**Supplemental Table 15. Summary of Objective Sedation Assessment Studies**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Author, Yr | Type N | Subjective | Bias | Quality Score | | | | | Agreement | Comments |
| **Timing BIS Assessed**  **0-2-4** | **Signal Quality**  **BIS Version**  **0-1-2** | **Deep Sedation**  **0-1-2** | **Stimulus Consistency**  **0-1-2** | **Total** |
| De Deyne 1998 [1] | 18 Surgical ICU pts | Ramsay | High | **0** | **2** | **0** | **0** | **2** | Not Reported | All with Ramsay 6 |
| Simmons 1999 [2] | 63 mixed ICU pts | SAS | Moderate | 2 | 2 | 1 | 0 | 5 | R=0.46 |  |
| Riker 2001 [3] | 37 post-CABG pts | SAS | Low | **4** | **2** | **1** | **1** | **8** | R=0.61 |  |
| Walder 2001 [4] | 14 post-CABG pts | Ramsay | High | **0** | **1** | **0** | **0** | **1** | Not Reported | Compared R6 vs R4: 74 ± 10 and 83 ± 10, p = 0.02 |
| Frenzel 2002 [5] | 19 intubated SICU | Ramsay, , OAA/S, Cook, SAS | High | **0** | **2** | **0** | **1** | **3** | Tau=0.59 | Large group with deep sedation “Deeper sedation, inter-individual differences increase” |
| Mondello 2002 [6] | 20 | Ramsay | High | **2** | **1** | **0** | **0** | **3** | R=0.55 |  |
| Nasraway  2002 [7] | 20 med/surg ICU pts | SAS | High | **0** | **2** | **0** | **2** | **4** | R2=0.37, r=0.6 |  |
| Riess 2002 [8] | 44 trauma, thoracic or abd surgery pts | Ramsay | High | **0** | **2** | **1** | **0** | **3** | R=-0.64 | Median EMG high (42 dB)  Correlation BIS-Ramsay if not shivering was 0.70, p<0.01 |
| De Wit 2003 [9] | 19 | SAS | Moderate | **4** | **0** | **0** | **0** | **4** | R=0.69 |  |
| Ely 2003 [10] | 124 Validation pts | RASS | High | **0** | **2** | **0** | **0** | **2** | R=0.64 | 65% were deep sedation (RASS -3 to -5), including 24% RASS -5 |
| Doi 2005 [11] | 40 post-op ventilated patients | Ramsay | High | **0** | **2** | **0** | **2** | **4** | R=-0.669 |  |
| Tonner 2005 [12] | 46 post-abd surgery intubated pts | Ramsay | High | **0** | **0** | **0** | **0** | **0** | Tau=0.40 | BIS-XP is incorporated in the currently available model of BIS  Better correlation with EMG <30 (this true for all EEG-based tools, including raw EEG) |
| Chisholm 2006 [13] | 26 conscious sedation OR patients | Ramsay  OAA/S | High | **0** | **0** | **0** | **0** | **0** | R=0.89 | In OR but conscious sedation being used with propofol, midazolam, fentanyl |
| Consales 2006 [14] | 40 RCT prop vs Midaz postop | Ramsay | Moder | **2** | **2** | **0** | **1** | **5** | R=0.75 |  |
| Turkmen 2006 [15] | 11 pts sternotomy dexmed sedation | RASS | High | **0** | **0** | **0** | **0** | **0** | R=0.78 | Also reported a correlation at 8 hours r=0.90 |
| Hernandez-Gancedo 2007 [16] | 50 post-op pts | Ramsay | High | **0** | **1** | **0** | **0** | **1** | R=-0.78 | assessed Q15 x 60 minutes, no NMB |
| Sackey 2007 [17] | 20 vented ICU pts (10 midaz, 10 Isoflurane) | Bloomsbury | High | **0** | **0** | **0** | **0** | **0** | R=-0057/0.012 | 56% were in 2 deepest sedation groups (B -2 or -3) |
| Haenggi 2008 [18] | 44 mostly medical ICU pts | Ramsay | High | **0** | **1** | **0** | **1** | **2** | R=-0.426 | EEG mean 30 seconds and 2 mins BEFORE event and 2,5,10 mins AFTER event - never stated which was used |
| Lu 2008 [19] | 90 post-op surgical ICU | Ramsay | High | **0** | **1** | **0** | **0** | **1** | Tau=0.69 |  |
| Arbour 2009 [20] | 40 vented medical ICU | SAS | High | **2** | **1** | **0** | **0** | **3** | R=0.50 |  |
| Olson 2009 [21] | 67 ventilated NeuroICU | Ramsay | High | **0** | **2** | **0** | **0** | **2** | R=0.28 |  |
| Trouiller 2009 [22] | 62 mixed ICU vented pts | ATICE Awareness Domain | High | **0** | **1** | **0** | **1** | **2** | R=0.43 |  |
| Karamchandani 2010 [23] | 24 ICU mostly post-op | RASS | High | **0** | **2** | **0** | **0** | **2** | R=0.56 |  |
| Plaschke 2010 [24] | 114 POD1 cardiac pts | RASS | High | **0** | **1** | **1** | **0** | **2** | R=0.36 | 18-20 hours post-op – never stated how many were intubated (though 56% delirious and 15% nondelirious had “CPAP”) |
| Ogilvie 2011 [25] | 94 intubated trauma pts | RASS | High | **0** | **0** | **0** | **0** | **0** | R=0.62 |  |
| LeBlanc 2012 [26] | 16 intubated surgical pts lorazepam infusions | SAS | High | **0** | **2** | **0** | **1** | **3** | R=0.22 |  |
| Yaman 2012 [27] | 30 | RASS, SAS, Ramsay, ATICE | High | **0** | **1** | **0** | **0** | **1** | R=0.75 (RASS)  R=0.66 (SAS) |  |
| Mahmood 2014 [28] | 110 trauma pts (47 BIS, 63 not) | Ramsay | High | **0** | **0** | **0** | **0** | **0** | NR | BIS monitoring associated with reduced midazolam and fentanyl doses, less agitation and need for tracheostomy, and shorter ICU length of stay |
| Prottengeier 2014 [29] | 30 mobile ICU pts | RASS | High | **0** | **2** | **0** | **0** | **2** | R=0.66 |  |
| Yang 2014 [30] | 1766 procedural sedation pts | Ramsay | High | **0** | **0** | **0** | **0** | **0** | R=0.16 |  |
| Paliwal 2015 [31] | 60 intubated pts | Ramsay | High | **2** | **1** | **0** | **0** | **3** | R=0.86 |  |
| Wang 2017 [32] | 90 med/surg | RASS | Low | **4** | **2** | **0** | **0** | **6** | R=0.67 |  |

**ATICE:**  Adaptation to the Intensive Care Environment (De Jonghe B. Crit Care Med 2003;31(9):2344-54); **Neuro:** Neurological; **Dexmed**: dexmedetomidine; **OAA/S**: Observer's assessment of alertness/sedation (OAA/S) scale; **SAS**:Sedation-Agitation Scale

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