:

1. Put the patient in the proper position with the affected arm over the head.
2. Clean the designated area for drainage usually in the mid-axillary line of the lower intercostal spaces.
3. Cover the area with sterile drape.
4. Anaesthetize with 1-2% Xylocaine.
5. Choose the chest tube with the proper size.
6. Make small incision through the skin and fascia at the designated area and avoid area adjacent to the lower border of the upper rib.
7. Use arterial or Kelly clamp to advance through the intercostal muscle until reaching the parietal pleura.
8. Use arterial clamp to pierce through the parietal pleura and insert the clamped chest tube such that the tip of the chest tube is in the proper drainage position.
9. Stop bleeding or leaking around the chest tube.
10. Secure the chest tube to the skin.
11. Connect the chest tube to the closed-seal unit.
12. Check that the chest tube is working well.
13. Clean and suture the incision then apply proper dressing.
14. If available, post-insertion chest X-ray should be done to assure the proper position of the chest tube.

Open Chest Management

Definition:

Open chest may be life-threatening if the wound is bigger than 1.5 cm in diameter with air passing in-and-out of the wound. The management means the process of closing the wound such that the air can get out but cannot get in.

Objectives:

The student should have the ability to perform wound closure in open chest injuries.

Deed:

1. Clean adjacent area of the wound if no contraindication until there is no clothes or others in that area.
2. Peel the plastic dresser wrapping without contaminating the inner surface of the wrap.
3. Put the wrap with its inner surface to cover the wound during full expiration.
4. Use adhesive tape to seal 3 sides of the wrap with one side open for the air to come out (3-side dressing technique).
5. Check that air can come out but cannot get in.

Figure 40: 3-side dressing technique

Flail-Chest Management

Definition:

Flail-chest means injury to the chest wall such that a portion of the chest wall moves paradoxically to the rest. This usually occurs with multiple fractures of the ribs and may cause breathing difficulty with hypoxia and death. The management means the process of securing that portion of the chest wall that moves paradoxically.

Objectives:

The student should have the ability to secure that portion of the chest wall that move paradoxically.

Deed:

1. Clean that portion of the chest to be secured.
2. Paint with tincture benzoin if available.
3. Apply adhesive elastic bandages until that portion of the chest is secured.
4. Give analgesics if the patient still suffers from pain.
5. Check that portion of the chest is maximally fixed and the patient is breathing better.

Needle Decompression for Tension Pneumothorax

Definition:

Tension pneumothorax means the pneumothorax that causes marked mediastinal shift which is life-threatening. Needle decompression or thoracocenthesis is the release of air to reduce the pressure inside that thoracic cavity.

Objectives:

The student should have the ability to perform needle decompression of tension pneumothorax.

Deed:

1. Clean the sub-clavicular area of the affected chest wall.
2. Give local anesthetic to the second intercostal space in the mid-clavicular line.
3. Pierce the needle or needle catheter with attached syringe through the skin and slowly advance through the soft tissue and parietal pleura into the pleural cavity when the air will enter the syringe. (If it is a glass syringe the syringe piston will prop-up. If it is a plastic syringe, a gentle aspiration will yield air).
4. Secure the needle or the catheter in place.
5. Connect the needle or the catheter to the sub-water drainage and air can be seen bubbling through the water.
6. Stabilize the sub-water drainage bottle.
7. Check if the patient is breathing better and if there is any complication.

Figure 41: Showing the location and direction of needle decompression

Pericardiocentesis

Definition:

Pericardiocentesis in CLS means emergency needle aspiration of abnormal pericardial fluid in cardiac tamponade.

Objectives:

After completion of this session the students should be able to:

1. Perform needle aspiration of pericardial sac (needle pericardiocentesis) correctly in artificial condition.
2. Describe the complications of needle pericardiocentesis and the way to detect them.

Detection

The important signs of cardiac tamponade are:

General appearance of circulatory shock e.g. altered mental status, cold clammy skin, tachycardia, hypotension, tachypnea.

Paradoxical pulse.

Kussmaul's sign (abnormal distension of neck veins which increases during inspiration.

Gap between palpable apical impulse and left cardiac border by percussion.

Beck's Triad

- Venous distention,
- Hypotension
- Heart sounds: muffled or absent

Determination

When cardiac tamponade is suspected, needle pericardiocentesis should be performed immediately with or without further investigations e.g.

1. Chest radiography

2. Electrocardiography: three classic findings for large pericardial effusion: sinus tachycardia, low voltage, electrical alternans.
3. Echocardiography.

