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Monitoring during anaesthesia: beyond minimal standards

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One of the fundamental tenets of anaesthesia is patient monitoring. In 1985, a modest initiative that started as a straightforward attempt to lower malpractice indemnity costs in hospitals linked with Harvard University made pulse oximetry and capnography mandatory during anaesthesia.[1] A year later, the formulated standards were later published in the Journal of the American Medical Association to promote patient safety at the national level.[2] In the same year, after much publicity, the American Society of Anesthesiologists ratified the national monitoring standards by an almost unanimous vote.[3]

The International Taskforce on Anaesthesia Safety was established in 1989 and comprises leaders who were involved in developing anaesthesia safety policies in their home nations with the goal of "improving anaesthesia safety by advocating international standards for anaesthesia practice".[4] The task force aimed to increase current regulations and offer a framework for anaesthesia practitioners in other countries to create their national safe practices. These efforts led to the World Federation of Societies of Anesthesiologists developing International Standards for a Safe Practice of Anaesthesia at the World Congress of Anesthesiologists in 1992.[5]

In embracing the efforts above, the Malaysian Society of Anaesthesiologists (MSA) published the Recommendations for Safety Standards and Monitoring during Anaesthesia and Recovery in 1993, and the second updated edition in 1997.[6] After over a decade, the College of Anesthesiologists (CoA), Academy of Medicine of Malaysia in collaboration with MSA produced the Recommendations for Safety Standards and Monitoring During

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Anaesthesia and Recovery Revised 2008.[7] Five years later, the fourth edition with a slightly different title of Recommendations for Patient Safety and Minimal Monitoring Standards during Anaesthesia and Recovery (4th Edition) 2013 was published by CoA and MSA.[8] More recently, the Recommendations for Patient Safety and Minimal Monitoring Standards during Anaesthesia and Recovery (5th Edition) 2022 was produced.[9]

In the latest edition of the recommendations, the following statements were indicated:[9]

- "A peripheral nerve stimulator should be available when muscle relaxants are used to monitor neuromuscular function" under the section of Intraoperative Monitoring of the Patient, under the subsection of Neuromuscular function.
- "Depth of anaesthesia monitoring (*e.g.*, BiSpectral Index, Auditory Evoked Potential, and Entropy) is indicated: In patients who are at high risk of developing awareness" and "When total intravenous anaesthesia technique is administered especially if it is used together with neuromuscular blockade" under the subsection of Depth of Anaesthesia Monitoring.

Near similar statements for neuromuscular function can be traced back to the second edition, and for depth of anaesthesia monitoring to the third edition.[6-8]

Residual neuromuscular blockade defined as a quantitative train-of-four (TOF) ratio of lower than 0.9 at the end of surgery has been linked to unpleasant clinical symptoms of weakness, extended stay in the Post-Anaesthesia Care Unit (PACU), reduced hypoxic ventilatory response, increased upper airway obstruction risk, and decreased ability to protect the airway.[10] Residual neuromuscular blockade is a contributing factor for postoperative pulmonary complication.[11]

Deep neuromuscular blockade defined as no TOF response and 2 or fewer responses to post-tetanic count enhanced surgical space conditions and reduced postoperative pain in the PACU for laparoscopic surgery.[12]

Bispectral index (BIS), a processed electroencephalography (pEEG) depth of anaesthesia monitor, has not been proven to reduce the incidence of accidental awareness under general anaesthesia (AAGA) for inhalational anaesthesia but exhibited a notable superiority for intravenous anaesthesia.[13] BIS usage has been associated with lower volatile and propofol anaesthesia doses, quicker recovery from anaesthesia, and a shorter PACU stay.[14]

A low BIS score defined as less than 40–45 has been linked to increased long-term mortality.[15 16] Anaesthesia guided by pEEG was associated with a reduction in post-operative delirium.[17] Light anaesthesia defined as BIS of 50 compared to deep anaesthesia defined as BIS of 35 among patients following major surgery decreased the incidence of postoperative delirium and postoperative cognitive impairment.[18]

Deep neuromuscular blockade guided by a peripheral nerve stimulator will improve the laparoscopic surgical condition and postoperative pain; its adequate reversal will reduce reduce post-extubation complications. Adequate delivery of anaesthetics guided by pEEG will reduce the incidence of AAGA; avoidance of excessive doses will reduce mortality and cognitive morbidity. These balancing acts will require going beyond the minimal standards.

