

# Intraoperative Neuromonitoring questionnaire

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| --- | --- |
| **Questions Types** | |
| \* Mandatory information | * Multiple answers allowed |
| * Only one answer allowed | \_\_ please specify |

## PRELIMINARY DATA

|  |  |
| --- | --- |
| **Neuromonitoring date \*** | **Neuromonitoring specified as \*:** |
| *dd/mm/yyyy* | * Surgeon only used hand-held or automated device * In-room neuromonitorist independently recorded tests * In-room neuromonitorist independently recorded tests and Surgeon also used hand-held or automated device |

### Institution/Hospital

|  |  |  |
| --- | --- | --- |
| **Operating rooms \*** | **University affiliated \*** | **Neurosurgery and/or orthopedic spine fellowship \*** |
| * < 10 operating rooms * 10 – 20 operating rooms * 21 – 30 operating rooms * 30 operating rooms | * Yes * No | * Yes * No |

### Model of Care

|  |  |
| --- | --- |
| **Model of Care \*:** | |
| * PhD neurophysiologist in operating room throughout case * MD neurophysiologist in operating room throughout case * Technologist or physiologist in room throughout case, in room PhD neurophysiologist part of case * Technologist or physiologist in room throughout case, in room MD neurophysiologist part of case * MD neurophysiologist not routinely in operating room but personally and immediately available | * PhD neurophysiologist not routinely in operating room but personally and immediately available * Technologist or physiologist reporting directly to surgeon; no PhD or MD neurophysiologist availability * Technologist or physiologist reporting to out of hospital/online MD supervising neurophysiologist * Technologist or physiologist reporting to out of hospital/online PhD supervising neurophysiologist * Surgeon driven (or automated) neuromonitoring only |

|  |  |  |  |
| --- | --- | --- | --- |
| **Planned maintenance anesthetic \*:** | | | |
| * Primarily inhaled agent | * Intravenous supplemented by inhaled agent | * Total intravenous anesthesia | * Unknown |

|  |  |  |
| --- | --- | --- |
| **Pre-op limb and/or walking neurological deficit \*:** | | |
| * Yes | | * No |
| If YES,  **Sensory deficit**   * Yes   **Motor deficit**   * Yes   **Walking deficit**   * Yes | if YES:   * one upper limb * both upper limbs * one lower limb * both lower limbs   if YES:   * one upper limb * both upper limb * one lower limb * both lower limbs   if YES:   * Cannot walk * Can walk with appliance and/or assistance * Can walk with fair or poor coordination or limp | * No * No * No |

|  |  |
| --- | --- |
| **High-risk findings on pre-op imaging:** | |
| * None * “Severe” (absolute/critical) stenosis at spinal cord and/or cauda equina level * T2 MRI intramedullary signal at operated spinal cord level | * Coronal or sagittal plane Cobb measurement ≥ 80° * Other high risk finding * Unknown |

## MEP and SEP data

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **MEP monitored \*** | | | | | | | | | |
| * Yes   If YES: | | | | | | | | * No   If NO,*:*   * Not attempted because not indicated * Not attempted because of patient factors * Not attempted because not ordered or declined by surgeon * Attempted but MEPs not recordable | |
| **Total intravenous anesthesia used during MEP acquisition \*** | | | | | | | |
| * Yes | * No | | | | | | |
| **Partial or complete neuromuscular blockade used during critical MEP acquisition \*** | | | | | | | |
| * Yes | * No | | | | | | |
| **When first MEP recorded, timing** | | | | | | | |
| * Before and after positioning | | | * After positioning   but before incision | | * After incision or   later in case | | |
| **Further optimized anesthesia and/or blood pressure management requested** | | | | | | | |
| * Yes | * No | | | | | | |
| if YES, further optimized anesthesia implemented | | | | | * Yes | * No | |
| **Before crucial surgical actions, MEPs recorded from all limbs/myotomes at risk** | | | | | | | | | |
| * Yes   if YES, | | | | | | | * No   if NO, were the non-elicitable MEPs from weak limb(s)? | | |
| * Optimal MEPs (> 100 µV and good trial to trial reproducibility) | | * Acceptable MEPs   (< 100 µV but good trial to trial reproducibility) | | * Suboptimal MEPs   (poor trial to trial reproducibility) | | | * Yes | | * No |

|  |  |  |  |
| --- | --- | --- | --- |
| From the end of exposure to the beginning of closure, please select the best overall estimate of the number of MEP trials per hour.  Concurrent left and right body recordings = one trial: | | | |
| **Estimated Bilateral MEP Frequency** \* | | | |
| * 6 or more bilateral MEPs per hour | * 4-5 bilateral MEPs per hour | * 1-3 bilateral MEPs per hour | * Less than 1 bilateral MEPs per hour |

