CHANGING SEDATION PRACTICES IN THE INTENSIVE CARE UNIT

- Protocol Implementation, Multifaceted Multidisciplinary Approach and Teamwork

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Abstract

Introduction: Sedation protocols have demonstrated effectiveness in improving ICU sedation practices. However, the importance of multifaceted multidisciplinary approach on the success of such protocols has not been fully examined.

Methods: The study was conducted in a tertiary care medical-surgical ICU as a prospective, 4-pronged, observational study describing a quality improvement initiative that employs 2 types of controlled comparisons: a "before and after" comparison related to intense education of ICU clinicians and nurses about sedation and analgesia in the ICU, and a comparison of protocolized versus non-protocolized care. Patients were assigned alternatively to receive sedation by a goal-directed protocol using the Riker Sedation-Agitation Scale (SAS) or by standard practice. A multifaceted multidisciplinary educational program was initiated including the use of

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point of use reminders, directed educational efforts, and opinion leaders. This included several lectures and in-services and the routine availability of at least one member of this group to answer questions. We included all consecutive patients receiving mechanical ventilation, who were judged by their treating team to require intravenous sedation.

Measurements and Main Results: The following data was collected: demographics, Acute Physiology and Chronic Health Evaluation (APACHE) II score and Simplified Acute Physiology score (SAPS) II, daily doses of analgesics and sedatives, duration of mechanical ventilation, ICU length of stay (LOS) and ventilator associated pneumonia (VAP) incidence. To examine the effect of the multifaceted multidisciplinary approach, we compared the first 3 months to the second 3 months in the following 4 groups: G1 no protocol group in the first 3 months, G2 protocol group in first 3 months, G3 no protocol group in the second 3 months, G4 protocol group in the second 3 months. After ICU day 3, SAS in the groups G2, G3 and G4 became higher than in G1 reflecting "lighter" levels of sedation. There were significant reductions in the use of analgesics and sedatives in the protocol group after 3 months. This was associated with a reduction in VAP rate and trends towards shorter mechanical ventilation duration and hospital length of stay (LOS).

Conclusions: The implementation of a multifaceted multidisciplinary approach including the use of point of use reminders, directed educational efforts, and opinion leaders along with sedation protocol led to significant changes in sedation practices and improvement in patients' outcomes. Such approach appears to be critical for the success of ICU sedation protocol.

Keywords: Sedation, intensive care, mechanical ventilation, protocol, education, ventilator associated pneumonia, resource utilization.

Introduction

There is an increasing body of evidence showing that protocol-based

strategies do not only reduce variation and cost of intensive care medicine, but also improve morbidity and mortality of critically ill patients[1]. Analgesia and sedation are among these areas where considerable variations exist among practitioners[2,3].

The concepts of analgesia and sedation in intensive care medicine have changed considerably over the last decade. Deep sedation is no longer the standard practice for most patients as it prolongs weaning from mechanical ventilation and the length of ICU stay and potentially increases morbidity[4,5]. On the other hand, inadequate sedation can result in anxiety, agitation and in recall of stressful experience in the post-ICU phase[6]. Therefore, analgesics and sedatives must be carefully titrated to the individual needs[7].

A sedation goal or endpoint should be established and regularly redefined for each patient. Regular assessment of the sedation level using a validated sedation scale is recommended[7]. The response to therapy should also be systematically documented. To avoid inadvertent accumulation and overdose, it is recommended to keep the patient at a sedation level at which communication is still possible unless the medical condition requires deeper levels of sedation[7]. A daily interruption of the sedation has shown to shorten the duration of mechanical ventilation and the length of ICU stay[4,8].

Sedation protocols have demonstrated effectiveness in improving ICU sedation practices[5,9-11]. However, these protocols remain underutilized. In a survey of Danish ICUs regarding the use of sedatives and analgesics in patients requiring mechanical ventilation, only 9% of the nurses and 23% of the physicians reported using a written protocol for sedation, while 30% of the nurses and 44% of the physicians reported the use of sedation scoring systems[12]. In surveys in the United States, only 13.4% of pediatric ICUs and 32.6% of adult ICUs indicated using written protocols for sedatives[2,3]. In a Nordic survey, 53% of responding ICUs used a sedation scale and 41% had written guidelines for sedation[13].

