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Standard requirements of Treatment of Malignant Hyperthermia for Critical Care Medicine clinics with limited resources

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Here are discussed problem of botulism and treatment standard of this disease in critical care medicine clinic. This standard includes diagnosis, care, treatment conditions and is supposed to be utilized by countries of limited resources in critical care medicine clinics. So, bed cost of each day is not more than 300,0-500,0 US.

Key Words: Malignant Hyperthermia, Critical patients, Blocs of information, Blocs of action, Standards.

Bloc of information

Synonyms are febrile schizophrenia and malignant neuroleptic syndrome. It was described in 1960 by Denborough in young men, who developed hyperthermia, cyanoses and died during the anesthesia made by phtorotan. Patient had hereditary disease by history.

Pathogenesis: it transmits genetically, with an autosomal dominant type. It transmits equally both in men and women, also the probability whether it will be from mother or father is equall.

Disease occurs 1:200 000 anesthesia. It is more frequent in Caucasians and in east-China, Japan. In other nations and also in black people is rare. Interesting fact is that black people who developed this syndrome in the blood had phenotype characteristic to Caucasian race. This syndrome is also common in people living in so called closed area (mountains, islands). Disease is transmitted by 19 chromosome and they think that it is connected with the mutation of several genes. during malignant hyperthermia mutation in RYRY gene may be manifested as the ARG163CYS, GLY341ARG, YYE403MET, ARG614CYS, GLY2433ARG and ARG2434HIS changes. Basis of malignant hyperthermia may be mutations in 1g (dyhydropyridine-sensitive L-type Ca channels-A1S_ 3q,5q,7q (dyhydropyridine sensitive L-type Ca channels –LA2) and 19q (ryanodine receptor) genes of chromosome 19. This should predispose 50%of patient to the development of malignant hyperthermia. Manifestation of malignant hyperthermia needs precondition: general anesthesia, muscle relaxants, phtorotan, nitrogen peroxide, methoxyflurane, barbiturates, lidocaine. Other supportive factors are: caffeine, treatment with belladonna preparations, overheating caused by high temperature, allergic and pseudoallergic reactions, leaving physical load and other influence of stress factors on the organism.

Drugs causing malignant hyperthermia:
Halothane
Methoxyflurane
Succinylcholine (anectine)
Decamethonium
Gallamine
Diethyl ether
Ethylene
Ethyl chloride
Trichloroethylene
Ketamine
Phencyclidine
Enflurane
Cyclopropane
During malignant hyperthermia thermogenesis exceeds patients ability to discharge heat. Patients with malignant hyperthermia have a defect of Ca metabolism in skeletal muscles, which is carried out by the biochemical changes in the skeletal muscles. Because of the decrease of absorption of Ca by sarcoplasmic reticulum, intracellular concentration of Ca increases and its transport extracellularly aggravates. This process is accompanied by the increase of energetical expenditure and increase of metabolism. Great amount of carbonic acid, lactate and other products of cellular metabolism are produced. Elimination of these products is difficult so they accumulate. Primary injury is directed towards the cellular intoxication, when temperature increases more than 42°C. At this time cellular function is deranged because of the stoppage of mytochondreal action, chemical connections in the enzymatic reactions changes and membrane conduction becomes unstable. This thermal toxic effect acts on many organs, causes its damage and by this forms hyperthermic syndrome. Other factors-dehydration, metabolic acidoses and hypoxia aggravates the manifestation of hyperthermic syndromes. During malignant hyperthermia muscles are injured because together with the local increase of temperature there is hypoxia and metabolic acidoses. Volume of blood ejected by the heart changes, because of the activation of metabolismincreases resistance of peripheral blood vessels and develops dehydration. Thermal intoxication causes cerebral swelling and local hemorrhages. As the result of these processes, develops deep stupor and coma. Purkinje cells of cerebrum have special sensitivity towards the high temperature. After recovery from acute stage of malignant hyperthermia as the result of residual effects manifests ataxia, dusmetria and dysarthrya. In the CSF there is xanthochromia, weakly manifested lymphocytic pleocytosis and increased level of protein. There is the renal injury, caused by dehydration, hypotonia and rhabdomyolysis. Thermo toxicity and decrease of intestinal perfusion causes development of ischemic ulcers in the intestine, which are often the cause of bleeding. Liver is injured in almost all cases. Its necrosis and cholestasis peaks

on second or third day. Number of leukocytes in the blood increases. Often there is anemia and hemorrhagic diathesis. Causes of its development are: activation of thrombocytes, decrease of the synthesis of coagulation factors, decrease of the number of megakaryocytes, disseminated intravascular coagulopathy, which develops 2-3 days after hyperthermia, there is hypoglycemia, but hyperglycemia may also be manifested, which is determined by the derangement of glucocorticoid and catecholamine metabolism. Level of potassium may be sharply increased due to the cell lysis. Sodium level is in normal range. Due to the rhabdomyolisis concentration of phosphate decreases. After 2-3 days from the injury, calcium level may decrease due to the precipitation in the intracellular area and on 2-3 weeks time there may be hypercalcemia due to the activation of parathyroid hormone.

