

Daily Sedation Interruption Performed by Nurses Alone-the Effects on Mechanical Ventilation in ICU

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Abstract: Sedation and analgesia are important therapies for mechanically ventilated patients who suffer from enormous stress. To avoid oversedation, daily sedation interruption (DSI) is pervasively advocated. However, it is usually assessed by doctors, and it was an increasing concern that DSI could be performed by nurses alone. To evaluate the effects of DSI on patients with mechanical ventilation in ICU, we conducted a prospective and randomized trial. One hundred and twenty patients with mechanical ventilation from January 2013 to December 2013 were recruited and randomly divided into two groups, observational group, in which DSI was decided and carried out all by nurses independently (n=60), and control group (n=60). Data about dose of sedation, complete arousal time after sedation, duration of mechanical ventilation, sedation time, and the length of ICU stay, as well as occurrence of adverse events, were all recorded and compared. Our study demonstrated that observational group had lower sedation dose, shorter fully waking time after drugs withdraw, shorter time of mechanical ventilation, total sedation time, and hospital stay in ICU. In conclusion, DSI conducted by nurses was an effective method which should be adopted in patients with mechanical ventilation in ICU.

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Key words: sedation, daily sedation interruption, nurse, mechanical ventilation.

1. Introduction

Patients with oral tracheal intubation were in strong stress. Therefore intravenous sedation and analgesia are important therapies during mechanical ventilation (MV) (Chinese Society of Critical Care Medicine, 2006). Although sedation is helpful in the care of patients, it has numerous negative effects. Especially over sedation should be avoided, as it is associated with longer duration of ventilation, longer hospital stay and adverse patient outcomes, such as delayed withdrawal, delirium and long-term psychological morbidity (Hu and Cai, 2010). In order to resolve these questions, some doctors suggested daily sedation interruption (DSI) (Kress and Pohlman, 2000). It was often judged by doctors according to patient's condition then carried out by nurses previously. Since nurses get the subtle changes of patient's condition directly, it was an increasing concern that daily sedation interruption could be performed by nurses alone. Here we are aimed to evaluate the effects of DSI on patients with mechanical ventilation in ICU.

2. Methods

2.1 Patients

We recruited 120 patients with mechanical ventilation from January 2013 to December 2013 in

this study. Eligible patients were ≥ 18 years of age, staying at least 48h in ICU, mechanically ventilated with a duration of at least 48 h, and sedation for a duration of 48h. Exclusion criteria were: cognitive disorder and failing to contact with others, liver dysfunction, neuromuscular disease or limb activity disorder, allergic to sedatives and analgesics, pregnant, and a history of sedation.

Patients were randomly divided into two groups, one was defined observational group (n=60), and another was defined as control group (n=60). Patients in observation group had daily interruptions which decided and carried out all by nurses independently. Patients in control group had interruptions decided by doctors and carried out by nurses. There were 36 male and 24 female patients in observation group with a mean age of 41.28 ± 15.67 . The acute physiology and chronic health evaluation II (APACHE II) score was 16.33 ± 5.71 in this group. There were 33 male and 27 female in control group with a mean age of 43.62 ± 17.13 . APACHE II score in this group was 15.83 ± 8.6 . No one had non-planned extubation and a history of alcohol in this study. There were no differences in body mass index and APACHE II scores between two groups. All nurses had the same qualifications.