The underutilization of sedation protocols and scales is related to several factors. First, these protocols have a certain degree of complexity making their implementation not easy and requires a consistent

collaborative effort[14]. Second, protocols and scales used in one setting may not be appropriate for another institution with different patient population; necessitating that protocols to be modified to suit patients' populations and institutional preferences[15]. Third, there is considerable variability in the perception and the practice of sedation among practitioners even in the same ICU. Fourth, assessment of sedation remains subjective even when using sedation scales with the lack of validated objective tools.

The purpose of this study is to examine the impact of implementing a protocol for analgesia and sedation and to assess effect of educating ICU practitioners and providing feedback on sedation practices. We hypothesize that a multifaceted multidisciplinary approach including the use of point of use reminders, directed educational efforts, and opinion leaders, is critical in the successful implementation of sedation protocol in an ICU with medical and nursing staff of different backgrounds.

Materials and Methods

Setting

King Fahad National Guard Hospital is an 800-bed tertiary care teaching hospital and is the main hospital in King Abdulaziz Medical City, Riyadh, Kingdom of Saudi Arabia. The 21-bed intensive care unit is a medical-surgical-trauma, a unit run as a closed unit by onsite full-time board-certified intensivisits 24 hours a day. The nurse: patient ratio is maintained at approximately 1:1.2 because of the high acuity of admissions. The ICU staff (120 nurses and 9 intensivisits in addition to residents and fellows) is multinational, and therefore with different practice backgrounds.

Study Design and Subjects

The study was conducted between Oct 2002 and March 2003 as a prospective, 4-pronged, observational study describing a quality

improvement initiative that employs 2 types of controlled comparisons: a "before and after" comparison related to intense education of ICU clinicians and nurses about sedation and analgesia in the ICU, and a comparison of protocolized versus non-protocolized care. All consecutive patients receiving mechanical ventilation, who were judged by their treating team to require intravenous sedation, aged ≥18 years and expected to stay 24 hours or more, were included in the study. The following criteria were used for exclusion from the study: epidural analgesia, no sedation required in the first 24 hours, post-cardiac arrest, ICU re-admission, brain death, and "Do Not Resuscitate" (DNR) status.

The protocol and the data collection process were approved by the ICU Quality Improvement Committee as it was considered a quality management project. Approval of the Research Committee of the Hospital was not required because the protocol was introduced as a clinical tool and the study as a monitoring procedure of this tool. In addition, both arms in the study, the protocol or the physician-directed sedation, were considered acceptable clinical practices. Based on the time of deciding to start analgesics or sedative infusions, enrolled patients were assigned alternatively to receive sedation by a goal-directed protocol using the Riker Sedation-Agitation Scale (SAS) or by standard practice which is physician directed.

The Protocol and the Multidisciplinary Educational Program

The Protocol

A standardized protocol was established based on published recommendations[7] by a taskforce of 3 physicians and 7 nurses charged to improve sedation practices in the ICU. The protocol consisted of several elements. First, validated scoring systems were adopted to assess the level of pain, sedation and agitation. Sedation and agitation assessment was performed using the Riker Sedation Agitation Scale (SAS)[16]. This scale scores a patient's level of consciousness and agitation from a seven-item list describing patient behavior and has demonstrated validity and

excellent inter-rater reliability[7] (Appendix). Pain assessment was made using the Visual Analogue Scale (VAS) whenever possible or subjective observation of pain-related behaviours and physiological indicators[7]. Nurses were requested to assess and document SAS and VAS every 4 hours. Physicians were requested to specify the target SAS ranging from 1 to 4 for each patient on a daily basis. As such the nurses were to adjust the dosage of analgesics and sedatives as titratable drugs.