Deed

Place the patient in supine position. There are two approaches for needle pericardiocentesis:

1. The substernal or sub-xipho-sternal approach.
2. The thoracic or apical approach.

The substernal or sub-xipho-sternal approach

1. Clean the epigastric region and put a sterile surgical drape over that area
2. Locally anesthetize the skin in the middle between xiphoid process and the costal margin about 2 cm. below the xipho-sternal junction on the left side.
3. Slowly advance the tip of the needle towards the inner surface of the costal margin with the direction towards left shoulder while infusing xylocaine to anesthetize soft tissue till the tip of the needle get into the pericardial sac at which moment there will be no resistance and the abnormal fluid will be aspirated into the syringe (if the syringe is taken out from the needle, the needle will move with the respiration, but not pulsating, if during the advance of the needle, some pulsating sensation is felt, the needle should be withdrawn because the tip of the needle get in touch with the heart).

Figure 42: Pericardiocenthesis

The thoracic or apical approach

1. Clean the precordial and apical area of the chest and put the sterile surgical drape to cover that area.
2. Locally anesthetize the skin in the middle between the apical impulse and the left cardiac border.
3. Slowly advance the needle (perpendicularly to the chest wall) through soft tissue while infusing xylocaine to anesthetize soft tissue till the tip of the needle get into the pericardial sac. At which moment there will be no resistance and the abnormal fluid will be aspired into the syringe (if during the advance of the needle, some pulsating sensation is felt, the needle should be withdrawn because the tip of the needle gets in touch with the heart).

If ECG monitoring is available during the pericardiocentesis, injury ST-segment pattern may appear when the tip of the needle touches the heart or getting into the epicardium.

Recognize the depth and direction of the anesthetized needle before repeating the pericardiocentesis with a drainage needle or needle catheter.

A 3-way stopcock should be applied to allow complete withdrawal of the abnormal pericardial fluid.

When the fluid could not be withdrawn any further, take off the syringe and turn off the 3-way stopcock and tape it to the chest wall such that future withdrawal can be done (if a catheter is used instead of a needle).

COMPLICATIONS OF PERICARDIOCENTESIS

Injury to the epicardium and or the epicardial vessels (coronary arteries or veins) particularly when the tip of the needle is just in touch with the epicardium. The tip of the needle will act as a knife scratching/cutting the epicardium and epicardial vessels causing hemopericardium. So, when a pulsating sensation is felt, the needle should be withdrawn. However, if a cardiac tamponade from pericardial effusion is strongly suspected, then the tip of the needle should rapidly be advanced through the epicardium and myocardium into the cardiac chamber (because a single piercing hole will cause less harm). By slowly withdrawing the tip of the needle out of the cardiac chamber and the heart if there is no abnormal fluid coming out then it is a definite evidence that there is no pericardial effusion. Differentiation of

ventricular cavity blood and pericardial blood is that the former will clot after it is withdrawn, but the pericardial blood will not.

Injury to intraabdominal organs may occur if the direction of the needle is not close to the inner side of the anterior chest wall in the sub-xipho-sternal approach.

False positive may occur when ascetic or pleural fluid is mistaken for pericardial fluid.

Destination

1. Specialist consultation.
2. Transfer to definitive care.

Intravenous/Intraosseous (IV/IO) Access

Definition:

Intravenous access in CLS means the process of giving IV fluid or drug intravenously.

Intraosseous access in CLS means the process of giving IV fluid or drug into the bone marrow cavity.

Objectives:

After completion of this session, the students should be able to:

- Know proper different methods and locations to gain intravenous(IV) and intraosseous(IO) access
- Identify the indication, contraindication, and complications of intravenous(IV) and intraosseous(IO) access
- Perform IV/IO correctly.

Deed

Modes of access:

- Intravenous Access:
  - Peripheral
  - Central (not recommended for general practitioners)
- Intraosseous

Peripheral venous access

Peripheral intravenous access requires basic equipment and simple skills that most health care providers can do within little time with the following indications and contra-indications:

Indications:

- For injection or infusion into the venous lumens.
  - IV fluid
  - Medication
  - Blood
  - Contrast medium infusion
- Venous blood sampling

Contraindications:

- Extremity with significant edema, sclerosis, phlebitis, thrombosis
- Ipsilateral upper limb with radical mastectomy or fistula
- Overlying skin infection, burns, wound or ulcer etc.

Procedure:

- Choose an appropriate site for IV cannulation:
  - Upper extremity:
    - Veins of the hands.
    - Median cubital vein.
    - Basilic vein.
    - Cephalic vein.
  - Lower extremity:
    - Dorsal digital vein.
    - Great saphenous vein.
    - Small saphenous vein.
  - External jugular vein

- Apply universal precaution.
- Apply local anesthesia if time permits and if available.
- Assemble the IV set.
- Apply tourniquet to the limb that will be cannulated to impede venous flow and identify the distended vein.
- Puncture the vein with the bevel of the needle up and the catheter 10 to 30 degrees between the catheter and the vein and parallel to the vein.
- Once a flash of blood is seen, advance the catheter into the vein while removing the needle.
- Connect the IV line or the saline lock.