In the regard of respiratory system injury, main symptom is cyanosis and tachypnoe. Respiratory alkalosis is frequent at the expense of increased oxygen demand and metabolic acidosis due to the intensification of catabolic processes.

Clinical presentation. Term “malignant hyperthermia” itself indicates the inevitable existents of hyperthermic reaction, which reaches very high level 41-45°C in a very short time. Every 5-10min or during hour temperature rises with 1° or more and does not submit to antipyretic treatment. This syndrome may develop with slow increase of temperature or its wave like increase and temperature may be in the range of 38-40°C. It is noteworthy, that high temperature is one of the main, but not necessary, also not early, but late manifestation. It is also noteworthy, that at some point heat regulation mechanism in the body is completely deranged and body temperature becomes same as the temperature around in the environment and varies according to this temperature change. At this stage clarification of diagnosis can be possible by clarifying patients body temperature and environmental temperature. Frequent, but not necessary accompanying sign of malignant hyperthermia is seizure and in 20% it does not occur. Sometimes seizure is local, rarely it is generalized. It appears as tonic as well as clonic discharges. Sometimes intensity of such seizures is so great that the hole body of the patient becomes rigid. It frequently starts from mandible, lower limbs and chest muscles, which is preceded by fibrillation and shivering. In addition during operation after the injection of myorelaxants perverted form malignant hyperthermia may occur, instead of relaxation may develop seizure and the intensity of seizure may increase together with the injection of next doses of myorelaxants. most frequent and early sign is tachycardia. It occurs in 96.1% and precedes the hyperthermia. At different stages tachycardia may progress into atrial or ventricular extrasystoles, which frequently are polytopic in nature. Later on ECG may be seen hyperkalemia (high picked T-waves, changed QRS complexes) or even earlier signs of hypokalemia (depression of ST-interval, inversion of T-wave, appearance of V-wave). Later ventricular fibrillation is frequent, which appears on the background of lung edema and hypotonia. Later in 85.5% of patients manifests hypotonia. In such cases by the indirect cardiac massage, to make heart work is very difficult. In the regard of respiration, at first there is tachypnea,

respiration is shallow, by such regime of hyperventilation and body tries to increase effect of heart loss. It is noteworthy, that Natron base located at respiratory machine is heated because of the increased secretion of CO2 and losses color very soon. Then breathing becomes superficial , accessory muscles also take part in breathing and artificial lung ventilation becomes necessary. Skin is cyanotic in 71.1%, but it may be pale and reddish-also pink, it is warm on touch, surgical wound is also warm and expired air. At first diuresis may be accelerated, later develops myoglobinuria. Urine is pink-reddish and amount decreases even at anuria. At first patient is egitated, restless, then there is a picture of brain swelling and encephalopathy. May develop meningeal and other pathological reflexes, symptom complex of brain stem injury comes to the foreground, decortications, brain stem dislocation and brain death is manifested.
A diagnosis is made by following indications:
Tachycardia
Cyanosis, tachycardia
Increase of the number of CO2 in exhaled air.
Increase of the body temperature by 0.5°C in every 15 min.
Respiratory and metabolic acidoses.
Diagnoses can be clarified by measuring creatin phosphokinase, but its normal value does not exclude malignant hyperthermia. There is a test, when skeletal muscle bipsy material is placed in the ringer locke solution and process this solution by various doses of kofein and phtorotan-during malignant hyperthermia in 50% cases this test is positive-muscle contraction (till contracture) with more power, then in indifferent individuals. From other methods should be mentioned metabolic acidosis, hypercalcemia with hypocalcemia later, hypokalemia with hypercalcemia, hyponatremia changes with hypernatremia, ALT, AST, amylase, creatinine, phosphokinase, irea, myoglobin and other enzymes are increased. Increases bilirubin (as total as well as direct and indirect), lactate, pyruvate, glucose, magnium, phosphorus. DIC is such an intensive that sometimes blood is hemolytic, there is thrombocytopenia, decreased level of prothrombin, antithrombin III, high level of fibrin degradation products. Most acceptable method is capnography, by it, it is possible to determine treatment effect.
Treatment
Immediate stoppage of provocative factors, even stoppage of surgery.
Dantrolene is one of the specific mean. By its action it is possible to inhibit discharge of the ionizing calcium, calcium gradually accumulates inside cell, which makes possible to regulate its intracellular concentration limit. IV is injected primary dose of drug – 2mg/kg in every 5-10min. Max dose is 10mg/kg. Next dose can be repeated after 12-15hours. It is effective in 30-48% of cases. After the injection of such dises of Dantrolene velocity of muscle contraction decreases significantly and corrects after 18-20hour. In studied patients feeling of weakness lasts no more than 24h. Effect of this drug on CNS, reflects in the loss of consciousness and dizziness. After its injection