Appendix

Riker Sedation Agitation Scale[7]

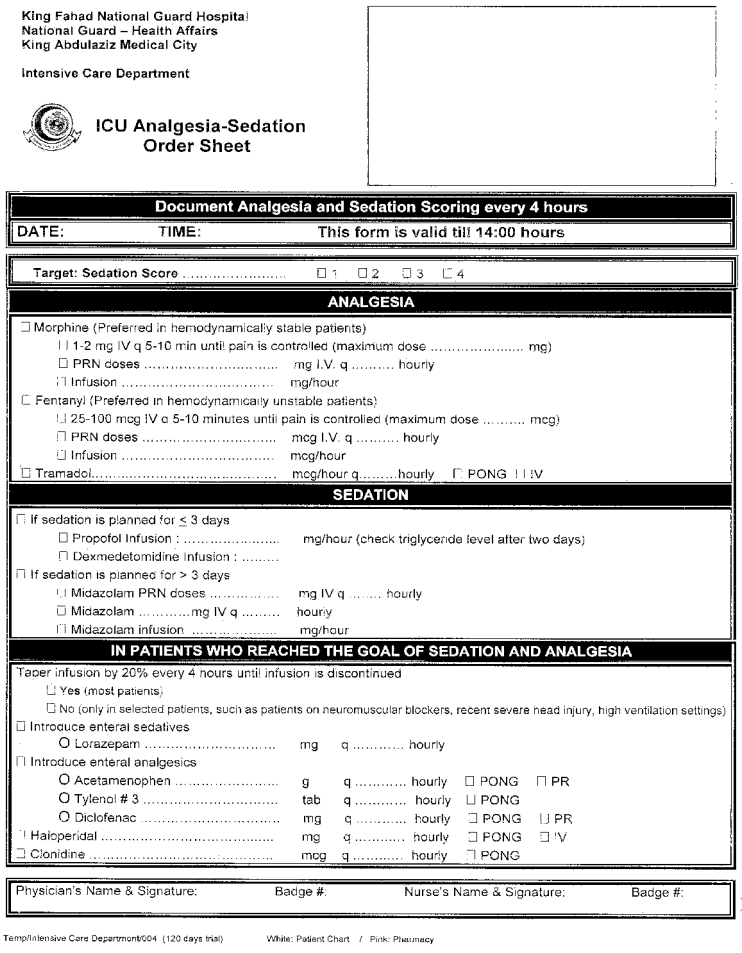
7	Dangerous Agitation	Pulling at endotracheal tube (ETT), trying to remove catheters, climbing over bedrail, striking at staff, trashing side-to-side
6	Very Agitated	Does not calm despite frequent verbal reminding of limits, requires physical restraints, biting ETT
5	Agitated	Anxious or mildly agitated, attempting to sit up, calms down to verbal instructions
4	Calm and Cooperative	Calm, awakens easily, follows commands
3	Sedated	Difficult to arouse, awakens to verbal stimuli or gentle shaking but drifts off again, follows simple commands
2	Very sedated	Arouses to physical stimuli but does not communicate or follow commands, may move spontaneously
1	Unarousable	Minimal or no response to noxious stimuli, does or communicate or follow

Second, once the target of sedation is reached, the doses of analgesics and sedatives were tapered down to avoid over-sedation by 20% of the given doses every 4 hours until the discontinuation of the intravenous infusions of analgesics and sedatives. Physicians may specify otherwise not to taper these medications in neurologic patients with severe brain injury or with increased intracranial pressure, in patients with high ventilatory settings and in patients who were pharmacologically paralysed. Third, the use of short-acting drugs (such as fentanyl and propofol) was recommended as first choice for anticipated short-term (less than 3 days) sedation[7]. Fourth, analgesics were the first line therapy for both analgesia and sedation. The use of sedatives in agitated patients

was started after providing adequate analgesia and treating potential reversible causes. Fifth, we introduced the concept of automatic stop orders for analgesia and sedation; these orders were valid only for 24 hours and needed to be re-assessed on a daily basis. The protocol included a daily physician order form that incorporated the above concepts (Fig. 1). A bedside nursing documentation sheet was introduced to document analgesia and sedation scores as well as Glasgow Coma Scale (GCS). One member of this group was routinely available to answer questions. To evaluate the effect of the protocol, we tested it on every other patient.

