**Supplemental Table 43. Pre-morbid risk factors affecting sleep in ICU patients.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Associated with sleep disruption** | | **No association with sleep disruption** | |
| **Risk Factor** | **Objective sleep measures** | **Subjective sleep measures** | **Objective sleep measures** | **Subjective sleep measures** |
| **Sex** |  | \* Bihari N 100 (multivariate analysis) (under age 60, female sleep worse than males, over age 60, females rate sleep better than males) [1] | \* Trompeo  N 29 [2] | \* Higgins N 20 [3]  \* Nicolas N 104 [4]  \* Freedman N 203 [5] |
| **Older age** |  | \* Higgins, N 20 [3]  \*Bihari N 100 -age and sex [1]interaction (multivariate analysis)  \* Engelmann N 66 [6] | \* Trompeo (427), N 29 [2]  \* Roche Campo (2464), N 27 (abnormal wakefulness or abnormal sleep; abnormal EEG) [7]  \* Chen N 85 [8] | \* Nicolas N 104 (< or >50 yrs) [4] \* Frisk N 31 (< or >75 yrs)) [9]  \* Hardin N 18 [10]  \* Freedman N 203 [5]  \* Chen N 85 [8] |
| **Hx of HTN** |  |  | \* Trompeo N 29 [2] |  |
| **Hx of diabetes** |  |  | \* Trompeo N 29 [2] |  |
| **Dx of cancer** |  |  | \* Trompeo N 29 [2] |  |
| **Tx for hypo/hyper-**  **thyroidism** |  |  |  | Bihari N 100 (p=0.10) \*authors report this as significant [1] |
| **Reported poor quality of sleep at home** |  | \* Kamdar N 300 [11]  \* Bihari N 100 [1]  \* McKinley (41981) N 222 [12] |  |  |
| **Regular use of sleep medication at home vs. no use** |  | \* Kamdar N 300 [11]  \* Bihari N 100 (p=0.07) [1] |  |  |

Trompeo (427) compared ICU patients with REM reduction vs. severe REM reduction.