arterial pressure, frequency of muscle contraction, during expiration peak of air flow, vital capacity, content of CO2 in the final portion of the exhaled air and indicators of respiratory frequency does not change. Level of Dantrolene in the plasma remains stable during 5h after injection and decreases only after this. Its pharmacokinetic, pharmakodynamic and length of its therapeutic effect is not fully studied.

Cooling and decrease of thermogenesis. Direct external cooling of patient considers its placement in the icy water and placement of the ice on patient. Cooling method by evaporation foresees patients wetting by 15° water and skin cooling by 30m/sec speed 45-48 airflow air conditioning or fan. This method is related to a high risk of cardiovascular shock. Peritoneum cavity wash out using 20° or 30° saline solution, washing out the stomach, hemodialysis and plasmapheresis are used.

Correction of acidosis is accompanied by sodium bicarbonate or trysamine. Dose is defined as follows: NaHCO2 m.equ=(base deficit x body weight): 3

Correction of water and electrolyte balance – malignant hyperthermia is accompanied by hyperkalemia. during treatment following should be taken into account: hyperventilation and injection of sodium bicarbonate solution. IV injection of 10-20 unit insulin and 50 ml- 50% glucose solution, which improves getting potassium inside cells and 1gr of Ca chloride IV injection during 5 min. Hyperkalemia may change into hypokalemia, at this time potassium injection is necessary.

When tachypnea is expressed (35-40min), cyanosis, sweating, the trend towards hypotension, PO2 in arterial blood is <60mm and PCO2 is >60mm, question about the artificial lung ventilation arises.

During paroxysmal tachycardia vagotony in the area of carotid sinus with massage is made, Verapamil, Esmolol, Propranolol, Phenylephrine and cardioversion are effective. During atrial flutter Verapamil, Propranolol and cardioversion are made. As the most frequent cause of death is ventricular fibrillation, at the early stage of malignant hyperthermia for the prophylaxis giving procainamid is is necessary as soon as the diagnosis is made.

For the prophylaxis use of antibiotics and steroids are not recommended.

Arterial pressure control by the insertion of arterial catheter is important, also the central venous catheter insertion is important for the injection of drugs and solutions. Also it is important to monitor diuresis – released excessive number of myoglobin and hemoglobin have toxic effect on the renal tubular epithelium. Patients are prescribed great amount of intravenous fluids at the same time osmo diuretic (Manitol 25mg) together with loop diuretics (furosemid 20mg) are injected. In case of renal failure polystyrene sulfonate is prescribed, for myoglobinuria plasmapheresis and dialysis are used.

Heparin therapy is necessary and the prophylaxis of disseminated intravascular coagulation.

Dehydration is used during lung and brain edema

Attack of malignant hyperthermia is severe condition for patients life, for the correction of which use of anesthetics, analytics and narcotics are not advisable, some think that use of Verapamil and Dantrolen together causes the risk of cardiac arrest.
During severe seizures patients are prescribed diazepam, as seizures facilitates growth of heat discharge and deepening metabolic acidosis and hypoxia.
Prophylaxis – people with malignant hyperthermia should wear ring on the hand with the inscription: “malignant hyperthermia, no strong inhalation anesthetics and muscle relaxants”. 1-2 days before surgery dantrolen is prescribed enterally. It frequently causes nausea, vomiting and diarrhea, so sometimes 2.5mg/kg dantrolen is injected 10-15 min earlier before surgery. After surgery injection of some dose of dantrolen is also recommended. During general anesthesia most safe method is use of sodium peroxide and sodium thiopental together with narcotics.
Prognosis: during malignant hyperthermia death approaches 30%. If coma continues more than 6 or 8 hour lethal outcome reaches 70-90%, mostly patients die from 12 hour to several days. Among survivals there are paresis and encephalopathy, muscle swelling, rigidity, pain and other residual effects, which in 87.9% heals. In other cases neurological status recovers very fast, but muscle weakness may last for several month. It is known, that those patients, who had malignant hyperthermia, have high risk of recurrence, because of this patients and their relatives are given appropriate recommendations.

