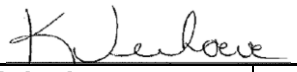
WOODSTOCK HOSPITAL

Department/Category	Nursing – RN (CCU)
Policy Name/ Unit Number	Train of Four Monitoring – Unit 2
Location	Clinical Practice Manual
Approval Committees	☒CPC: June 2, 2020 ☒NAC: June 25, 2020 ☐MAC: Click here to enter a date. ☐P and T: Click here to enter a date. ☐Board of Directors: Click here to enter a date. ☐Senior Team: Click here to enter a date. ☐Patient and Family Advisory: Click here to enter a date. ☐Other: Click here to enter a date.
Signature (if applicable)	

Document Owner	**Original Date**	**Reviewed Date**	**Revision Date**	**Page 1 of 5**
Staff Development	April 2011	May 2020		

Background Information:
Train of Four (TOF) monitoring is performed on patients receiving continuous infusion of neuromuscular blocking agents in the critical care unit. TOF is not required in the event the patient is receiving intermittent bolus doses of Neuromuscular Blocking Agents (NMBA).
Neuromuscular blocking agents are used to: facilitate endotracheal intubation under special circumstances, facilitate mechanical ventilation and improve gas exchange in patients who cannot be managed with sedation, analgesia and ventilator parameter manipulation alone (i.e. poor lung and chest wall compliance) suppress struggling, coughing or hiccupping despite adequate sedation.

Purpose:
To ensure that the patient is adequately paralyzed with neuromuscular blocking agents using TOF monitoring. TOF testing is used to measure the degree of neuromuscular blockade using a peripheral nerve stimulator. The number of responses to the TOF stimuli indicates the degree of neuromuscular blockage. The desired number of twitches must be ordered by the physician. The use of TOF monitoring in the CCU may result in the reduction of NMBAs' dose and subsequent decrease risk pf complications related to prolonged and or excessive blockade such as Intensive care unit-acquired weakness

Alert:
Peripheral nerve monitoring is used in conjunction with the assessment of clinical goals and clinical decisions should never be made SOLELY on the basis of twitch response**.**
Paralytic medications should never be administered without sedation and or pain medication**.**

Peripheral Nerve Stimulation (PNS)
1. Method to objectively monitor degree of neuromuscular blockage
2. Helps to decrease avoidable side affects such as unwanted movement, prolonged paralysis, and delayed recovery drug or metabolite accumulation

Train of Four (TOF)
1. Stimulus is delivered as a group of four pulses spaced
2. Each TOF is accompanied by audible chirp

Equipment:
1. Peripheral nerve stimulator (located in CCU)
2. Monitoring electrodes
3. Felt tip marker

Procedure:
1. TOF should be assessed every 30 minutes X4 or until ordered twitches achieved, then Q1H once goal TOF is achieved
2. Obtain baseline vital signs, pupillary assessment and baseline TOF prior to initiation of the NMBA
3. Record date on the 2 electrodes and attach along the course of the nerve on dry non- greasy skin. It is optimal to place electrode approximately 1-3cm apart along the nerve path
4. The ulnar nerve is recommended for TOF testing. If the patient is very edematous or ulnar placement not possible, the facial nerve is used. Please refer to the electrode placement below

Electrode Placement:
Ulnar Nerve: place negative electrode (black) on wrist in line with the smallest digit 1-2 cm below skin crease and the positive electrode (red) 1-3cm proximal to the negative electrode
Response: Adductor pollicis muscle- thumb adduction

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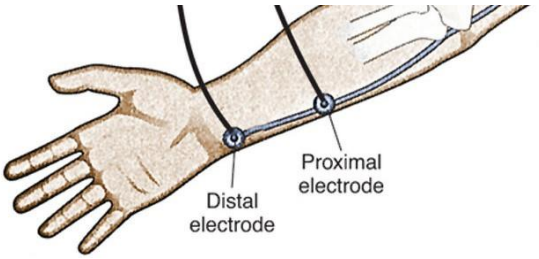
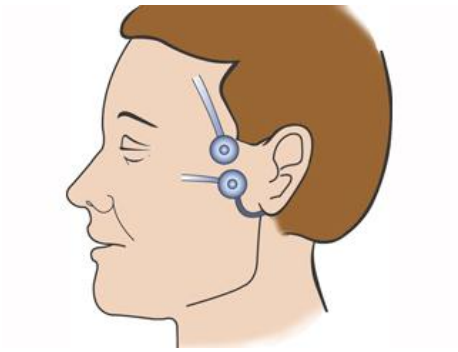
Train of Four Monitoring