2.2 Daily interruption

Patients were given intravenous injection of midazolam at a dose of 0.05-0.1mg/kg with a duration of 30-60 seconds, then followed by intravenous infusion of midazolam at a dose of 0.03-0.1mg/kg/h. Nurses would evaluate the Ramsay sedation score every two hours aimed to a Ramsay score target of 3-4 (Carson and Kress, 2005). Patients in observation group stopped midazolam usage at 5:00 in the next morning. Nurses evaluated the degree of arousal every 15-30 minutes to make sure patients' completely awaken and even more finish some easy action such as blink eyes and move fingers. But for those with bad poor consciousness and those with uncomplete awakening, the objective should be obvious change of vital signs such as increasing of blood pressure, fasten of pulse, or involuntary movement. For some patients planning extubation, nurses report conditions to doctors and decided by doctors. For patients not planning extubation, after 1 hour of patients awaken or finishing easy actions, restart sedation with a half of previous dose through intravenous until patients reach target sedation level mentioned above (Wittbrod, 2005). If patients had stress hypertension or restless, repeat sedation were started depending to specific condition. Control group would have interruption decided by doctors according to patients' conditions and then carried out by nurses. During this process, beside nurse should pay close attention to patients and evaluate patients' conditions carefully then report to doctors.

2.3 Standard of observation

All patients had their level of sedation monitored with Ramsay sedation scores. Patients with Ramsay sedation score 3-4 were quiet and easy to interrupt which was the sedation target. Ramsay sedation score 1 means anxiety, restless and uneasy; Ramsay sedation score 2 represents calm and cooperate, have

orientation; Ramsay sedation score 3 means react to orders only; Ramsay sedation score 4 represents sleep, react soon to soft spike glabellum or shout; Ramsay sedation score 5 reflect sleep, react slowly to soft spike glabellum or shout; Ramsay sedation score 6 represents non-response to stimulate, deep sleep or anesthesia.

2.4. Monitoring indexes

Main monitoring indexes including dose of sedation, completely wake up time after sedation, duration of mechanical ventilation, sedation time, and the length of ICU stay. We recorded the fluctuation of mood, heart rate (>110 beats/min), and blood pressure (>150/100mmHg). Also we recorded the occurrence of resisting to mechanical ventilation and accidental drawn tubes. Then we calculate the rate of above mentioned abnormality to total interruption times. According to patient's subjective reaction to interruption (including expressions, body movements, or language expressed), we divided the mood into 7 kinds. That was anxiety, nervous, disappointment, painful, hopelessness, angry, and refuse. If patients had one of the mentioned mood and accompanied with change of breath, heart rate, or blood pressure, it was defined mood disorder.

2.5. Statistical analysis

All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 19.0 (SPSS Inc., Chicago, IL, U.S.). Data were presented as mean \pm SD or median. $P < 0.05$ was considered statistically significant.

3. Results

3.1. Compared with control group, observation group had lower sedation dose, shorter fully awake time after drugs withdrawal, shorter time of mechanical ventilation, total sedation time, and hospital stay in ICU (Table 1).

Table1. Data about sedation in two group

Indices	Observation group (n=332)	Control group (n=237)	t	P
Dose of midazolam(mg)	206.73 \pm 57.49	372.97 \pm 91.88	5.13	< 0.01
Fully awaken time (min)	36.33 \pm 10.69	61.35 \pm 12.81	5.20	< 0.01
Duration of MV(h)	123.14 \pm 43.52	206.50 \pm 70.38	3.49	< 0.01
Total sedation time(h)	114.89 \pm 49.03	181.73 \pm 59.18	3.01	< 0.01
Hospital stay in ICU(d)	5.75 \pm 3.28	9.75 \pm 4.85	2.37	< 0.05

MV, mechanical ventilation.

3.2. Both two groups had none severe adverse events such as accidental drawn of tube. The incidence of mood disorder was highest (69.6%, 71.3%), then was blood pressure disorder (46.1%

and 54.0% respectively), resistance to mechanical ventilation (35.8% and 41.8% respectively), and abnormal heart rate (22.9% and 27.8%). There were no difference in two groups (Table 2).

Table 2. Comparison of adverse events between two groups

Indices	Observation group (n=332)	Control group (n=237)	χ^2	P
Mood disorder (n, %)	231(69.6)	169(71.3)	0.198	>0.05
Abnormal heart rate (n, %)	76(22.9)	66(27.8)	1.814	>0.05
Abnormal blood pressure (n, %)	153(46.1)	128(54.0)	3.474	>0.05
Resistance to MV (n, %)	119(35.8)	99(41.8)	2.057	>0.05

MV, mechanical ventilation.