### Upper SEPs

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Upper SEPs were monitored** | | | | | |
| * Yes   if YES, | | | | | * No |
| **Recorded before and after positioning** | | | | |
| * Yes | * No | | | |
| **Trial to trial reproducibility BEFORE crucial surgical actions** | | | | |
| * Excellent | | * Good | * Fair | * Poor |

### Lower SEPs

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Lower SEPs were monitored** | | | | | |
| * Yes   if YES, | | | | | * No |
| **Recorded before and after positioning** | | | | |
| * Yes | * No | | | |
| **Trial to trial reproducibility BEFORE crucial surgical actions** | | | | |
| * Excellent | | * Good | * Fair | * Poor |

## Warning Criterion (WC)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Major MEP WC Definition: spinal cord \*** | | | | |
| * at least 50% amplitude decrease | * at least 65% amplitude decrease | * at least 80% amplitude decrease | * Disappearance   (100% loss) | * Other |
| If other, please specify:  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Major MEP WC Definition: root, plexus \*** | | | | |
| * at least 50% amplitude decrease | * at least 65% amplitude decrease | * at least 80% amplitude decrease | * Disappearance   (100% loss) | * Other |
| If other, please specify:  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | | | |

## MEP ALARM(S): CONTECT, ACTION, RECOVERY

### Alarm 1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Warning Criterion (WC) met?\*** *(Alarm occurred)* | | | | | | | |
| * Yes | | * No | | | | | |
| **If YES, Was the alarm anesthesia and/or technically related \*** | | | | | | | |
| * Yes | | * No | | | | | |
| **If YES, add another alarm?**  *(up to 3 alarms reportable)* | | **If NO,**  **Surgeon informed and acknowledged \*** | | | | | |
| * Yes | * No | * Yes | * No | | | | |
| *(If yes, report as another alarm below)* | |  | **If No,** | | | | |
| * Surgeon deferred response or delayed acknowledgment | | | * Not sure surgeon heard or   understood alarm | |
| **MEP WC: limbs affected \*** | | | | |
| * one upper  limb | * both upper limbs | * one lower  limb | | * both lower   limbs |
| **Surgical context** | | | | |
| * Positioning body; head/neck; upper/lower limb | * Surgeon action/maneuver | * Inadequate blood pressure, perfusion, and/or oxygenation | | * Unknown or Other |
| **Intervention \*** | | | | |
| * None | * Adjusted or reversed surgeon action | * Re-positioned | | * Corrected blood pressure, perfusion and/or oxygenation |
| * Surgical pause | * Aborted surgery | * Wake up test | |  |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **Complete or partial MEP recovery before surgery end \*** | |
| * Yes   **I**f YES, | * No |
| * Complete (all affected MEPs no longer met WC) | * Partial (improvement but one or more MEPs still meet WC) |
| **Add another alarm? \*** *(up to 3 alarms reportable)* | |
| * Yes   *(If yes, report as another alarm below)* | * No |