Blocs of action

Code: 88224		Critical			Treatment period : 7,0 bed-days	
Level of medical support : II - III - IV						
105		Malignant hyperthermia (critical condition)				
level	code	Pharmacologic treatment			number	
		Name	dosage	unit	Essential	Recommendation
	B__01	Block N 1-1, 1-2 – reception of patient			1	1
	B__02	Block N 2 -1, 2-2, 2-3, 2-4, 2-5 - diagnosis			1	1
	B__03	Block N 3-1, 3-2 – basic and aiding means			2	2
	B__04	Block N 4 - treatment of patient			2	2
	B__05	Block N 5 – water and electrolytes			1	1

	B__06	Block N 6 – correction of metabolic acidosis			2	2
	B__08	block N 8-2, 8-3, - nutrition			1	1
	B__11	block N 11-1, 11-2 – pain management			2	2
	B__25	block N 25-3 – antibacterial therapy			2	2
	B__29	block N 29-1, 29-2, 29-3 – respiratory correction APV			1	1
	B__34	block N 34 – non-differentiated therapy			1	1
	B__45	block N 45 – sensibility of receptors			2	2
	B__46	block N 46 – protection of intestinal mucosa			2	2
	B__47	block N 47 stimulation of digestion			1	1
Result:		Recovery of vital functions, improvement of clinic-laboratorial analysis, Elimination of critical condition				

block N 1-1	
name	reception of patient:
subject:	Critical care medicine doctor, nurse, sanitarian
controlling:	Head of critical care medicine service
dates of implementation :	First hour of patient in clinic
characteristics of work:	Replace patients into bed
	Cleaning up of breathable ways
	Oxygen provision
	Attaching with monitor
	Catheterization of peripheral vein
	catheterization of urine bladder
	Send blood and urine for lab tests
	ECG monitoring
Implement:	block 1- 2
Indication:	All critical patients
Contradiction:	No
Result of implementation:	A patient is placed into bed, under permanent monitoring and all actions are performed as written in protocol
Notes:	Cancellation of block, work or conditions of change
Signing: doctor:	

block N 1-2	
name	reception of patient:
subject:	Critical care medicine doctor, nurse, sanitarian
controlling:	Head of critical care medicine service
Dates	the first hour of patient in clinic
Characteristics of work:	Evaluation of patient's condition by severity in aids of analogous digital scale, monitoring
Indication:	Evaluation of all patients according to digital-analogous scale
Contradiction:	No
Result:	Patient is involved in monitoring, condition is evaluated as---- points
Notes:	Cancellation of block, work or conditions of change
Signing: doctor	

block N 2-1	
name	diagnosis
subject:	Critical care medicine doctor, nurse, sanitarian, lab assistant, nurse assistant, radiologist
controlling:	Head of critical care medicine service
Dates:	First 6 hours of patient in clinic
	Following tests must be carried out:
	ECG
	X-ray of chest
	Blood test

	Urine test
	Coagulogram
	Electrolytes
	Balance of airs in blood and acid-alkaline
	Creatinine
	Sugar
	Bilirubine
	Total albumin
	Glasgow scale
	APACHE II scale
	Calculation of blood components in circulation
	Total analysis of liquor in pleura
Indication:	All critical patients
	Analysis of liquor is performed when there is a doubt about meningeal encephalitis
	Pleural punctate test is conducted when there is more than 700ml liquid in pleural cavity or in order to determine processes in pleura
Contradiction:	Take of liquor and pleural pulctate can be postponed if there are acute respiratory failure and failure of blood circulation
	Liquor test can be postponed if there is a doubt on voluminous process in brain until CT of brain
Note:	Each tests are conducted once a week and in this period parameters that are sharply deviated from norm are also studied or it is doubtful that they are changed after one week of treating
Result:	Patients has all tests according to diagnosis
Cancellation of block, work or conditions of	
Signature : doctor	
block N 2-2	
name	diagnosis
subject:	Critical care medicine doctor, nurse, radiologist, endoscopist
controlling:	Head of critical care medicine service
Dates:	First 24 hours in clinic
Description:	
Following tests must be carried out:	Echoscope
	Echocardioscope
	ECG
	Transcranial Doppler
	Fibro-gastro-deudenoscopy
	Bronchoscopy
Indication:	Echocardioscopy and transcranial Doppler must be conducted with all patients
	EEG at the time of post-anoxia injury, also in case of convulsive syndrome სინდრომების დროს.
	Gastroscopy+gastro-duodenal bleedings
	Bronchoscopy: urgent pathology of bronchi, impossibility to determine disorder of traumatic ways in aids of less invasive method.:
Contradiction:	Gastroscopy and bronchoscopy can be postponed in patients above 70 years because of Acute respiratory disorder or blood circulation problems after decision of endoscopist.