Fig. 1

Analgesia and sedation protocol



King Fahad National Guard Hospital
National Guard – Health Affairs
King Abdulaziz Medical City

Intensive Care Department

ICU Analgesia-Sedation Order Sheet

Document Analgesia and Sedation Scoring every 4 hours

DATE: TIME: This form is valid till 14:00 hours

Target: Sedation Score ..... ☐ 1 ☐ 2 ☐ 3 ☐ 4

ANALGESIA

☐ Morphine (Preferred in hemodynamically stable patients)
- ☐ 1-2 mg IV q 5-10 min until pain is controlled (maximum dose ..... mg)
- ☐ PRN doses ..... mg I.V. q ..... hourly
- ☐ Infusion ..... mg/hour

☐ Fentanyl (Preferred in hemodynamically unstable patients)
- ☐ 25-100 mcg IV q 5-10 minutes until pain is controlled (maximum dose ..... mcg)
- ☐ PRN doses ..... mcg I.V. q ..... hourly
- ☐ Infusion ..... mcg/hour

☐ Tramadol..... mcg/hour q.....hourly ☐ PONG ☐ IV

SEDATION

☐ If sedation is planned for ≤ 3 days
- ☐ Propofol Infusion : ..... mg/hour (check triglyceride level after two days)
- ☐ Dexmedetomidine Infusion : .....

☐ If sedation is planned for > 3 days
- ☐ Midazolam PRN doses ..... mg IV q ..... hourly
- ☐ Midazolam .....mg IV q ..... hourly
- ☐ Midazolam infusion ..... mg/hour

IN PATIENTS WHO REACHED THE GOAL OF SEDATION AND ANALGESIA

Taper infusion by 20% every 4 hours until infusion is discontinued
- ☐ Yes (most patients)
- ☐ No (only in selected patients, such as patients on neuromuscular blockers, recent severe head injury, high ventilation settings)

☐ Introduce enteral sedatives
- ☐ Lorazepam ..... mg q ..... hourly

☐ Introduce enteral analgesics
- ☐ Acetamenophen ..... g q ..... hourly ☐ PONG ☐ PR
- ☐ Tylenol # 3 ..... tab q ..... hourly ☐ PONG
- ☐ Diclofenac ..... mg q ..... hourly ☐ PONG ☐ PR

☐ Haloperidal ..... mg q ..... hourly ☐ PONG ☐ IV

☐ Clonidine ..... mcg q ..... hourly ☐ PONG

Physician's Name & Signature: Badge #: Nurse's Name & Signature: Badge #:

Temp/Intensive Care Department/004 (120 days trial) White: Patient Chart / Pink: Pharmacy

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The Multidisciplinary Educational Program

The multifaceted multidisciplinary approach included several elements. Several lectures and in-services were given before and throughout the study period. These lectures included several ICU Grand Rounds on sedation in the ICU, lectures to the residents as well as in-services on the protocol itself. These were given by the medical and nursing members of the taskforce. In addition, members of the taskforce stimulated discussions on sedation on rounds and provided feedback about the implementation of the protocol. For example, for a patient requested to achieve SAS of 4, the team will discuss at bedside the meaning of this score and how to titrate sedative to achieve the goal. One member of the taskforce was always available to respond to queries.

Measurements

The following baseline data was collected: patient's demographics, severity of illness scores including Acute Physiology and Chronic Health Evaluation (APACHE) II[17] and Simplified Acute Physiology Score (SAPS) II[18], measures of organ failure on admission including Glasgow Coma Scale (GCS), PaO_2/FIO_2, platelet count, creatinine, and the presence of shock defined as hypotension (systolic blood pressure <90 mmHg requiring vasopressors not including dopamine at doses of <5 mcg/kg/min). We documented the presence of severe chronic illnesses as defined by APACHE II system[17]. The type of admission (medical, post-operative or non-operative trauma) was documented.