- Secure the IV line with adhesive tape.

Complications:

- Bruising.
- Infiltration or leakage.
- Air embolism.
- Phlebitis.
- Infection.
- Nerve damage.
- Thrombosis.

Central venous access

Central venous access is not recommended for general practitioners.

Intraosseous Access

Intraosseous access can be done by using bone marrow biopsy needle or a large bore needle. Currently there are a number of commercially available devices, they are expensive and may be unavailable in some hospitals or rural area.

Figure 43: Intraosseous needle and devices

Equipment:

- Intraosseous devices/intraosseous needles/bone marrow biopsy needle/large bore needle.
- 10 mL syringe.
- IV infusion set.
- Antiseptic.
- Equipment to fix the IO needle.

Figure 44: Intraosseous devices

Procedure:

- Identify and choosing the site of IO insertions. Possible sites are:
  - Proximal tibia: the location is approximately 2 cm below the lower border of tibial tuberosity and 1-2 cm medially in the middle of anteromedial surface of the tibia (see figure 45a).
  - Distal tibia: the location is approximately 3 cm above the most prominent aspect of the medial malleolus in the middle of anteromedial surface of the tibia (see figure 45b).
  - Distal femur (not recommended).
  - Proximal humerus (not recommended).
- Clean and sterilize the site for needle insertion.
- Give local anesthetic if necessary.
- Insert the needle through the skin and soft tissue to reach the bone.
- Insert the needle perpendicular to the bone with a twisting motion until a sudden loss of resistance is felt, the tip of the needle will be in the bone marrow.
- Confirm correct placement of the needle by any of the followings:

- Aspiration of blood or bone marrow.
- Free flowing of infusing fluid without signs of extravasation.
- The needle in upright position without support.

- Secure the needle in place.

Figure 45a-45b: Locations for IO accesses are indicated by the "X" marks.

Complications:

- Technical difficulties
  - Over/incomplete penetration.
  - Needle obstruction.
  - Fluid extravasation.
- Soft tissue and bony complications.
  - Infection.
  - Bony inflammatory reaction.
  - Skin sloughing.
  - Compartment syndrome.
  - Epiphyseal injury.
  - Fat embolism.
  - Pain with infusion.

Destination

Once the IO access has been done, care should be taken like other types of IV infusion. The needle should be removed when other IV access is gained. This is preferably done within 24 hours to avoid complications of infection.

Hemorrhage Control

Definition:

Hemorrhage control in CLS means the control of massive (life- threatening) hemorrhage that can be simply controlled externally.

Objective:

After completion of this session, the students should be able to:

- Know different kinds of massive (life-threatening) bleedings.
- Stop the bleedings.

Detection:

Massive (life-threatening) bleedings in CLS are any of the followings:

1. Arterial (pulsating) bleeding.
2. Large quantity of blood lost.
3. Amputated limbs.
4. Pelvic fracture with bleeding

Deed

- Arterial bleeding can be stopped by direct pressure on the proximal pulsating point or points (see figure 46). If failed, a tourniquet should be applied.
- Large quantity of blood lost e.g. scalp wound, large wound, apply large dressing or bandages with sufficient pressure.
- Amputated limbs: apply tourniquet until the bleeding is stop almost completely (some blood oozing should be present to prevent overpressure).