result of work:	The studies were carried out to all patients in the study, except -
Notes:	These diagnostic methods are used in the case diagnostic tools used when found ineffective or less informative
Block, Cancellation, suspension or change working conditions.	
Signature: doctor	
block N 2-3	
name	diagnosis
subject:	Nurse radiologist, doctor radiologist
controlling:	Head of critical care medicine service
dates of implementation :	First 72 hour in clinic
Description:	CT
	Nuclear magnetic resonance test
	angiography or CT angiography
indication:	These studies are done with all of the critical patients when damaging or organs and tissues are likely to be.
	Nuclear magnetic resonance test is conducted when CT and other tests are not informative enough
	CT angiography is conducted in case of likelihood of aneurism
Contradiction:	MRI is not subjected to artificial ventilation of lungs patients or patients with any metal in the body at the time
result of work:	Necessary test is conducted with patient so that to diagnose a pathology
Notes:	Examinations are financed by the insurance company and the patient's owner.
Block, Cancellation, suspension or change working conditions	
Signature: doctor	
block N 2-4	
name	diagnosis
subject:	Critical care medicine doctor, nurse, laborer
controlling:	Head of critical care medicine service
Dates:	First 72 hours in clinic
Description:	Bacteriologic test
	Viral test
	Immunologic test
	Diagnostics of myocardial attack
	Diagnostics of severe sepsis
	Toxicological tests
	Hematologic test
indication:	These studies need to be done infectious, viral, immunological, toxicological, hematological pathologies, as well as myocardial infarction or sepsis are suspected.
Contradiction:	No
Result:	Patient has following analysis.
notes:	Examinations are financed by the insurance company and the patient's owner.

Block, Cancellation, suspension or change working conditions	
Signature: doctor	
block N 2-5	
name	diagnosis
subject:	Consultant
controlling:	Head of critical care medicine service
Dates:	48 hours after confirmation of consultation
Descriptions:	Following consultations must be carried out:
	Therapeutist
	Cardiologist
	Neuropathologist
	Neurosurgeon
	General surgeon
	Endocrinologist
	Hematologist
	Angiologist
	Oncologist
	Other specialist
indication:	Indication of consultation can be such problem or which cannot be identified or the implementation of the Protocol or its holding beyond the boundaries of critical care medicine doctor's competence, such as surgery, chemotherapy, and other.
contradiction: :	no
result of work:	Patient has mentioned consultation with doctor.
Notes:	The patient has consultations depending on the most severe symptoms.
Block, Cancellation, suspension or change working conditions	
Signature: doctor	
block N 3-1	
name	Provision with basic means
subject:	Critical care medicine doctor, nurse
controlling:	Head of critical care medicine service
Description:	Patient must be provided with basic means
	Catheter (one-time)
	Tube of tracheostomy
	Gastral pump
	Needle for lumbar puncture
	Intubation tube
	Catheter of Foley
indication:	All critical patients
Contradiction:	no
Result:	Provision with basic and aiding means
notes:	
Block, Cancellation, suspension or change working conditions	
Signature doctor:	

block N 3-2	
name	Provision with basic means
subject:	Critical care medicine doctor, nurse, sanitarian
controlling:	Head of critical care medicine service
characteristics	Patient must be provided with aiding means
	Cotton
	Bandage non-sterile
	Syringe (onetime)
	Alcohol
	Iodine
	Glove
	System of transfusion
	Syringe (10ml)
	Syringe(15ml)
	Syringe(20ml)
	Plaster
	poliviline tube
	Butterfly
indication:	All critical patients
contradiction: :	No
Result:	Basic and aiding means
Notes:	
Block, Cancellation, suspension or change working conditions	
ხელმოწერა: ექიმი:	
block N 4	
name	Take care of patient
subject:	Critical care medicine nurse, sanitarian
controlling:	Head of critical care medicine service
Dates:	Once a day 10.00
Characteristics:	Cleaning up mouth with antibacterial solutions
	Prevention of bed sores (by means of camphoric alcohol, washing procedures)
	Bowel movement per2-3 days and if necessary enema
	Enteric nutrition 4 times a day according to defined calories in advance Take care of vein and urine bladder catheters
	Usage of gloves and onetime means
indication:	All critical care patients
Contradictions:	No
Result:	Patient is cleaned up, maintained
notes:	Onetime cleaning up procedure of patient with wet wipes Block, Cancellation, suspension or change working conditions
Signature: doctor	