**Supplemental Table 43. ICU and disease-related risk factors affecting sleep in ICU patients.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Associated with sleep disruption** | | **No association with sleep disruption** | |
| **Risk Factor** | **Objective sleep measures** | **Subjective sleep measures** | **Objective sleep measures** | **Subjective sleep measures** |
| **Days in ICU or LOS** |  |  |  | \* Frisk N 31 [9]  \* Freedman N 203 [5]  \* Simpson N 84 [13] |
| **Disease severity (APACHE II Score)** | \* Fanfulla N 22 [14] |  | \* Roche Campo N 27 [7] | \* Little N 116[15]  \* Hardin N 18 [10] |
| **SOFA Score** |  |  | \* Roche Campo (2464) N 27 [7] |  |
| **In surgical patients, type of surgery** |  |  |  | \* Nicolas N 104 [4]  \* Simpson N 84 [13] |
| **Delirium** | \* Trompeo N 29 [2]  \* Roche Campo N 27 [7] |  |  |  |
| **Disorientation to time of day** |  | \* Little N 116 (reported by 29%) [15]  \* Ehlers N 34 (reported by 82.4 - 85.3%) [16] |  |  |
| **Immobility/ inability to lie comfortably post-op** |  | \* Ugras (3046) N 66 (reported by 63.6%) [17]  \* Simpson N 84 (mentioned by 70.2%, score 2.5/4) [13] |  |  |
| **Temperature** |  |  |  | \* Hardin N 18 [10] |
| **Pain** |  | \* Little N 116 (reported by 40%) [15]  \* Nicolas N 104 (reported by 20.2%) [4]  \* Zhang N 152 (reported by 63.2%) [18]  \* Jones N 100 (reported by 13%) [19]  \* Ehlers N 34 (reported by 58.8 - 91.2%) [16]  \* Ugras N 66 (reported by 59.1%) [17]  \* Hofhuis N 24 (reported by 21%) [20]  \* Simpson N 84 (score 2.6/ 4) [13] |  |  |
| **Fear, anxiety, or stress** |  | \* Jones (32004) N 100 (reported by 9%) [19]  \* Nicolas (2904), N 104 (reported by 9.6%) [4]  \* Ehlers (32006) N 34 (reported by 70.6 - 91.2%) [16]  \* Ugras (3046) N 66 (reported by 27.3 - 56.1%) [17]  \* Hofhuis (2846) N 24 (reported by 25%) [20]  \* Simpson (8465), N 84 (score 2.1/ 4) [13] |  |  |
| **Headache** |  | \* Ugras (3046) N 66 (reported by 54.5%) [17] |  |  |
| **Dyspnea** |  | \* Zhang (20647) N 152 (reported by 38.8%) [18] |  |  |
| **Cough** |  | \* Zhang (20647) N 152 (reported by 57.9%) [18]  \* Ehlers (32006) N 34 (reported by 44.1%) [16] |  |  |
| **N/V** |  | \* Ugras (3046) N 66 (reported by 36.4%) [17] |  |  |
| **Hunger** |  | \* Ugras (3046) N 66 (reported by 34.8%) [17] |  |  |
| **Thirst** |  | \* Ehlers (32006), N 34 (79.4%) [16] |  |  |
| **Needing to use toilet** |  | \* Ugras (3046) N 66 (reported by 30.3%) [17] |  |  |
| **Being naked** |  | \* Ugras N 66 (reported by 45.5%) [17] |  |  |
| **Gas exchange** | \* Fanfulla (2032) N 22 [14] |  | \* Roche Campo N 27 [7] |  |
| **Being together with/ seen by other patients** |  | \* Ugras N 66 (reported by 34.8 - 48.5%) [17] |  |  |
| **Feelings and worries related to family & loved ones** |  | \* Zhang N 152 (reported by 55.9%) [18]  \* Ehlers N 34 (reported by 58.8%) [16]  \* Ugras N 66 (reported by 54.4%) [17] |  |  |
| **Feeling lonely** |  | \* Ugras N 66 (reported by 40.9%) [17] |  |  |
| **Discomfort** |  | \* Little N 116 (reported by 35%) [15]  \* Jones N 100 (reported by 45%) [19]  \* Nicolas N 104 (reported by 11.6%) [4]  \* Ugras N 66 (reported by 22.7%) [17] |  |  |
| **Feeling hot at night** |  | \* Ehlers N 34 (reported by 32.4%) [16] |  |  |
| **Feeling cold at night** |  | \* Ehlers N 34 (11.8%) [16] |  |  |
| **Inability to perform usual routine before sleep** |  | \* Simpson N 84 (reported by 57.1%, score 2.1/ 4) [13] |  |  |
| **“Environment” or “space”** |  | \* Jones N 100 (reported by 21%) [19]  \* Ehlers N 34 (50.0%) [16] |  |  |
| **Unfamiliar/ strange environment** |  | \* Zhang N 152 (reported by 42.1%) [18]  \* Ehlers N 34 (reported by 47.1%) [16]  \* Ugras N 66 (reported by 51.5%) [17] |  |  |
| **Unfamiliar nurses** |  | \* Ehlers N 34 (55.9%) [16] |  |  |
| **“Equipment ”** |  | \* Simpson N 84 (score 2/4) [13] |  |  |
| **“Bed”** |  | \* Simpson N 84 (score 2.3/4) [13] |  |  |
| **Nursing care & interventions** |  | \* Jones N 100 (reported by 14%) [19]  \* Zhang N 152 (reported by 36.2%) [18]  \* Elliott N 47 [21]  \* Elliott N 45 [22]  \* Freedman N 203 [5]  \* Simpson N 84 (score 2.1/ 4) [13] |  | \* Nicolas N 104 [4]  But in Nicolas study, reported to have been a factor by N 11/ 104 (objective measure of # of interventions did not show this effect) |