### Alarm 2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Warning Criterion (WC) met?\*** *(Alarm occurred)* | | | | | | | |
| * Yes | | * No | | | | | |
| **If YES, Was the alarm anesthesia and/or technically related \*** | | | | | | | |
| * Yes | | * No | | | | | |
| **If YES, add another alarm?**  *(up to 3 alarms reportable)* | | **If NO,**  **Surgeon informed and acknowledged \*** | | | | | |
| * Yes | * No | * Yes | * No | | | | |
| *(If yes, report as another alarm below)* | |  | **If No,** | | | | |
| * Surgeon deferred response or delayed acknowledgment | | | * Not sure surgeon heard or   understood alarm | |
| **MEP WC: limbs affected \*** | | | | |
| * one upper  limb | * both upper limbs | * one lower  limb | | * both lower   limbs |
| **Surgical context\*** | | | | |
| * Positioning body; head/neck; upper/lower limb | * Surgeon action/maneuver | * Inadequate blood pressure, perfusion, and/or oxygenation | | * Unknown or Other |
| **Intervention \*** | | | | |
| * None | * Adjusted or reversed surgeon action | * Re-positioned | | * Corrected blood pressure, perfusion and/or oxygenation |
| * Surgical pause | * Aborted surgery | * Wake up test | |  |
| **Complete or partial MEP recovery before surgery end \*** | | | | |
| * Yes   **I**f YES, | | * No | | |
| * Complete (all affected MEPs no longer met WC) | | * Partial (improvement but one or more MEPs still meet WC) | | |
| **Add another alarm? \*** *(up to 3 alarms reportable)* | | | | |
| * Yes   *(If yes, report as another alarm below)* | | * No | | |

### Alarm 3

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Warning Criterion (WC) met?\*** *(Alarm occurred)* | | | | | | | |
| * Yes | | * No | | | | | |
| **If YES, Was the alarm anesthesia and/or technically related \*** | | | | | | | |
| * Yes | | * No | | | | | |
| **If YES, add another alarm?**  *(up to 3 alarms reportable)* | | **If NO,**  **Surgeon informed and acknowledged \*** | | | | | |
| * Yes | * No | * Yes | * No | | | | |
| *(If yes, report as another alarm below)* | |  | **If No,** | | | | |
| * Surgeon deferred response or delayed acknowledgment | | | * Not sure surgeon heard or   understood alarm | |
| **MEP WC: limbs affected \*** *(multiple answers allowed)* | | | | |
| * one upper  limb | * both upper limbs | * one lower  limb | | * both lower   limbs |
| **Surgical context \*** | | | | |
| * Positioning body; head/neck; upper/lower limb | * Surgeon action/maneuver | * Inadequate blood pressure, perfusion, and/or oxygenation | | * Unknown or Other |
| **Intervention \*** | | | | |
| * None | * Adjusted or reversed surgeon action | * Re-positioned | | * Corrected blood pressure, perfusion and/or oxygenation |
| * Surgical pause | * Aborted surgery | * Wake up test | |  |
| **Complete or partial MEP recovery before surgery end \*** | | | | |
| * Yes   **I**f YES, | | * No | | |
| * Complete (all affected MEPs no longer met WC) | | * Partial (improvement but one or more MEPs still meet WC) | | |

## WARNING CRITERION WC

|  |  |  |
| --- | --- | --- |
| **Major SEP WC Definition \*** | | |
| * at least 50% amplitude decrease | * amplitude reduction from recent   pre-change values exceeding variability | * Other |
| If other, please specify:  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | |

## SEP ALARM(S): CONTEXT, ACTION, RECOVERY

### Alarm 1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Warning Criterion (WC) met?\*** *(Alarm occurred)* | | | | | | | |
| * Yes | | * No | | | | | |
| **If YES, Was the alarm anesthesia and/or technically related \*** | | | | | | | |
| * Yes | | * No | | | | | |
| **If YES, add another alarm?**  *(up to 3 alarms reportable)* | | **If NO,**  **Surgeon informed and acknowledged \*** | | | | | |
| * Yes | * No | * Yes | * No | | | | |
| *(If yes, report as another alarm below)* | |  | **If No,** | | | | |
| * Surgeon deferred response or delayed acknowledgment | | | * Not sure surgeon heard or   understood alarm | |
| **SEP WC: limbs affected \*** | | | | |
| * one upper  limb | * both upper limbs | * one lower  limb | | * both lower   limbs |
| **Surgical context** | | | | |
| * Positioning body; head/neck; upper/lower limb | * Surgeon action/maneuver | * Inadequate blood pressure, perfusion, and/or oxygenation | | * Unknown or Other |
| **Intervention \*** | | | | |
| * None | * Adjusted or reversed surgeon action | * Re-positioned | | * Corrected blood pressure, perfusion and/or oxygenation |
| * Surgical pause | * Aborted surgery | * Wake up test | |  |
| **Complete or partial SEP recovery before surgery end \*** | | | | |
| * Yes   **I**f YES, | | * No | | |
| * Complete (all affected SEPs no longer met WC) | | * Partial (improvement but one or more SEPs still meet WC) | | |
| **Add another alarm? \*** *(up to 3 alarms reportable)* | | | | |
| * Yes   *(If yes, report as another alarm below)* | | * No | | |