block N 5	
name	Provision with water and electrolytes
subject:	Critical care medicine doctor, nurse
controlling:	Head of critical care medicine service
Dates:	
Description:	Sodium chloride 0,9% 500მლ.
	Potassium chloride 4% 200მლ.
	Calcium chloride or gluconate 10-30მლ.
	Magnesium sulphate 25% 15ml per day
Indication:	All critical care patients
Contradiction:	A higher than normal rate of electrolyte
result of work:	Water and electrolyte balance is corrected
Notes:	Block, Cancellation, suspension or change working conditions
Signature: doctor	
block N 6	
name	Correction of metabolic acidosis
subject:	Critical care physician, critical care nurse.
controlling:	Head of critical care medicine service
Dates:	
Description:	
indication:	Metabolic acidosis
contradiction: :	Metabolic alkalosis
Result:	Correction of metabolic acidosis
notes:	Bicarbonate dose is calculated by a special formula individually.
Block, Cancellation, suspension or change working conditions	
Signature: doctor:	
block N 8 -2	
name	Enteral feeding
subject:	Critical care medicine doctor, transfussiologist, nurse
controlling:	Head of critical care medicine service
Dates:	
Description:	About 3500-4500kkal
	-1 G per kilogram of body weight. Protein, 1 g. Fat and 4 g. Hydrocarbons.
indication:	All critical patients
Contradictions:	No
result of work:	Critically ill patient gets energetic feeding
Notes:	Food is provided orally, Nazo / or gastric probe and gastrostomy
Block, Cancellation, suspension or change working conditions	
Signature: doctor:	
block N 8 -3	
name	Compound nutrition
subject:	Critical care medicine doctor, transfussiologist, nurse
controlling:	Head of critical care medicine service
Dates:	
Description:	About 3500-4500kkal
	-1 G per kilogram of body weight. Protein, 1 g. Fat and 4 g. Hydrocarbons.

	500 ml of 40% glucose and insulin in 40, 2 times a day with the infusion rate of 100 ml / h
	The amino acid mixture - 500 ml. 1-2jer day parallel to glucose 100 ml / hr
indication:	All critical patients
contradiction: :	No
Dates:	Critically ill patient gets energetic feeding
notes:	Intravenous infusion, per orally, naso-gastral probe or gastrostomy, after calculating calories
Signature: doctor:	Block, Cancellation, suspension or change working conditions
block N 11-1	
name	Pain relief drugs and psychotropic medicines
subject:	Critical care medicine doctor, nurse
controlling:	Critical care medicine doctor
შესრულების დრო:	First 30 minutes after pain phenomenon
სამუშაოს დახასიათება პაციენტს უკათდება:	Fentanyl dose of 1-3 mg / kg intravenously slow. 1-2 min after the injection. Infusion: 1-3 Mcg / kg / hr. Validity of 0,5-1 hours.
	Morphine dose 0.1-0.2mg / kg, the infusion: 10-80 mcg / kg / min. Duration 3-4 Hours.
	Ketamine dose: 20-50mg. Iv Infusion: 0.5-2mg / kg / hr. Validity Start 1 min.
	Midazolam (Dormicum) intravenously 2.5 mg (initial dose).
indication:	Traumatic shock, myocardial infarction, postoperative period, any pain that requires analgesia.
Contradictions:	Fentanyl Contraindications: bradycardia, chest rigidity, vasodilatation, hypoventilation, vomiting, nausea, constipation. Morphine Contraindications: vasodilatation, hypoventilation, vomiting, nausea, constipation. Ketamine contradictions: head injury, intracranial hypertension, ischemic heart damage, hypertension. Ketorolac Contraindications: dyspepsia, nausea, vomiting, hallucinations, insomnia, hypertension.
result of work:	Reach to anesthesia
Notes:	Consumption of narcotic analgesics must be indicated in the registration journal, which indicates a time, series, the patient's name and number of the history, signature of doctor
Block, Cancellation, suspension or change working conditions	
Signature: doctor:	
block N 11-2	
name	Pain management with non-addictive drugs
subject:	Critical care medicine doctor, nurse
controlling:	Head of critical care medicine service
Dates:	First 30 minutes from pain phenomenon
	Ketorolac (Toradol) dose: 30 mg. one time per 6 hours 120mg per day, action time 10 min
	analgin 50% 2,0ml intravenously
	Nonsteroidal anti-inflammatory drugs for example: (diclofenac) 75 mg. IM
indication:	Postoperative period, any pain that requires analgesia.
contradiction: :	
Ketorolac Contraindicatio ns	Dyspepsia, nausea, vomiting, hallucinations, insomnia, hypertension. The asteroid ignition anti-drug: gastric ulcer and ulcer of duodenum.

