Neuromuscular Blocking Agents (NMBA) Safer Practice Advisory Tool for Australian hospitals

Background

Neuromuscular Blocking Agents (NMBAs) are used to produce paralysis of skeletal muscles. They are a high-risk medication used in anaesthesia and other critical care settings. The unintentional administration of an NMBA may result in permanent injury or death. (1-3)

The Victorian NMBA advisory group was established to provide expert advice and develop a tool to support the safe handling of NMBAs with the goal to reduce the risk of inadvertent administration. The interdisciplinary group comprised representatives from both rural and metropolitan Victorian hospitals.

The risk reduction strategies for NMBAs align with the steps of the medication management process, as defined by the Australian Commission on Safety and Quality in Health Care (ACSQHC) National Safety and Quality Health Service Standards. These standards support health service organisations to safely supply, store, compound, manufacture, prescribe, dispense, administer, monitor and dispose of medicines. (4)

How to use the advisory tool

This advisory tool aims to assist staff in Australian hospitals take an active approach to NMBA safety. It is designed to be completed with input from relevant stakeholders including (*but not limited to*) representatives from pharmacy, anaesthesia and nursing.

Completion of the advisory tool will support staff to assess NMBA medication management practices and identify opportunities for safer medication handling. The tool is designed to be employed every three years and may be used to demonstrate compliance with the National Safety and Quality Health Service Standards.

Acknowledgements

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Advisory Group

Thank-you to members of the Victorian NMBA advisory group for developing the content of this advisory tool.

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Pilot

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Alfred Health, Melbourne, Victoria.

Austin Health, Heidelberg, Victoria.

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East Grampians Health Service, Ararat, Victoria.

Eastern Health, Box Hill, Victoria.

Melbourne Health, Parkville, Victoria.

Latrobe Regional Hospital, Traralgon, Victoria.

Monash Health, Clayton, Victoria.

Northeast Health, Wangaratta, Victoria.

Peninsula Health, Frankston, Victoria.

South West Healthcare , Warrnambool, Victoria.

Royal Hobart Hospital, Hobart, Tasmania.

Western Health, Footscray, Victoria.

Scoring key	
A	Not considered or implemented
B	Considered but not implemented
C	Partially implemented
D	Implemented everywhere

Strategies within the Medication Management Process ***(Applicable NSQHS standards: 4.2 & 4.15)***

1. Purchasing

Risk reduction strategy	A	B	C	D	Action(s)/ Comment(s)	To be actioned by	Date when actions are due for completion	**Date implemented everywhere** (Unless 'B' selected)
1.1 Safe medication procurement practices are in place within the organisation. (4) Before an NMBA brand change, a consultative process involving pharmacy and end users (such as anaesthetists and intensivists) occurs to minimise the risk of look-alike packaging. (3, 4, 6-9)	☐	☐	☐	☐				
1.2 NMBA brands in vials with the red warning statement; 'Warning paralysing agent (or similar) clearly visible are preferred. (3, 6, 7) The addition of the red warning statement is mandatory for manufacturers (excluding NMBAs in plastic ampoules) from 2020. (10)	☐	☐	☐	☐				
1.3 Whenever there is an NMBA brand change, formalised and timely communication to end-users occurs before and following distribution. (3, 4, 6, 7)	☐	☐	☐	☐				
1.4 The manufacturer and other relevant bodies (e.g. Health Purchasing Victoria) receive feedback on any NMBA look-alike labelling and packaging issues.	☐	☐	☐	☐				