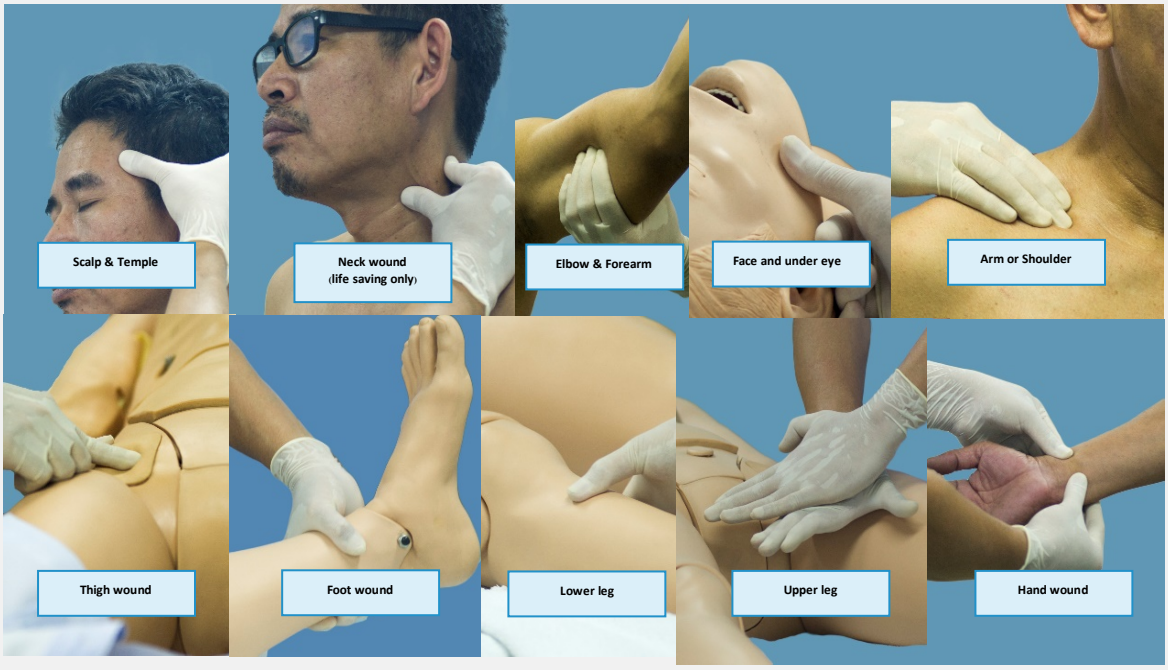

Figure 46: Pressure points to stop arterial bleedings (carotid artery compression to stop bleeding from neck wound should be performed cautiously to avoid cerebral ischemia).

Massive arterial bleeding, massive blood loss and/or bleeding from amputated limbs should be controlled before CLS-C.

- Pelvic fracture with bleeding should be suspected in patient with severe pain over the pelvis with evidences of threatening hemorrhagic shock. Bleeding control in this case should be performed during CLS-C. Pelvic binding can be performed by using available commercial binders, bed sheet or alike. When doing the pelvic binding, remember to limit motion of the patient especially the pelvis as it can further worsen the injury. Insert the sheet or binder under the buttock by carefully holding the pelvic ring to minimize further injury.

Figure 47: Pelvic bindings

a. Commercial binder
b. Bed sheet

Part III

Appendices

Devices and materials for Essential Procedures Workshops:

1.Basic airway support

Items	amount	remark
1. Ambu bag + Reservoir		
2. Nasopharyngeal airway, various sizes		#6.5, #7
3. Oropharyngeal airway, various sizes		#2, #3
4. O2 cannula		
5. O2 mask with bag		
6. Set updraff nebulizer		
7. Rubber bulb		
8. Choking manikin		

2. Non-surgical advanced airway support

Items	amount	remark
1. Ambu bag + Reservoir		
2. Endotracheal tubes		#6.5, #7.0, #7.5, #8.0
3. Laryngoscope set		
4. Magill forceps		
5. Syringes		3,5,10,20,50 ml
6. Strapping materials		
7. Laryngeal mask airways (LMA)		
8. Guide wires		
9. Lubricate gel		
10. Combitube, Laryngeal tube		
11. Airway manikin		

3.Surgical advanced airway support

Items	amount	remark
1. Ambu bag + Reservoir		
2. Needle cricothyroidotomy		
4. Surgical airway manikin		
5. Medicuts		#16, #18, #20
6. Syringes		3,5,10 ml
7. ET tubes		#6.5, #7.0, #7.5, #8.0
8. Cut down set		
9.Blades		#10, #11, #15
10. Strapping materials		

4.Needle decompression

Items	amount	remark
1. Needle decompression manikin		
2. Needles		#14, #16, #18
3. Medicuts		#14, #16, #18
4. Syringe 3,5,10 ml.		
5.Gauze		
6.Adhesive tape		
7.Sterile water		
8. Pneumothorax chest film		

5.Open & Flail Chest Management

Items	amount	remark
1. 3-sided occlusive chest wound dressing		
2. Chest tube manikin		
3. Gauze packs for 3-sided dressing		
4. Medicuts		#16, #18, #20
5. Latex Gloves for making 1-way valve		Used in Needle thoracostomy
6. Flail chest films		
7.Adhesive tape		

6.Needle & Tube ICD

Items	amount	remark
1. Needle for thoracostomy		
2. Tube for thoracostomy		
3. ICD bottle set		
4. ICD tubes		#28, #32
5. Artery clamps		
6. Cut down set + Silk		
7.Adhesive tapes		
8. Gauzes		