| **Vital signs** |  | \* Freedman N 203 [5] |  |  |
| **Phlebotomy** |  | \* Freedman N 203 [5] |  |  |
| **Medication administration** |  | \* Freedman N 203 [5] |  |  |
| **Diagnostic tests/ Procedures** |  | \* Elliot N 47 [21]  \* Ugras N 66 (reported by 27.3%) [17]  \* Elliott N 45 [22]  \* Freedman N 203 [5]  \* Simpson N 84 (score 2.3/ 4) [13] |  |  |
| **Worries about unpredictable check/ being constantly observed** |  | \* Zhang N 152 (reported by 48%) [18]  \* Ugras N 66 (reported by 31.8%) [17] |  |  |
| **Noise** | \* Freedman N 22 (accounted for 17% of arousals) [23]  \* Fanfulla N 22 (accounted for 10% of nighttime arousals) [14] | \* Little N 116 (reported by 42%) [15]  \* Nicolas N 104 (reported by 10.6%) [4]  \* Zhang N 152 (variably reported by 13.2 - 34.2%) [18]  \* Jones N 100 (reported by 51%) [19]  \* Elliot N 47 [21]  \* Ehlers N 34 (reported by 91.2%) [16]  \* Hofhuis N 24 (reported by 54%) [20]  \* Elliott N 45 [22]  \* Freedman N 203 [5] | \* Elliot N 53 [21]  \* Elliott N 45 [22] | \* Frisk N 31 [9]  \* Yinnon N 12 (33%) [24]  \* Hu N 45[25] |
| **Telemetry alarms** |  | \* Freedman N 203 [5] |  |  |
| **IV pump alarms** |  | \* Freedman N 203 [5]  \* Bihari N 100 [1] |  |  |
| **Pulse oximeter** |  | \* Freedman N 203 [5] |  |  |
| **Others talking** |  | \* Little N 116 (reported by 33%) [15]  \* Zhang N 152 (variably reported by 15.8-40.8%)[18]  \* Ehlers N 34 (reported by 35.3 - 58.8%) [16]  \* Freedman (542), N 203 [5] |  |  |
| **Lights** |  | \* Little N 116 (reported by 40%) [15]  \* Jones N 100 (reported by 16%) [19]  \* Elliot N 47 [21]  \* Ehlers N 34 (reported by 64.7%) [16]  \* Elliott N 45 [22]  \* Freedman N 203 [5] | \* Fanfulla N 22 [14]  \* Elliott N 45 [22] | \* Yinnon N 12 (34%) [24] |
| **IV catheters, tubes** |  | \* Little N 116 (reported by 33%) [15]  \* Ehlers N 34 (reported by 61.8 - 88.2%) [16]  \* Ugras N 66 (reported by 56.1%) [17] |  |  |
| **Television** |  | \* Bihari N 100 [1]  \* Freedman N 203 [5] |  |  |
| **Phone** |  | \* Bihari N 100 [1]  \* Freedman (542) N 203 |  |  |
| **Beepers** |  | \* Freedman (542) N 203 [5] |  |  |
| **Lack of privacy** |  | \* Ehlers N 34 (64.7%) [16] |  |  |
| **Hospital attire** |  | \* Ehlers N 34 (52.9%) [16] |  |  |
| **Dislike using urinals and/ or bedpans** |  | \* Ehlers N 34 (32.4%) [16] |  |  |
| **Blood pressure cuff smelling badly** |  | \* Ehlers (32006), N 34 (88.2%) [16] |  |  |
| **“IV sedation”** |  |  |  | \* Little (1733) N 116 |
| **Use of “sleeping pills”** |  |  |  | \* Little (1733) N 116 |
| **Use of “hypnotic” vs. none** |  |  |  | \* Frisk (6028), N 31 |
| **Benzo dose or bezo vs. no benzo** | \* Trompeo N 29 [2] |  | \* Fanfulla N 22 [14]  \* Elliott N 45 [22] | \* Elliott N 45 [22] |
| **Propofol dose & propofol vs. placebo** | \* Kondili N 12 [26] |  | \* Trompeo N 29 [2] |  |
| **Morphine dose** |  |  | \* Trompeo N 29 |  |
| **Midaz vs. propofol** |  |  |  | \* Treggiari-Venzi N 40 [27] |
| **Steroids vs. no steroids** |  | \* Bihari (1595) N 100 |  |  |
| **Foreign body sensation due to intubation** |  | \* Zhang (20647) N 152 (reported by 53.9%) |  |  |
| **Spontaneous breathing vs. mechanical ventilation (any mode)** | \* Roche Campo (31981) N 16  \* Elliot (31948) N 53  \* Elliott (43720) N 45 |  | \* Fanfulla N 22 [14] | \* Little N 116 [15]  \* Elliott N 45 [22]  \* Freedman N 203 [5] |
| **Spontaneous mode (vs. controlled modes)** | \* Parthasarathy N 11 [28]  \* Andrejak N 26 [29] |  | \* Toublanc N 20 [30] |  |
| **PAV+ vs. PS** | \* Alexopoulou N 17 [31]  \* Bosma N 13 [32] |  |  |  |
| **Clinically adjusted PSV vs. automatically adjusted PSV** | \* Cabello N 15 [33] |  |  |  |
| **NIV duration** |  |  | \* Roche Campo N 27 [7] |  |
| **Spontaneous breathing vs. NIV** | \* Drouot N 24 [34] |  |  |  |
| **Patient-ventilator asynchrony on NIV** | Cordoba-Izquierdo N 24 [35] |  |  |  |
| **Sound related to NIV** | Cordoba-Izquierd N 24 [35] |  |  |  |
| **“Ventilation system”** |  | \* Simpson N 84 (score 2.2/ 4) [13] |  |  |

Trompeo [2] compared ICU patients with REM reduction vs. severe REM reduction.

Cabello [33] showed difference only in Stage 2 sleep.

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