### Alarm 2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Warning Criterion (WC) met?\*** *(Alarm occurred)* | | | | | | | |
| * Yes | | * No | | | | | |
| **If YES, Was the alarm anesthesia and/or technically related \*** | | | | | | | |
| * Yes | | * No | | | | | |
| **If YES, add another alarm?**  *(up to 3 alarms reportable)* | | **If NO,**  **Surgeon informed and acknowledged \*** | | | | | |
| * Yes | * No | * Yes | * No | | | | |
| *(If yes, report as another alarm below)* | |  | **If No,** | | | | |
| * Surgeon deferred response or delayed acknowledgment | | | * Not sure surgeon heard or   understood alarm | |
| **SEP WC: limbs affected \*** | | | | |
| * one upper  limb | * both upper limbs | * one lower  limb | | * both lower   limbs |
| **Surgical context \*** | | | | |
| * Positioning body; head/neck; upper/lower limb | * Surgeon action/maneuver | * Inadequate blood pressure, perfusion, and/or oxygenation | | * Unknown or Other |
| **Intervention \*** | | | | |
| * None | * Adjusted or reversed surgeon action | * Re-positioned | | * Corrected blood pressure, perfusion and/or oxygenation |
| * Surgical pause | * Aborted surgery | * Wake up test | |  |
| **Complete or partial SEP recovery before surgery end \*** | | | | |
| * Yes   **I**f YES, | | * No | | |
| * Complete (all affected SEPs no longer met WC) | | * Partial (improvement but one or more SEPs still meet WC) | | |
| **Add another alarm? \*** *(up to 3 alarms reportable)* | | | | |
| * Yes   *(If yes, report as another alarm below)* | | * No | | |

### Alarm 3

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Warning Criterion (WC) met?\*** *(Alarm occurred)* | | | | | | | |
| * Yes | | * No | | | | | |
| **If YES, Was the alarm anesthesia and/or technically related \*** | | | | | | | |
| * Yes | | * No | | | | | |
| **If YES, add another alarm?**  *(up to 3 alarms reportable)* | | **If NO,**  **Surgeon informed and acknowledged \*** | | | | | |
| * Yes | * No | * Yes | * No | | | | |
| *(If yes, report as another alarm below)* | |  | **If No,** | | | | |
| * Surgeon deferred response or delayed acknowledgment | | | * Not sure surgeon heard or   understood alarm | |
| **SEP WC: limbs affected \*** | | | | |
| * one upper  limb | * both upper limbs | * one lower  limb | | * both lower   limbs |
| **Surgical context \*** | | | | |
| * Positioning body; head/neck; upper/lower limb | * Surgeon action/maneuver | * Inadequate blood pressure, perfusion, and/or oxygenation | | * Unknown or Other |
| **Intervention \*** | | | | |
| * None | * Adjusted or reversed surgeon action | * Re-positioned | | * Corrected blood pressure, perfusion and/or oxygenation |
| * Surgical pause | * Aborted surgery | * Wake up test | |  |
| **Complete or partial SEP recovery before surgery end \*** | | | | |
| * Yes   **I**f YES, | | * No | | |
| * Complete (all affected SEPs no longer met WC) | | * Partial (improvement but one or more SEPs still meet WC) | | |

## CO-DIAGNOSTICS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **2 dimensional (Conventional C-arm)** | **3 dimensional  (Isocentric C-arm, O-arm, intraoperative CT, or navigation)** | **Robot guided screw implantation or other surgical maneuver** | **Surgeon directed/driven hand-held and/or automated neuromonitoring device** | **Stagnara (wake-up) test** |
| * Yes * No | * Yes * No | * Yes * No | * Yes * No | * Yes * No |