References

1. Pandya AN, Majid SZ, Desai MS. The Origins, Evolution, and Spread of Anesthesia Monitoring Standards: From Boston to Across the World. Anesth Analg. 2021 Mar 1;132(3):890-898. https://doi.org/10.1213/ANE.0000000000005021
2. Eichhorn JH, Cooper JB, Cullen DJ, Maier WR, Philip JH, Seeman RG. Standards for patient monitoring during anesthesia at Harvard Medical School. JAMA. 1986 Aug 22-29;256(8):1017-20
3. Epstein BS. ASA Adopts Standards for the Practice of Anesthesiology. Arch Surg. 1987;122(10):1215–1216. https://doi.org/10.1001/archsurg.1987.01400220125027
4. Eichhorn JH. The standards formulation process. Eur J Anaesthesiol Suppl. 1993;7:9-11.
5. Merry AF, Cooper JB, Soyannwo O, Wilson IH, Eichhorn JH. International Standards for a Safe Practice of Anesthesia 2010. Can J Anaesth. 2010 Nov;57(11):1027-34. https://doi.org/10.1007/s12630-010-9381-6
6. Recommendations for Safety Standards and Monitoring during Anaesthesia and Recovery 1997: Malaysian Society of Anaesthesiologists [cited 2023 May 20]. Available from: http://www.acadmed.org.my/view_file.cfm?fileid=180
7. Recommendations for Safety Standards and Monitoring during Anaesthesia and Recovery Revised 2008: College of Anaesthesiologists, Academy of Medicine Malaysia and Malaysian Society of Anaesthesiologists [cited 2023 May 20]. Available from: http://www.acadmed.org.my/view_file.cfm?fileid=182
8. Recommendations for Safety Standards and Minimal Monitoring Standards during Anaesthesia and Recovery (4th Edition) 2013: College of Anaesthesiologists, Academy of Medicine Malaysia and Malaysian Society of Anaesthesiologists [cited 2023 May 20]. Available from: https://www.msa.net.my/view_file.cfm?fileid=156
9. Recommendations for Safety Standards and Minimal Monitoring Standards during Anaesthesia and Recovery (5th Edition) 2022: College of Anaesthesiologists, Academy of Medicine Malaysia and Ma-

laysian Society of Anaesthesiologists [cited 2023 May 20]. Available from: https://www.msa.net.my/view_file.cfm?fileid=230

10. Thilen SR, Weigel WA, Todd MM, et al. 2023 American Society of Anesthesiologists Practice Guidelines for Monitoring and Antagonism of Neuromuscular Blockade: A Report by the American Society of Anesthesiologists Task Force on Neuromuscular Blockade. Anesthesiology. 2023 Jan 1;138(1):13-41 https://doi.org/10.1097/ALN.0000000000004379
11. Miskovic A, Lumb AB. Postoperative pulmonary complications. Br J Anaesth. 2017 Mar 1;118(3):317-334. https://doi.org/10.1093/bja/aex002
12. Bruintjes MH, van Helden EV, Braat AE, et al. Deep neuromuscular block to optimize surgical space conditions during laparoscopic surgery: a systematic review and meta-analysis. Br J Anaesth. 2017 Jun 1;118(6):834-842. https://doi.org/10.1093/bja/aex116
13. Gao WW, He YH, Liu L, Yuan Q, Wang YF, Zhao B. BIS Monitoring on Intraoperative Awareness: A Meta-analysis. Curr Med Sci. 2018 Apr;38(2):349-353. https://doi.org/10.1007/s11596-018-1886-1
14. Punjasawadwong Y, Phongchiewboon A, Bunchungmongkol N. Bispectral index for improving anaesthetic delivery and postoperative recovery. Cochrane Database Syst Rev. 2014 Jun 17;2014(6):CD003843. https://doi.org/10.1002/14651858.CD003843.pub3
15. Zorrilla-Vaca A, Healy RJ, Wu CL, Grant MC. Relation between bispectral index measurements of anesthetic depth and postoperative mortality: a meta-analysis of observational studies. Can J Anaesth. 2017 Jun;64(6):597-607. English. https://doi.org/10.1007/s12630-017-0872-6
16. Liu YH, Qiu DJ, Jia L, et al. Depth of anesthesia measured by bispectral index and postoperative mortality: A meta-analysis of observational studies. J Clin Anesth. 2019 Sep;56:119-125. https://doi.org/10.1016/j.jclinane.2019.01.046
17. MacKenzie KK, Britt-Spells AM, Sands LP, Leung JM. Processed Electroencephalogram Monitoring and Postoperative Delirium: A Systematic Review and Meta-analysis. Anesthesiology. 2018 Sep;129(3):417-427. https://doi.org/10.1097/ALN.0000000000002323
18. Evered LA, Chan MTV, Han R, et al. Anaesthetic depth and delirium after major surgery: a randomised clinical trial. Br J Anaesth. 2021 Nov;127(5):704-712. https://doi.org/10.1016/j.bja.2021.07.021