The study endpoints were the daily doses of analgesics and sedatives, average achieved SAS for each daytime and nighttime shifts for the first 5 ICU days, duration of mechanical ventilation, ICU and hospital length of stay (LOS), ventilator-associated pneumonia (VAP) incidence and ICU and hospital outcome. Mechanical ventilation duration was calculated as the total number of calendar days of invasive mechanical

ventilation. VAP was defined using the CDC-National Nosocomial Infections Surveillance System (NNIS) definition and was monitored independently of the sedation data collection as a part on an ongoing surveillance process[19].

Data Analysis

Statistical analysis was performed using Minitab for Windows (Release 12.1, Minitab, Inc. State College, PA, USA). Continuous variables were expressed as mean ± standard error of the mean (SEM) and were analyzed using Analysis of Variance (ANOVA). Categorical variables were expressed as absolute and relative frequencies and were analyzed using chi-square test. P values ≤ 0.05 were considered significant.

To examine the effect of education we compared the first 3 months to the second 3 months. Therefore, we had 4 groups: G1 no protocol group in the first 3 months, G2 protocol group in first 3 months, G3 no protocol group in the second 3 months, G4 protocol group in the second 3 months. Comparison between G1 and G4 reflected the combined impact of the protocol and education.

First 3 months	Second 3 months
G1 – no protocol group	G3 – no protocol
G2 – protocol group	G4 – protocol

Results

Baseline Characteristics: Table 1 shows patients characteristics. There were no major differences among the 4 groups in age, sex, APACHE II, SAPS II or organ failure indicators. Patients in the second 3 months (G3 and G4) were more likely to be admitted for medical reasons and had more patients with chronic respiratory illness.

Table 1
Baseline Characteristics

	First 3 months		Second 3 months				
	No protocol (G1)	Protocol (G2)	No protocol (G3)	Protocol (G4)	p-value (all)	p-value (G1 vs G4)	p-value (1st vs 2nd 3 months)
Number	50	51	53	53			
Male Sex (%)	39 (78)	38 (75)	34 (64)	36 (70)	0.40	0.25	0.11
Age	42 ± 3	45 ± 3	51 ± 3	48 ± 3	0.19	0.21	0.053
Medical	17 (34)	25 (49)	34 (64)	25 (47)	0.024	0.17	0.043
Surgical	25 (50)	21 (41)	11 (21)	16 (30)	0.012	0.04	0.003
Trauma	8 (16)	5 (10)	8 (15)	12 (23)	0.36	0.39	0.24
APACHE II	21 ± 1	23 ± 1	23 ± 1	20 ± 1	0.25	0.69	0.85
SAPS II	41 ± 2	45 ± 3	47 ± 2	42 ± 3	0.42	0.71	0.58
Organ Failure Indicators							
PaO2/FIO2	236 ± 15	222 ± 16	216 ± 16	228 ± 17	0.83	0.74	0.67
GCS	10 ± 1	9 ± 1	11 ± 1	10 ± 1	0.20	0.41	0.41
Creatinine	123 ± 21	155 ± 26	145 ± 17	110 ± 15	0.38	0.59	0.54
Bilirubin	30 ± 6	49 ± 20	74 ± 26	36 ± 11	0.31	0.61	0.39
Platelets	182 ± 16	190 ± 15	180 ± 19	203 ± 17	0.76	0.37	0.74
Shock	25 (25)	32 (63)	35 (66)	27 (51)	0.24	0.92	0.77
Chronic Illnesses							
Respiratory	0 (0)	2 (4)	6 (11)	4 (6)	0.08	0.05	0.02
Cardiac	0 (0)	0 (0)	2 (4)	1 (2)	NA	NA	NA
ESRD	2 (4)	2 (4)	1 (2)	4 (8)	0.55	0.44	0.79