4. Discussions

Daily interruption conducted by nurses had significant effects on patients with mechanical ventilation

Analgesia and sedation have become a regular treatment and broadly adopted in ICU, especially for those with mechanical ventilation. However it brings the risk of drug accumulation, induced resistance, excessive sedation, and even interfere with the assessment of neurological function. Finally it may increase the incidence of ventilator-associated pneumonia, prolong the duration of mechanical ventilation and hospital stay in ICU, increase hospital costs, and heighten the social burden. Kress et al studied 128 measles patients and found that DSI could decrease the dose of sedation and analgesia (morphine, midazolam, and propofol), shorten the duration of mechanical ventilation and hospital stay in ICU. Meanwhile, DSI was helpful for more detailed assessment carried out on the patient, including consciousness, state of mind, sensory and motor functions, vital signs and physiological defense reflex. It also helps the judgement of prognosis and guides the treatment and nursing care. Nurses often work beside patients in ICU and observe carefully on patients' condition. The specificity of nurse's working make it easy for nurses to conduct DSI independently. Our study demonstrated that observation group had lower sedation dose, shorter fully awake time after drugs withdraw, shorter time of mechanical ventilation, total sedation time, and hospital stay in ICU. It reminds us that DSI conducted by nurses was of significance. Since nurses were more familiar with patient's condition, easier to observe, and could dispose timely, it became more valued by doctors and nurses in ICU. Patients with mechanical ventilation were apt to resist to mechanical ventilation as a result of fear, nervous, tracheotomy, trachea cannula and the pain of wound. Patients would have dysphoria and not coordinate the treatments since the retention of carbon dioxide and intolerable to trachea cannula (Wei and Zhang, 2013). Therefore nurses could care more about patient's psychology, dysphoria, and resistance to mechanical ventilation during the process of DSI. By this means, the non-

planned withdraw of tube could be effectively avoided and patient's pain would be relieved.

DSI had potential risk of complication which needed to be cared

During the interruption process, sedation patients have the risk of stress hypertension, increase of heart rate, and resistance to mechanical ventilation. Since the special environment of ICU and the worry about self-condition, patients could have anxiety, fear, and mania. It was still existent during the daily interruption. Even more patients would draw the tube or catheter independently. In our study, patients had none severe adverse event such as accidental drawn of tube. The incidence of mood disorder was highest, then was blood pressure, resistance to mechanical ventilation, and heart rate. There were no difference in two groups. Since the existence of above risks, nurses should be very careful, especially in daily interruption. We should pay intensive care, fix the trachea cannula and deep vein catheter, prevent unplanned withdraw, and even use restraint when necessary. For awoken patients with mood fluctuation, we should comfort and pacify patients (Zheng and XV, 2010). For patients with fluctuation of heart rate, blood pressure and resistant to mechanical ventilation, nurses should report to doctors timely for expectant treatment. When severe resistant to mechanical ventilation happens, if patients had severe irritable, breathing difficulty, and oxygen saturation decreases gradually, sedations should be started immediately with a half dose of previous treatment and ask for the assistance of doctor. During the interruption process, tell the patients the knowledge about disease, the environment of ward, and the purpose of mechanical ventilation (Zhu and Jin, 2013). By this means, patients would be more confident with our treatment and comply our treatment.

In conclusion, DSI conducted by nurses was an effective method which should be adopted in patients with mechanical ventilation in ICU. It could improve the quality of care and relieve patient's pain. This was a single center study with small sample size. Sedation and analgesia was monitored by subjective indicators. Bispectrum index, heart rate variability, and the contractility of lower esophagus are lacking here.

Studies with large sample size and objective indexes are needed in the future. Studies with patients followed-up which could get data on long-term effect of DSI would provide powerful evidence.

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