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2. Supply

Risk reduction strategy	A	B	C	D	Action(s)/ Comment(s)	To be actioned by	Date when actions are due for completion	**Date implemented everywhere** (Unless 'B' selected)
2.1 An annual review is in place to ensure NMBAs are only included in critical care areas with high clinical use. (3, 4, 6, 11-13, 14-16)	☐	☐	☐	☐				
2.2 Before distribution to imprest areas, a red 'Warning Paralysing Agent' label is applied to all NMBA ampoule/vials. (3, 15-17) Appendix 1. Note: after September 2020, this applies to NMBAs in plastic ampoules only. (10)	☐	☐	☐	☐				
2.3 Electronic Pharmacy dispensing alerts are in place for NMBAs outside of imprest areas; such as Theatres, Emergency or ICU, to ensure validation of NMBA supply.	☐	☐	☐	☐				
2.4 a. An NMBA ampoule/vial transported with a patient is kept in a separate bag/container that features the red warning statement 'warning-paralysing agent' on the front. If not needed the NMBA is returned to the appropriate storage area as soon as practicable. **b.** A pre-drawn NMBA transported with a patient is drawn-up in a red-plunger								

syringe and labelled according to the relevant national standards (18). If not needed the NMBA is disposed of as soon as practicable. *Example, in the circumstance an NMBA must accompany a patient with an unstable Traumatic Brain Injury to and from the Intensive Care Unit and Radiology.*								

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3. Storage

Risk reduction strategy	A	B	C	D	Action(s)/ Comment(s)	To be actioned by	Date when actions are due for completion	**Date implemented everywhere** (Unless 'B' selected)
3.1 NMBAs storage in all areas are: **a.** ideally segregated from other medications, and **b.** the different NMBAs and strengths are in separate containers that feature the red warning statement 'warning – paralysing agent' in front of the stock. (3, 6, 8, 11, 12, 16, 17) Appendix 1.	☐	☐	☐	☐				
3.2 In medication trolleys and/or MET Call/Code Blue bags, NMBAs are stored in a separate closed container that is clearly labelled with the red warning statement 'warning – paralysing agent'. (7, 13, 19, 20)	☐	☐	☐	☐				
3.3 NMBA storage listed in 3.1 and 3.2 is standardised across all areas and hospital sites. (12, 11)								

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4. Prescribing

Risk reduction strategy	A	B	C	D	Action(s)/ Comment(s)	To be actioned by	Date when actions are due for completion	**Date implemented everywhere** (Unless 'B' selected)
4.1 Practice procedure/guidelines and education include the prescription of NMBAs is restricted to medical trainees under supervision and medical staff familiar with their actions and trained to facilitate mechanical ventilation. (3)	☐	☐	☐	☐				

5. Administration

Risk reduction strategy	A	B	C	D	Action(s)/ Comment(s)	To be actioned by	Date when actions are due for completion	**Date implemented everywhere** (Unless 'B' selected)
5.1 The organisation has implemented the recommendations of the Australian and New Zealand College of Anaesthetists (ANZCA) 'Guidelines for the Safe Administration of Injectable Medicines in Anaesthesia'. (3, 7, 13)	☐	☐	☐	☐				
5.2 NMBAs are only administered in environments with equipment and monitoring for advanced airway and respiratory support. (9)	☐	☐	☐	☐				
5.3 Red plunger NMBA syringes are available and used exclusively to measure and	☐	☐	☐	☐				

administer NMBAs; exceptions include paediatric units and administration of NMBA infusions. (3)								
5.4 Practice procedure/guidelines and education include the time interval between drawing up and administering an NMBA is as short as practicable. (7)	☐	☐	☐	☐				
5.5 Practice procedure/guidelines and education state that bungs and lines must be flushed immediately after NMBA administration. (6) For bungs, this applies even in the presence of a running line (21).	☐	☐	☐	☐				
5.6 For NMBA continuous infusions: **a.** standardised concentrations, and **b.** smart pump error reduction technology is used. (6)	☐	☐	☐	☐				
5.7 The electronic medicine management system features an alert for NMBAs to prevent inadvertent administration. In the circumstance, it is not correctly ceased upon transfer from a critical-care area to a general ward. ***Example**: For NMBAs, in the 'order comments section' of the Medication Administration Record the warning statement 'warning - paralysing agent' is included.*	☐	☐	☐	☐				