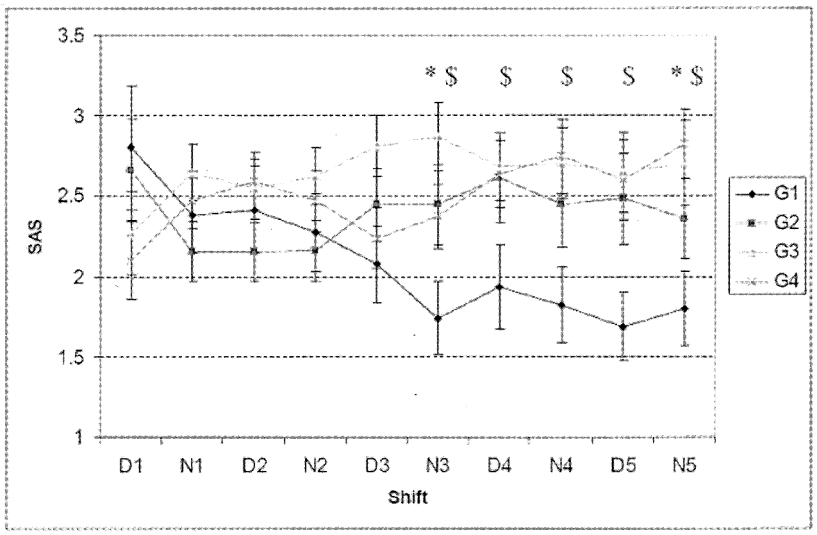
Cirrhosis	4 (8)	5 (10)	7 (13)	2 (4)	0.38	0.36	0.38
Immunosuppression	5 (10)	3 (6)	7 (13)	4 (8)	0.59	0.66	0.59

The Impact of Protocol and the multifaceted multidisciplinary approach on Sedation Scores

Figure 2 demonstrates the average Sedation Agitation Scale (SAS) per day and night shifts for the four groups. Patients in G1 had progressive decline in SAS reflecting deepening of sedation levels. In contrast, SAS in the other 3 groups (G2, G3 and G4) became higher than in G1 after study day 3 reflecting "lighter" levels of sedation compared to G1.

Table 2 shows SAS levels on days and nights 3 and 4. The proportion of patients with SAS 3-4 increased and the proportion of patients with SAS 1-2 decreased with education and protocol.

Fig. 2
Riker Sedation Agitation Scale (SAS) over the first 5 study days



* p value < 0.05 among all groups, $ p value < 0.05 for G1 versus G4.

Table 2
Riker Sedation Agitation Scale in the four groups

	First 3 months		Second 3 months				
	No protocol (G1)	Protocol (G2)	No protocol (G3)	Protocol (G4)	p-value (all)	p-value (G1 vs G4)	p-value (1^{st} vs 2^{nd} 3 months)
Day 3 SAS ≤2	69%	61%	45%	57%	0.17	0.31	0.086
Day 3 SAS 3-4	25%	28%	51%	41%	0.053	0.16	0.01
Day 3 SAS ≥5	6%	11%	4%	2%	0.32	0.35	0.11
Nights 3 SAS ≤2	83%	60%	45%	57%	0.013	0.023	0.020
Night 3 SAS 3-4	10%	29%	47%	38%	0.009	0.008	0.004
Night 3 SAS ≥5	7%	12%	9%	4%	0.60	0.62	0.41
Day 4 SAS ≤2	78%	54%	48%	48%	0.057	0.012	0.046
Day 4 SAS 3-4	15%	30%	45%	50%	0.012	0.003	0.002
Day 4 SAS ≥5	7%	16%	7%	2%	0.14	0.30	0.08
Nights 4 SAS ≤2	77%	61%	46%	45%	0.037	0.01	0.009
Night 4 SAS 3-4	19%	31%	46%	50%	0.036	0.011	0.006
Night 4 SAS ≥5	4%	8%	7%	5%	0.84	0.89	0.89

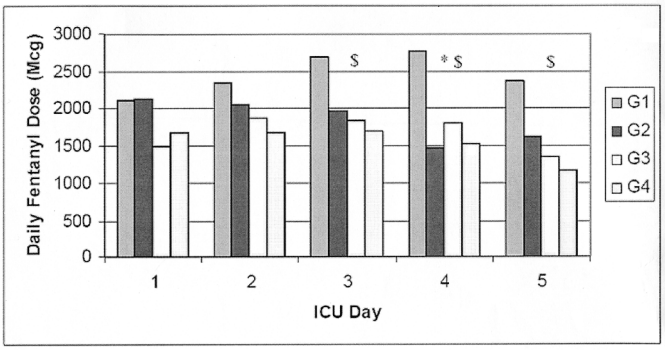
The Impact of Protocol and Education on Sedative and Analgesic Doses

As shown in Table 3, there were significant reductions in the doses of midazolam, propofol and fentanyl especially with G4.