Dates:	anesthesia
notes:	Consumption of narcotic analgesics must be indicated in the registration journal, which indicates a time, series, the patient's name and number of the history, signature of doctor
Block, Cancellation, suspension or change working conditions	
Signature: doctor:	
block N 25-3	
name	Antibacterial therapy
subject:	Critical care medicine doctor, nurse
controlling:	Head of critical care medicine service
Dates:	15-21 days
Description:	fosfomicin (monaural) 3gr per day
	Or dominal 400 gr per day
indication:	Existence of inflectional process
Contradictions:	Allergic reactions towards any antibiotic
result of work:	Prevention and treatment of inflectional process
Notes:	Or according to antibacterial sensibility
Block, Cancellation, suspension or change working conditions	
Signature: doctor:	
block N 29-1	
Name	Oxygenation of critical patient on spontaneous breathing
subject:	Critical care medicine doctor, nurse
controlling:	Head of critical care medicine service
შესრულების დრო:	
სამუშაოს დახასიათება:	Oxygen is supplied in the following ways: 1. Nasal cannula, 2. Simple maks, 3 mask of venture, 4. Mask with reservoir-24-60% concentration, by 1,6l/min
indication:	All critical patients
contradiction: :	no
Result:	Showings of external respiration are satisfactory
Notes:	Oxygenation indicators must be maintained for 5 l / min in light of SO O2-90% - = high. Otherwise, moving to pulmonary ventilation.
Block, Cancellation, suspension or change working conditions	
Signature: doctor:	
block N 29-2	
name	Oxygenation of patient on spontaneous respiration by CPAP face mask.
subject:	Critical care medicine doctor, nurse
controlling:	Head of critical care medicine service
Dates:	
Description:	Patient has pulmonary ventilation by menas of CPAP mask on the background of oxygen provision FIO2 60%. 15-30min
	Then oxygenation with cannula again
indication:	All critical care patients
Contradictions:	no
result of work:	Showings of external respiration are satisfactory

notes:	Oxygenation indicators must be maintained for 5 l / min in light of SO O2-90% - = high. Otherwise, moving to pulmonary ventilation.
Block, Cancellation, suspension or change working conditions	
Signature: doctor:	
block N 29-3	
name	Artificial pulmonary ventilation
subject:	Critical care medicine doctor, nurse
controlling:	Head of critical care medicine service
Dates:	
Description:	Initial parameters of ventilation in adults
	FIO2100% maintaining < 60%, to avoid toxicity of oxygen and pulmonary injury
	Respiration rate (ლლ) 8-12min. 18-24/min to reach therapeutic ventilation
	Regimes SMV, SIMV, SIPAP, BYPAP
	Inhalation volume (TV) 6-8ml/kg.
	Inhalation flow speed (IFR) 60ლ/წთ
	Inhalation/exhalation correlation (I/E) 1/2½- 1/3.
	Plateau pressure <35სმ H2O must be maintained low that maximal showing to avoid barotrauma
	(PIP)<45 სმ. H2O
	pressure support and positive end-expiratory pressure (PEEP) 5sm. H2O.
	Cardiac volume in patients with hypovolemia
indication:	Respiratory failure caused from various pathologies
contradiction: :	Bullous lungs
Result:	Patient has artificial pulmonary respiration and all necessary procedures
Notes:	Applications of all parameters is not easy during named regimes because technical characteristics of various respiratory apparatus are different: rate >20 can be increased by PEEP. Elevated volume can cause danger of barotraumas and cause damage associated with ventilator. Extremely low showing of IFR can increase PEEP because of lack of inhalation time. Extremely high showing of IFR can increase PIP. Increased correlation can be effective at the time of acute obstruction or COPD. Transverse correlation (2:1) is used for elevation of PAO2 at the time of severe hypoxia. PIP must be maintained at low levels(is less important than pressure of plateau)
Block, Cancellation, suspension or change working conditions	
Signature: doctor:	
block N 34	
name	Non-differentiated therapy
subject:	Critical care medicine doctor, nurse
controlling:	Head of critical care medicine service
Dates:	
description	

drug	dosage	unit
Diazepam	10mg/2ml	amp
Cetamin	500mg/10ml	bottle
Atropine	1mg/1ml	amp
Adrenaline	1mg/ml	amp
Prednizolone	30mg/ml	amp
Klonidine	0,15mg	injection
Digoxine	50mkg/ml	1ml
Dopamine	200mg/5ml	bottle
Forudemid	20mg/2ml	amp
Insulin short action	400 IU/10 ml	bottle
Neostigmine	2,5mg	bottle
Aminophiline injection	250mg/10ml	amp
Calcium glukonate	0.1	amp
Lidocaine injection	10% 100mg/5ml	amp
indication:		All critical patients
Contradiction:		no
result of work:		
notes:		
Block, Cancellation, suspension or change working conditions		
Signature: doctor:		