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6. Disposal

Risk reduction strategy	A	B	C	D	Action(s)/ Comment(s)	To be actioned by	Date when actions are due for completion	**Date implemented everywhere** (Unless 'B' selected)
6.1 In theatre and other critical care settings where NMBAs are administered, practice procedure/guidelines and education state that empty ampoules are retained after administration until confirmation of clinical effect. (7)	☐	☐	☐	☐				
6.2 NMBA ampoules and syringes are immediately discarded after use when no longer required and medications have been reconciled. (3, 6, 7)	☐	☐	☐	☐				

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7. Clinical Governance

Risk reduction strategy	**A**	**B**	**C**	**D**	Action(s) &/or Comment(s)	To be actioned by	Date when actions are due for completion	**Date implemented everywhere** (Unless 'B' selected)
7.1 NMBAs are recognised within the organisation as a high-risk medication (e.g. added to the APINCH taxonomy for high-risk medicines). (4, 6, 11-13) ***Applicable National Safety and Quality Health Service (NSQHS) standard: 4.15***	☐	☐	☐	☐				
7.2 Standardised education is available on the safe supply, storage, and administration of NMBAs. (3, 4) ***Example**: NMBAs is incorporated into organisation education &/or procedure/guideline on high risk medications.* ***Applicable NSQHS standard: 1.19, 4.1***	☐	☐	☐	☐				
7.3 The specific reporting of NMBA incidents, including near misses, within the organisation is supported and shared with relevant department(s) and interdisciplinary committee(s). (3, 4, 6, 8, 19) ***Applicable NSQHS standard: 1.11***	☐	☐	☐	☐				
7.4 The specific reporting of NMBA incidents externally is supported. (4, 6) For anaesthetists, they should be entered into WebAIRS (Web-based Anaesthetic Incident Reporting System). (22) For more information on WebAIRS refer to the	☐	☐	☐	☐				

Australian and New Zealand Tripartite Anaesthetic Data Committee website. ***Applicable NSQHS standard: 1.11***								
7.5 Reported NMBA incidents, including near misses, are routinely reviewed by an interdisciplinary team (e.g. medication safety committee) that recommends/facilitates implementation of risk reduction strategies. (4, 6, 12) ***Applicable NSQHS standard: 1.11, 4.2***	☐	☐	☐	☐				
7.6 Regular monitoring occurs to ensure maintenance of NMBA risk reduction strategies. (4) ***Applicable NSQHS standard: 1.7, 4.2***	☐	☐	☐	☐				

Appendix 1. NMBA warning statement

WARNING: Paralysing Agent causes respiratory distress

Alert stickers for NMBA vials and ampoules are available from Baypac. Code: BC 2315