Facial Nerve: Place the negative (black) electrode by the ear lobe an the positive (red) electrode 2 cm from the eyebrow (along the facial nerve inferior and lateral to the eye)
Response: Orbicularis occuli muscle - eyelid twitching

Obtain Baseline Threshold Prior To Paralysis

1. Turn stimulator on, Press TOF (Train of Four) once and select the current necessary (usually 5-10mA) for patient to twitch when the stimulus is applied. It will deliver a “train” of four pulses. Four twitches should be observed. The pattern will repeat when pressing the TOF a second time
2. If no twitches observed, recheck connection, electrodes and battery. Retry, if no twitches observed, turn stimulus control dial clockwise to increase amperage until twitches observed ~~9~~ **(**up to maximum if necessary). Consider alternate site for TOF monitoring. If still no twitching observed, report to physician prior to initiating paralysis
3. Turn off nerve stimulator between uses

TOF Monitoring:

1. Turn stimulator on, Press TOF
2. Count the number of twitches observed from the 4 delivered. Goal is 1 to 2 out of 4 twitches as per physician’s order
3. If no twitching is seen recheck the connections, check electrodes and battery. If system appears to be working correctly patient may be 100% blocked. Hold next

bolus of neuromuscular blocking agent or decrease infusion by 50% and re-evaluate TOF in 30 mins. Check TOF Q30 min until 1 to 2 out of 4 twitches observed as ordered. Resume neuromuscular blockade as per physician orders
4. Turn off nerve stimulator between uses
5. Remove or replace electrodes Q24 hrs as needed

Nursing documentation to include:
1. Baseline and subsequent thresholds on critical care flow sheet
2. Document response level of blockade on critical care flow sheet
3. Administration of paralytic /sedation on eMAR
4. Associated nursing intervention

Nursing Alerts:
Patient must have an advanced airway and be ventilated on a fixed rate prior to initiation if neuromuscular blockade

Must have a knowledge regarding Neuromuscular Blocking Agent (NMBA) used (i.e.: onset of action and mechanism of action, duration of action, adverse effects)
Assess patient prior to receiving a NMBA to obtain baseline threshold and ensure proper electrode placement
DO NOT USE other programs on the stimulator as they may cause extreme discomfort

Nursing Considerations
1. Obtain physician orders for
    a) Sedation
    b) Eye lubrication
    c) VTE prophylaxis
    d) Physiotherapy
2. Maintain HOB 30-40 degrees unless contraindicated
3. Initiate pressure ulcer prevention techniques (regular repositioning, skin care measure)
4. Regular tracheal suctioning as required
5. Have bag valve mask and airway at the bedside and readily available in case of tracheal tube displacement or mechanical dysfunction
6. Answer all ventilator alarms promptly
7. Draw ABG's as ordered
8. Continuous SaO2 monitoring and end-tidal C02 monitoring
9. Record vital signs, including temperature**,** Q1h and prn. Pupillary assessment Q4h and prn
10. Visual and clinical assessment of the patients response to NMBA should be preformed in conjunction with TOF monitoring: tactile assessment of patients muscle tone, skeletal muscle movement and respiratory effort

11. Once paralytics discontinued, maintain sedation until TOF reaches 4:4 twitches

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Responsibility:	Director of Patient Care
Reference:	1) Elsevier Clinical Skills Online- Peripheral Nerve Stimulator, accessed May 5 2020 2) Clinical assessment and train-of-four measurements in critically ill patients treated with recommended doses of cicatracurium or atracurium for neuromuscular blockade: a prospective descriptive study, Bouju et al. Intensive Care (2017) 7;10 DOI10.1186/s13613-017-0234-0, accessed on line January 3, 2020 3) Neuromuscular blocking agents in critically ill patients: Use, agent selection, administration and adverse effects, Edward A Bittner, MD, PhD, MSEd, FCCM, Up-To Date (2019) accessed on line January 12, 2020
Cross Reference:	