7.Cardiac Arrest

Items	amount	remark
Basic CPR		
1. CPR manikin		
2. Ambu bag + Reservoir		
3.Automated External Debibrillator (AED)		
4. O2 Tank		
5. Nasopharyngeal airway, various sizes		#6.5, #7
6. Oropharyngeal airway, various sizes		#2, #3
Advanced CPR		
1.Defibrillator		
2.Cardiac Arrest algorithm		
3. EKG		
4.Adrenaline		
5. 50% Glucose		
6. 7.5% Sodium bicarbonate		
7. Calcium gluconate		
8. Dopamine		
9.$MgSO_4$		
10.Amiodarone		
11.IV fluid + set & 3-way + extension		
12.Syringes		3, 5, 10, 20, 50 ml
13.Cardiac board		
14.Record sheet		

8.Pericardiocentesis

Items	amount	remark
1.Pericadiocentesis Manikin		
2.Chest film		
3.O2 Tank		
4.Needles		#16, #18
5. Medicuts		#16, #18, #20
6.Syringes		3, 5, 10, 20, 50 ml
7.Gauze/Top gauze		
8.Adhesive tape		
9.Other materials for decoration.		

9.Venous access

Items	amount	remark
1. I/O manikin		
2.Bone Injection Gun		
3.Needles		#16, #18
4. Medicuts		#16, #18, #20
5.Syringes		3, 5, 10, 20, 50 ml
6.IV fluid + set & 3-way+extension		
7.Gauzes		
8.Adhesive tape		
9.Splinting materials		

10. Hemorrhage control

Items	amount	remark
1. Splinting equipment		
2.Combat Tourniquet		
3.Triangle drapes		
4.Gauzes		
5.Adhesive tapes		
6.Elastic bandages		

Competency Checklist:

1.Cardiac Arrest

Name..... Date.....

10 = Performs independently, requires no prompting

5 = Competent, requires minimal prompting

0 = Unfamiliar with task, requires significant prompting

(* Essential skill, must score 5 or 10)

No.	Competency Lists	0	5	10
	BLS			
1	Scene Safety			
2	Check patient response			
3	Call for help/1669/ AED or defibrillator			
4	Check respiration/ Carotid Pulse within 10 secs			
5	Start chest compression Correct hand position Chest compression depth 5-6 cm Chest compression rate >100 /min Chest compression: ventilation 30:2 Switch chest compressor every 2 minute			
Subtotal				
	CLS-C advanced life support			
6	**Identify the shockable rhythm**			
7	**Defibrillation** Recognize scene safety before Do the defibrillation Do the Defibrillation immediately when notice the shockable rhythm? Start chest compression immediately after Do the defibrillation Check pulse, ECG monitor every 2 minute			

8	**During CPR, Give additional RX** IV/IO with promptly requesting for blood examination Epinephrine 1 mg. IV/IO push followed by 10 ml. NSS IV push, 3-5 min Amiodarone 300 mg. IV/IO push followed by 10 ml. Endotracheal intubation with Ambu bag ventilation (10 times/ min)				
9	**Identify cause of cardiac arrest**				
	5H: Hypovolemia, Hydrogen ion, Hypothermia, Hyperkalemia or Hypokalemia, Hypoglycemia	**5T**: Tension pneumothorax, Tamponade, Thrombosis Coronary/pulmonary, Toxins			
10	**Post Cardiac arrest care**: Intensive monitoring and cares. Targeted Temperature Management (TTM) if available) Treat cause of cardiac arrest				
Subtotal					
Total					
Percentage = Total/Full scores *100 =					%

2.Pericardiocentesis Workshop checklist:

No.	Competency list	0	5	10
1	Identify signs & symptoms for Pericardiocentesis			
2	Select proper equipment for Pericardiocentesis			
3*	Monitor the patient's vital signs (electrocardiogram may be an option) before, during, and after the procedure.			
4	Surgically prepare the xiphoid and subxiphoid areas.			
5	Slowly advance 22-gauge spinal needle (connected with a syringe containing local anesthetic) directing its tip toward the left shoulder and close to the inner chest wall while alternatively drawing and infiltrating until abnormal fluid is drawn. Continue drawing the fluid. Check the depth and the direction of the needle before withdrawing it out.			
6	If there is a pulsating feeling of the needle while advancing, withdraw the needle immediately because the needle tip is reaching the epicardium. Retry the process from the beginning in a new direction until abnormal fluid is drawn.			
7	Slowly advancing a 16- to 18-gauge, 10 cm or longer needle (according to the depth of the previous infiltrating needle), attached to a 20-50 mL empty syringe in the same direction as the infiltrating needle. Pulling the piston to create suction pressure while advancing the needle until obtaining the abnormal fluid.			
8	When taking the syringe off the needle, the needle will move with the respiration without pulsating signifying that its tip is in the pericardial sac. Pulsating movement of the needle means its tip is in the myocardium. With ECG monitoring an "injury pattern or current of injury" will indicate that the needle touch the epicardium or myocardium.			
10	If there is massive amount of pericardial fluid, a 3-way-stopcock will be helpful in withdrawing the fluid. After aspiration is completed, if further aspiration is required, the syringe should be removed leaving the stopcock closed; if no further aspiration is required, the needle should be removed.			
Subtotal				
Total				
Percentage = Total/Full scores *100 =				%