Table 3
Doses of Analgesics and Sedatives

	First 3 months		Second 3 months				
	No protocol (G1)	Protocol (G2)	No protocol (G3)	Protocol (G4)	p-value (all)	p-value (G1 vs G4)	p-value (1^{st} vs 2^{nd} 3 months)
Study Days	4.0 ± 0.2	4.0 ± 0.2	4.1 ± 0.2	4.2 ± 0.2	0.66	0.33	0.47
Daily fentanyl (mcg)	1964 ± 271	1412 ± 225	1533 ± 195	1344 ± 168	0.22	0.04	0.32
Daily Propofol (mg)	236 ± 65	264 ± 106	171 ± 84	105 ± 33	0.10	0.06	0.03
Daily Midazolam (mg)	87 ± 14	68 ± 11	51 ± 9	63 ± 9	0.20	0.18	0.09
Daily Morphine (mg)	7 ± 2	14 ± 5	1 ± 1	14 ± 5	0.045	0.18	0.48
Daily Haloperidol (mg)	0.94 ± 0.71	1.57 ± 0.62	0.41 ± 0.26	0.87 ± 0.33	0.39	0.93	0.18
Daily oral Lorazepam (mg)	0.31 ± 0.16	0.36 ± 0.16	0.10 ± 0.09	0.16 ± 0.07	0.28	0.33	0.06

Fig. 3
Changes in average daily doses of fentanyl

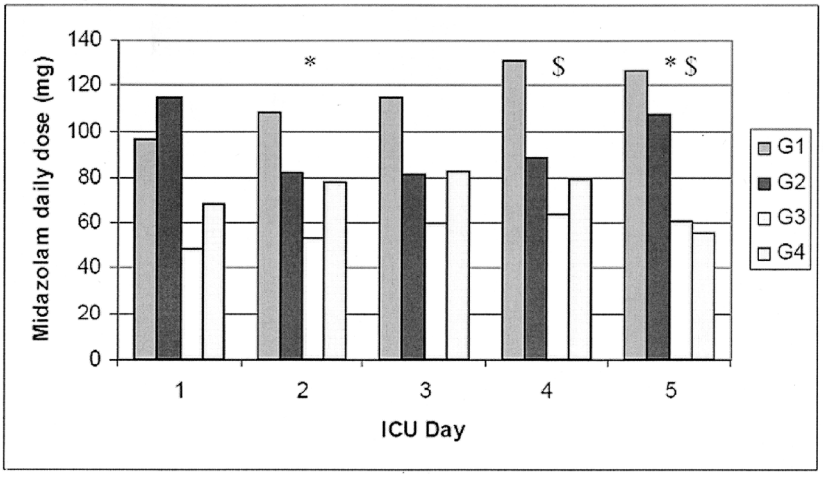


* p value < 0.05 among all groups, $ p value < 0.05 for G1 versus G4.

The Impact on Patients Outcomes

Table 4, shows the clinical outcomes. Patients in the second 3 months (G3 and G4) had lower rates of ventilator associated pneumonia and trends towards shorter duration of mechanical ventilation and hospital stay.

Fig. 4
Changes in average daily doses of midazolam



* p value < 0.05 among all groups, $ p value < 0.05 for G1 versus G4.

Table 4
Patients' Outcomes

	First 3 months		Second 3 months				
	No protocol (G1)	Protocol (G2)	No protocol (G3)	Protocol (G4)	p-value (all)	p-value (G1 vs G4)	p-value (1st vs 2nd 3 months)
Ventilation days	12 ±2	11 ±1	10 ± 1	8 ± 1	0.21	0.07	0.055
VAP (%)	28%	29%	11%	11%	0.02	0.03	0.002
Tracheostomy	11 (22)	15 (29)	12 (23)	8 (15)	0.38	0.37	0.23
ICU LOS	13 ± 2	13 ± 1	12 ± 1	10 ± 1	0.42	0.17	0.15
ICU Mortality (%)	10 (20)	9 (18)	12 (23)	7 (13)	0.64	0.35	0.87
Hospital LOS	50 ± 7	55 ± 8	41 ± 7	40 ± 6	0.34	0.27	0.08
Hospital Mortality	12 (24)	12 (24)	19 (36)	12 (23)	0.35	0.87	0.35