References

1. A.McRae. Time for Change: Proposed improvements to the labelling and packaging of Neuromuscular Blocking Agents in Australia Melbourne2015 [cited 2018 21 May]. Available from: http://clinicalcred.com/Clinical_Cred/EZDrugID_files/TimeForChange.pdf.
2. D.Bramley. Making a serious drug error shouldn't be so easy. ANZCA Bulletin. 2015:24 - 5.
3. Graudins LV, Downey G, Bui T, Dooley MJ. Recommendations and low-technology safety solutions following neuromuscular blocking agent incidents. Joint Commission Journal on Quality and Patient Safety. 2016;42(2):86-91.
4. Australian Commission on Safety and Quality in Health Care. National Safety and Quality Health Service Standards Sydney 2017 [cited 2018 7th April]. 2nd ed:[Available from https://www.safetyandquality.gov.au/wp-content/uploads/2017/12/National-Safety-and-Quality-Health-Service-Standards-second-edition.pdf.
5. VicTAG. VicTAG | Statement of purpose 2018 [cited 2018 1 July]. Available from: http://www.victag.org.au/about/statement-of-purpose.
6. Institute for Safe Medication Practices. ISMP Medication Safety Self Assesment for High-Alert Medications, [Internet]. 2017 [cited 2018 7 April]. Available from: https://www.ismp.org/assessments/high-alert-medications
7. Australian and New Zealand College of Anaesthetists (ANZCA). Guidelines for the Safe Management and Use of Medications in Anaesthesia 2017 [cited 2018 7 April]. Available from: http://www.anzca.edu.au/documents/ps51-2009-guidelines-for-the-safe-administration-o.pdf.
8. Mahajan RP. Medication errors: can we prevent them? British Journal of Anaesthesia. 2011;107(1):3-5.
9. National Institute of Academic Anaesthesia. NAP5 Report - National Audit Project London2014 [cited 2018 7 April]. Available from: http://www.nationalauditprojects.org.uk/NAP5report.
10. Therapeutic Goods Administration (TGA), Department of Health, Australian Government. Canberra 2018 [cited 2019 5 August]. Available from: https://www.tga.gov.au/new-warnings-labels-medicines-containing-neuromuscular-blocking-agents
11. Institute for Safe Medication Practices. 2018-2019 Targeted Medication Safety Best Practices for Hospitals, Pennsylvania 2018 [cited 2018 7 April]. Available from: https://www.ismp.org/sites/default/files/attachments/2017-12/TMSBP-for-Hospitalsv2.pdf.
12. Clinical Excellence Commission. Medication Safety Self Assessment® for Australian Hospitals(2015) Sydney2015 [cited 2018 7 April]. Available from: http://www.cec.health.nsw.gov.au/patient-safety-programs/medication-safety/mssa.
13. NSW Government Health Standards. High-Risk Medicines Management Policy Sydney2015 [cited 2018 7 April]. Available from: http://www1.health.nsw.gov.au/pds/ActivePDSDocuments/PD2015_029.pdf.
14. Grissinger M. Your High-Alert Medication List Is Relatively Useless Without Associated Risk-Reduction Strategies. P T. 2016;41(10):598-600.
15. Victorian Therapeutic Advisory Group Quality Use of Medicines (Vic TAG QUM) group. High Risk Medication Neuromuscular Blocking Agents(2013) Melbourne2013 [cited 2018 7 April].
16. Institute for Safe Medication Practices Canada. Neuromuscular blocking agents: Enhancing safety by reducing the risk of accidental administration Pennsylvania 2007 [cited 2018 7 April]. Available from: http://ismpwe.ismp-canada.org/download/caccn/CACCN-Spring07.pdf.
17. Phillips MS, Williams RL. Improving the safety of neuromuscular blocking agents: A statement from the USP Safe Medication Use Expert Committee. American Journal of HealthHealth-System Pharmacists. 2006.
18. Australian Commission on Safety and Quality in Health Care. User-applied Labelling of Injectable Medicines, Fluids and Lines Sydney 2015 [cited 2019 28 August]. Available from:. https://www.safetyandquality.gov.au/sites/default/files/migrated/National-Standard-for-User-Applied-Labelling-Print-version-Aug-2015.pdf
19. Grigg EB, Roesler A. Anesthesia Medication Handling Needs a New Vision. Anesthesia and Analgesia. 2018;126(1):346-50.
20. Grigg EB, Martin LD, Ross FJ, Roesler A, Rampersad SE, Haberkern C, et al. Assessing the impact of the anesthesia medication template on medication errors during anesthesia: A prospective study. Anesthesia and Analgesia. 2017;124(5):1617-25.
21. Broome RI, Gibson AA. The importance of flushing injection ports. Anaesthesia. 2019; 74:394-408.
22. Australian and New Zealand Tripartite Anaesthesia Data Committee (ANZTADC) – Web-based Anaesthesia Incident Reporting System (WebAIRS). Available from http://www.anztadc.net/