3. Intravenous/Intraosseous

No	Competency list	0	5	10
1	Identity the indications in performing IO access			
2	Identify 2 contraindications in performing IO			
3	Apply universal precaution			
4	Choose the correct equipment			
5	Identify the correct landmark for IO access			
6	Sterilise the site for IO access			
7	Give local analgesia			
8	Insert the needle into the bone in a twisting motion to until there is loss of resistance			
9	Remove the stylet of the needle			
10	Confirm needle placement by seeing if the needle stands up right on its own, needle aspiration, infuse IV fluid			
11	Secure the needle in place			
12	After care: plan for replacement of IO access with IV access			
13	Identify 2 complications			
Subtotal				
Total				
Percentage = Total/Full scores *100 =				%

4.Hemorrhage Control

4.1 General hemorrhage control

No.	Competency list	0	5	10
	General concept of hemorrhage control			
1	Apply personal protective equipment			
2	Identify the site of bleeding			
3	Apply direct pressure to the bleeding site with sterile gauze			
4	Elevate the affected extremity			
5	Check for bleeding after applying direct pressure to the wound			
	Arterial pressure point compression			
6	Know the indication and contraindications for arterial pressure point compression			
7	Locate appropriate arterial point			
8	Apply pressure to arterial point with sufficient pressure			
	Tourniquet application			
9	Know the indications and contraindications for applying tourniquet			
10	Apply tourniquet correctly and at the correct site			
11	Note the time the tourniquet is applied			
Subtotal				
Total				
Percentage = Total/Full scores *100 =				%

4.2 Pelvic binding (Circumferential Sheeting)

No.	Competency list	0	5	10
1	Indication (unstable pelvic fracture) Contraindications (Open fracture, A foreign body impaled, Burn)			
2	Prepare the equipment for Pelvic binding. (Bed sheets, clamps, adhesive tape)			
3	Call for help for the Log-Roll motion.			
4	Set the width of bed sheet for wrapping around the greater trochanters (Pubic symphysis level)			
5	Log-Roll motion, Move the pelvis as little as possible.			
	Attach the bed sheet at behind his/her buttock.			
6	Wrap the sheet tightly around the patient's pelvis.			
7	Applying adequate pressure for stabilization.			
8	Use towel clamps/adhesive type to secure sheet ends.			
9	Patient monitor, IV replacement and send to definite care.			
Subtotal				
Total				
Percentage = Total/Full scores *100 =				%

5.Basic Airway Management Workshop checklist:

No.	Competency list	0	5	10
Maneuvers without equipment				
1	Head tilt - Chin lift maneuver			
2	Jaw thrust maneuver			
3	Recovery position			
4	Sniffing position in infant and child			
5	Heimlich's maneuver (chest/abdominal thrusts)			
6	Back blows			
Maneuvers with equipment				
7	Oropharyngeal airway insertion			
8	Nasopharyngeal airway insertion			
9	Suction			
10	Bag-valve-mask (BVM) Ventilation			
Subtotal				
Total				
Percentage = Total/Full scores *100 =				%

6.Non-surgical advanced airway

No.	Competency List	0	5	10
	Endotracheal intubation			
1	Assess the ease of intubation (LEMON)			
2	Use laryngoscope correctly.			
3	Properly check the position of the endotracheal tube.			
	LMA			
4	Knows the indications and contraindications.			
5	Insert the LMA correctly.			
6	Properly check the position of the LMA.			
	Combitube			
7	Knows the indications and contraindications.			
8	Insert the combitube correctly.			
9	Properly check the position of the LMA.			
Subtotal				
Total				
Percentage = Total/Full scores *100 =				%