block N 45	
name	Recover of receptor's sensibility
subject:	Critical care medicine doctor, nurse
controlling:	Head of critical care medicine service
Dates:	
Description:	prednizolone 30mg 1ml amp
	dexamethasone 4მგ.1ml amp
indication:	Intoxications of various kinds, collagenoses, myasthenia, polumieloradiculoneuritis, chronic obstruction disease of lungs, hydrothorax
contradiction: :	Disease of gastro-duodenal tract
Result :	Recovery of sensitiveness of receptors
Notes:	On the background of protection of stomach mucosa
Block, Cancellation, suspension or change working conditions	
Signature: doctor:	

block N 46	
name	Protection of stomach muscosa
subject:	Critical care medicine doctor, nurse
controlling:	Head of critical care medicine service
Date:	Permanently
სამუშაოს დახასიათება:	Blocker of hydrogen ions (omeprazole, lansoprazole 1 caps per day, in the morning before meal)
	Patients of gastro-intestinal disease in anamnesis need inhibitor of H2 receptors: for example: Zantac 25mg-1ml 2 times a day
	Gastric mucosa exhibition means Simalgel 10ml 4 times or sucralfate 1gr 2 times 20 min before meal 1გრ 2ჯერ კვების წინ 20 წუთით ადრე.
indication:	All patients especially one with pathologies of gastro-intestinal tract.

Contradictions:	no
result of work:	Protection of stomach mucosa
notes:	
Block, Cancellation, suspension or change working conditions	
Signature: doctor:	
block N 47	
name	Stimulation of bowel movement
subject:	Critical care medicine doctor, nurse
controlling:	Head of critical care medicine service
Dates:	Per 2-3 days
Description:	Gutalax
	cleaning enema at at 2-3 days
	If peristaltic is slow then prozerine 1ml amp before 20 min before enema ით ადრე.
indication:	All critical patients
contradiction: :	No
	Regulation of bowel movement
notes:	Enema must be conducted carefully in case of cardiac pathologies and thrombosis and prozerine- epilepsy,hyperkinesis, bronchial asthma, stenocardia and intestinal obstruction of mechanical character
Block, Cancellation, suspension or change working conditions	
Signature: doctor:	

References:

1.Z.Kheladze,Zv.Kheladze-"Critical Care Medicine", First book, Tbilisi, Georgia, 2015,-300pp.
.2.Z.Kheladze,Zv.Kheladze-"Critical Care Medicine", Second book, Tbilisi, Georgia, 2016,-320pp

ზ.ხელაძე,ზვ.ხელაძე

ავთვისებიანი ჰიპერთერმიის მკურნალობის სტანდარტი შეზღუდული რესურსების მქონე კრიტიკული მედიცინის კლინიკებისათვის

კრიტიკული მედიცინის ინსტიტუტი,თბილისი,საქართველო.

განხილულია ავთვისებიანი ჰიპერთერმია პრობლემა. მოტანილია აუცილებელი ინფორმაცია ავთვისებიანი ჰიპერთერმია შესახებ.აქვეა წარმოდგენილი კრიტიკული მედიცინის კლინიკაში ავთვისებიანი ჰიპერთერმიის მკურნალობის სტანდარტი. ეს უკანასკნელი მოიცავს ავადმყოფის დიაგნოზის,მოვლის და მკურნალობის პირობებს, სტანდარტი გამიზნულია შეზღუდული რესურსების მქონე ქვეყნების კრიტიკული მედიცინის კლინიკებისათვის.ამ თვალსაზრისით

თითოეული საწოლ-დღის ღირებულება არ აღემატება 300,0-500,0 აშშ. დოლარს

განხილულია თირკმლების მწვავე უკმარისობის პრობლემა.მოტანილია აუცილებელი ინფორმაცია თირკმლების უკმარისობის შესახებ.აქვეა წარმოდგენილი კრიტიკული მედიცინის კლინიკაში თირკმლების მწვავე უკმარისობის მკურნალობის სტანდარტი. ეს უკანასკნელი მოიცავს ავადმყოფის დიაგნოზის,მოვლის და მკურნალობის პირობებს, სტანდარტი გამიზნულია შეზღუდული რესურსების მქონე ქვეყნების კრიტიკული მედიცინის კლინიკებისათვის.ამ თვალსაზრისით თიოთოპეული საწოლ-დღის ღირებულება არ აღემატება 300,0-500,0 აშშ. დოლარი