Discussion

Our study demonstrates that implementing a sedation protocol accompanied by a multifaceted multidisciplinary program was effective in improving sedation practices in the ICU. Moreover, the educational and feedback program rather than the direct effect of the protocol itself appears to be responsible for most of the observed effects. This is evident by the fact that most of the changes occurred in the second 3 months of the study even on patients who were not placed on the protocol.

Implementing sedation protocols in the ICU is a typical example of the need for multidisplinary teamwork in critical care practice. In clinical medicine in general and the ICU in particular, teamwork is now considered essential to ensure quality of care[20], safety[21], patient satisfaction[22] and improved outcomes[23-25]. Teamwork is considered the best approach for tasks with a high degree of complexity and interdependence; tasks requiring large volumes of information and tasks necessitating special skills[25,26]. Such tasks can only be executed by the

combined, *collaborative* efforts of several individuals[26,27]. Changing sedation practices in the ICU meets all these criteria. The multidisplinary teamwork was critical in generating and accepting the protocol, in conducting the educational and feedback program and also in collecting the data used to assess its effectiveness.

Our protocol also delegated the decision making authority in titrating the analgesics and sedatives to ICU nurses which enhanced the sense of ownership over the protocol, hence was critical in the successful implementation. Nursing-led protocols have been shown to reduce the duration of mechanical ventilation, the intensive care unit and hospital lengths of stay, the need for tracheostomy and to provide effective and timely management of patient comfort[5,28].

Both propofol and midazolam doses were reduced (Table 3, Fig. 3, Fig. 4). We noticed a significant reduction in fentanyl doses and not morphine. The reason is that fentanyl is the main narcotic used in our ICU, while morphine is less commonly used. As we implemented the protocol, we encouraged the use for morphine for hemodynamically stable patients as per SCCM guidelines, and as such no significant reduction was seen.

Our study has several strengths, including the prospective nature, the collection of physiologic, pharmacologic and clinical endpoints.

Limitations include the mono-center nature of the study. There was no pre-protocol and pre-education period because collecting data by ICU nurses required significant education which would impact the sedation practices. Another limitation was the alternative allocation to protocol versus no protocol which probably led to underestimation of the protocol effect the education affected all patients.

As this study was performed as a quality management project, other aspects of care such as the decision to perform tracheostomy were not protocolized but rather based on the treating intensivist discretion. While we cannot exclude the possibility of bias, we believe these decisions were made independent of whether the patient was on sedation protocol or not.

Conclusion

Changing sedation practices in the ICU is an easier said-than-done task. While sedation protocols are proposed to change these practices, their implementation in real life remains a major challenge. This is especially true in ICUs with staff from different educational backgrounds. Our article describes our quality improvement initiative to improve sedation practices and illustrates that having a protocol may not be enough without a multifaceted multidisciplinary approach including the use of point of use reminders, directed educational efforts, and opinion leaders.

Key Messages

- Protocols are proposed to improve sedation practices, but their implementation in real life remains a major challenge especially in ICUs with staff from different educational backgrounds.
- Having sedation protocol may not be enough without a multifaceted multidisciplinary approach including the use of point of use reminders, directed educational efforts, and opinion leaders.
- The task of improving sedation practices can only be executed by collaborative teamwork because of its high degree of complexity and interdependence and the need for large volumes of information and special skills.

Competing Interests

None

Financial Support: None

Authors' contribution

YA, SH, RH, TM and AA performed the study, RH, TM, MP, BN, AI, BY and CG carried out data collection. YA drafted the manuscript. YA performed the statistical analysis. YA designed the database. YA, SH, RH, and TM conceived the study and participated in its design and coordination. All authors read and

approved the final manuscript.

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