7.Needle cricothyroidotomy

No.	Competency list	0	5	10
1	Universal Precautions and proper use of PPE			
2	Confirm the indications and contraindications for the surgical airway			
3	Ventilate patient if necessary, inline manual stabilization should be maintained			
4	Prepare proper equipment			
5	Place the patient in a supine position			
6	Locate the cricothyroid membrane and clean the area with alcohol or another antiseptic agent			
7	Stabilize thyroid cartilage between thumb and middle finger of one hand			
8	Insert needle/catheter, bevel up through skin and lower half of cricothyroid membrane carefully			
9	When syringe is able to aspirate air, stop advancing needle			
10	Continue to advance catheter downward, remove the syringe and withdraw the needle			
11	Attache oxygen source to catheter hub			
12	Ventilate at approximately 6 breaths per minute with 100% oxygen			
13	Confirm the correct tube placement and stabilize the tube			
14	Utilize end-tidal carbon dioxide detection device and oxygenation saturation monitoring			
15	Reassess the patient and record the procedure			
Subtotal				
Total				
Percentage = Total/Full scores *100 =				%

8. ICD insertion

No.	Competency list	0	5	10
1	Indications (Massive hemo-/hrdro-/pneumo-thorax,) Contraindications (Coagulopathy , skin infection at the site)			
2	Choose proper size of chest tube (Pneumothorax ; 24-28 Fr., if fluid is present; 32-34 Fr.)			
3	Select equipment for ICD insertion (Gauze, Vaseline gauze, chest tube, clamp, blade, needle holder, silk, Xylocaine, needles)			
4	Use proper underwater seal system (If fluid is present use 2 bottles.)			
5	Set the patient's position (Supine or semi-upright with affected-site arm raised over the head.)			
6	ICD insertion landmark (4-6th ICS in midaxillary line, close to upper border of rib.)			
7	Usage of PPE (cap, mask, face shield or goggle, sterile gloves, sterile gown.)			
8	Monitoring (vital signs, optional O_2 sat, ECG)			
9	Anesthetic infiltration (block intercostal nerves of the intended ICS together with the upper and lower ones)			
10	Insertion procedure (after skin incision, bluntly dissect the soft tissue with the arterial clamp and finger to form a tract until reaching the pleura. Insert the Kelly's forceps (with nipped ICD tube) through the tract into the pleural cavity with the direction superiorly and posteriorly. Then release the clamp and advance the ICD tube until the last fenestration is inside the pleural cavity).			
11	Securing the chest tube to the thoracic wall by a stay or purse-string suture.			
12	Connect chest tube with underwater seal system correctly (with 2 bottles under water seal system)			
13	Check position of tube by chest X-ray, content in the tube, air bubbling and/or fluctuation of air-fluid level			
Subtotal				
Total				
Percentage:				

9.Flail-Chest Management

No.	Competency List	0	5	10
1	Identify signs & symptoms, indications and contraindications			
2	Select proper equipment for Flail-Chest Management			
3	Monitor the patient's vital signs			
4	Clean that portion of the chest to be secured.			
5	Paint with tincture benzoin if available.			
6	Apply adhesive elastic bandages until that portion of the chest is secured			
7	Give analgesics if the patient still suffers from pain.			
8	Check that portion of the chest is properly fixed and the patient is breathing better.			
9	Monitor the patient after the Management & send to the definitive care			
Subtotal				
Total				
Percentage = Total/Full scores *100 =				%

10.Open Chest Management

No.	Competency List	0	5	10
1	Identify signs & symptoms for Open Chest Wound			
2	Select proper equipment for Open Chest Management			
3	Clean adjacent area of the wound until there is no clothes or others in that area.			
4	Peel the plastic dresser wrapping without contaminating the inner surface of the wrap.			
5	Put the wrap with its inner surface to cover the wound during full expiration.			
6	Use adhesive tape to seal 3 sides of the wrap with one side open for the air to come out (3-side dressing technique).			
7	Check that air can come out but cannot get in.			
8	Monitor the patient after the Management.			
9	Send the patient to the definitive care.			
Subtotal				
Total				
Percentage = Total/Full scores *100 =				%

11.Needle Chest Decompression for Tension Pneumothorax

No.	Competency list	0	5	10
1	Know the indications and contraindications for the procedure			
2	Prepare proper equipment.			
3	Identify the location for the chest decompression.			
4	Clean the site with antiseptic solution.			
5	Insert the needle catheter attached to a syringe into the chest at a 90-degree angle to the chest wall until air enter the syringe. Hold the needle securely while advancing the catheter inside.			
~~6~~	~~Note a rush of escaping air~~			
6	Secure the catheter in place with underwater drainage or a one-way valve system.			
7	Check for breath sounds and complications			
8	Plan for ICD insertion			
Subtotal				
Total				
Percentage = Total/Full scores *100 =				%

Reference Data and Information:

Thrombolytic indications and contraindications:

Indications
Diagnosis of ischemic stroke causing a measurable neurological deficit
Onset of symptoms <4.5 h before initiation of treatment
CONTRAINDICATIONS
Clinical
Sustained hypertension above 180/110 mm Hg
Symptoms suggestive of subarachnoid hemorrhage
Previous history of intracranial hemorrhage
ST elevation myocardial infarction within the previous 3 months
Major head trauma or stroke within the previous 3 months
Major surgery within the previous 14 days
Gastrointestinal or urinary tract hemorrhage within the previous 21 days
Arterial puncture at a non-compressible site within the previous 7 days
Active bleeding or acute traumatic fracture on examination
Seizure at onset with suspected postictal deficits
Minor or rapidly improving neurological deficits
Radiological
Head CT showing hemorrhage or multilobar infarction (i.e., hypodensity involving >1/3 of the cerebral hemisphere
Laboratory
Oral anticoagulation with INR >1.7*
Heparin within previous 48 h with elevated current aPTT
Platelet count <100,000 per mm^3
Blood glucose level <50 mg/dL (2.7 mmol/L) at presentation with improving deficits following correction of hypoglycemia
Additional contraindications for treatment between 3 and 4.5 h
Age >80 years
Very severe deficits at onset (NIHSS score >25)
Combination of previous stroke and diabetes mellitus

**Oral anticoagulation regardless of current INR should be considered a contraindication for treatment between 3 and 4.5 h.*

Antidotes

Agent	Indication
100% or hyperbaric oxygen therapy (HBOT)	carbon monoxide poisoning and cyanide poisoning
Activated charcoal with sorbitol	used for many oral toxins
Atropine	organophosphate and carbamate insecticides, nerve agents, somemushrooms
Beta blocker	theophylline
Calcium chloride	calcium channel blockers, black widow spider bites
Calcium gluconate	hydrofluoric acid
Chelators such as EDTA, dimercaprol (BAL), penicillamine, and 2,3-dimercaptosuccinic acid (DMSA, succimer)	heavy metal poisoning
Cyanide antidote (hydroxocobalamin, amyl nitrite, sodium nitrite, or thiosulfate)	cyanide poisoning
Cyproheptadine	serotonin syndrome
Deferoxamine mesylate	Iron poisoning
Digoxin Immune Fab antibody (Digibind and Digifab)	digoxin poisoning
Diphenhydramine hydrochloride and benztropine mesylate	Extrapyramidal reactions associated with antipsychotic
Ethanol or fomepizole	ethylene glycol poisoning and methanol poisoning
Flumazenil	benzodiazepine poisoning
Glucagon	beta blocker poisoning and calcium channel blocker poisoning
Insulin with Glucagon	beta blocker poisoning and calcium channel blocker poisoning
Leucovorin	methotrexate and trimethoprim
Methylene blue	treatment of conditions that cause methemoglobinemia

N-acetylcysteine	Paracetamol (acetaminophen) poisoning
Naloxone hydrochloride	opioid overdose
Octreotide	oral hypoglycemic agents
Physostigmine sulfate	anticholinergic poisoning
Phytomenadione (vitamin K) and fresh frozen plasma	warfarin poisoning and indanedione
Pralidoxime chloride (2-PAM)	organophosphate insecticides, followed after atropine
Protamine sulfate	Heparin poisoning
Prussian blue	Thallium poisoning
Pyridoxine	Isoniazid poisoning, ethylene glycol
Sodium bicarbonate	ASA, TCAs with a wide QRS
Succimer, chemical name Dimercaptosuccinic acid (DMSA)	lead poisoning
Theophylline	adenosine poisoning

NIHSS

Category	Score/Description		Date/Time Initials	Date/Time Initials	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 eyes, 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. Visual Fields (Introduce visual stimulus/threat to pt's visual field quadrants)	0 = No visual loss 1 = Partial Hemianopia 2 = Complete Hemianopia 3 = Bilateral Hemianopia (Blind)						
4. Facial Paresis (Show teeth, raise eyebrows and squeeze eyes shut)	0 = Normal 1 = Minor 2 = Partial 3 = Complete						
5a. Motor Arm - Left 5b. Motor Arm - Right (Elevate arm to 90° if patient is sitting, 45° 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 30° 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 limbs						
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. Dysarthria (Evaluate speech clarity by patient repeating listed words)	0 = Normal articulation 1 = Mild to moderate slurring of words 2 = Near to unintelligable or worse X = Intubated or other physical barrier						
11. Extinction and Inattention (Use information from prior testing to identify neglect or double simultaneous stimuli testing)	0 = No neglect 1 = Partial neglect 2 = Complete neglect						
TOTAL SCORE							

INITIAL	SIGNATURE	INITIAL	SIGNATURE	INITIAL	SIGNATURE

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DEPARTMENT OF MEDICAL SERVICES

Supported by Department of Medical Services, Ministry of Public Health of Thailand.