

Безопасный перевод пациента из операционной в палату: роль капнометрии в предупреждении ВОЗМОЖНЫХ нарушений вентиляции

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Киев
24 апреля 2014



No conflicts of interest





NAP4

4th National Audit Project of
The Royal College of Anaesthetists and The Difficult Airway Society

Major complications of airway management in the United Kingdom

Report and findings
March 2011

EXECUTIVE SUMMARY

- at least **one in four** major airway events reported to NAP4 was from ICU or the emergency department
- failure to use capnography in ventilated patients likely contributed to more than **70%** of ICU related deaths

Recommendation: Capnography has the potential to aid early detection of airway obstruction. It should be available and used in high-risk cases.

INDICATIONS :END-TIDAL CO2 MONITORING

- Validation of proper endotracheal tube placement and maintain position
- Evaluation of ventilation-perfusion mismatch :hemodynamic
 - Adequacy of pulmonary perfusion/Cardiac function and volume status
 - Evaluate ventilator settings (TV, RR and PEEP)
- Detection of obstruction airways : Bronchospasm
- Detection of airway leaks or loss airway (transport patient)
- CPR (adequacy of compression and detect ROSC/prognosis)

[Respir Care 2003;48(5):534–539]

Использование капнометрии у неинтубированных пациентов

PRACTICE GUIDELINES FOR SEDATION AND ANALGESIA BY NON-ANESTHESIOLOGISTS

(Approved by the House of Delegates on October 25, 1995, and
last amended on October 17, 2001)

*An Updated Report by the American Society of Anesthesiologists
Task Force on Sedation and Analgesia by Non-Anesthesiologists*

Anesthesiology

96: 1004-1017, 2002

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All patients undergoing sedation/analgesia should be monitored by pulse oximetry with appropriate alarms. If available, the variable pitch "beep", which gives a continuous audible indication of the oxygen saturation reading, may be helpful. In addition, ventilatory function should be continually monitored by observation and/or auscultation. Monitoring of exhaled CO₂ should be considered for all patients receiving deep sedation and for patients whose ventilation cannot be directly observed during moderate sedation. When possible, blood pressure should be determined before sedation/analgesia is initiated. Once sedation/analgesia is established, blood pressure should be measured at 5-minute

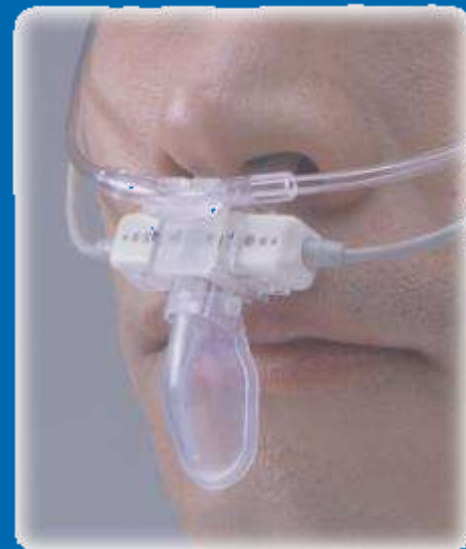
Использование капнометрии у неинтубированных пациентов

Continuous Respiratory Monitoring and a “Smart” Infusion System Improve Safety of Patient-Controlled Analgesia in the Postoperative Period

Ray R. Maddox, PharmD; Harold Oglesby, RRT; Carolyn K. Williams, BSPharm; Marianne Fields, RN, MSN; Sherry Danello, RN, MSN

Abstract

The Anesthesia Patient Safety Foundation has noted an underappreciated risk of serious injury from patient-controlled analgesia (PCA)—including life threatening respiratory depression (RD) in young, healthy patients—and has urged consideration of “smart” PCA pumps and continuous oxygenation and ventilation monitoring of patients receiving PCA therapy. St. Joseph’s/Candler Health System was the first U.S. hospital system to implement this technology. Clinical experience shows that non-invasive capnographic monitoring provides the earliest warning of RD. Use of this technology has resulted in a 50% reduction in the incidence of RD, higher than previously reported. We describe implementation of “smart” PCA pumps with continuous respiratory monitoring and result in the use of a significant program and procedures adopted and patients protected even when the PCA infusion was correctly programmed. Our experience shows that continuous respiratory monitoring of PCA therapy, especially non-invasive capnography, assists clinicians in early identification of RD and other complications to prevent serious adverse events and the need for costly interventions.



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Am J Health Syst Pharm
2006; 63: 157-164.

Использование капнометрии у неинтубированных пациентов

Continuous Oximetry/Capnometry Monitoring Reveals Frequent Desaturation and Bradypnea During Patient-Controlled Analgesia

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BACKGROUND: The most serious complication of patient-controlled analgesia (PCA) is respiratory depression (RD). The incidence of RD in the literature is derived from intermittent sampling of pulse oximetry (SpO_2) and respiratory rate and defined as a deviation below an arbitrary threshold.

METHODS: We monitored postsurgical patients in a hospital ward receiving morphine or meperidine PCA with continuous oximetry and capnography. Nurses responding to audible monitor bedside alarms documented respiratory status and interventions.

RESULTS: A total of 178 patients were included in the analysis, 12% and 41% of whom had episodes of desaturation ($\text{SpO}_2 < 90\%$) and bradypnea (respiratory rate < 10) lasting 3 min or more. One patient required "rescue" with positive pressure ventilation, and none required naloxone. Patients over 65 years of age and the morbidly obese were at greater risk for desaturation. Patients over 65 years of age were also more likely to have bradypnea, whereas the morbidly obese and patients receiving PCA with morphine were at greater risk for bradypnea.

CONCLUSIONS: Our incidence of RD by bradypnea is significantly higher than the 1%–2% incidence in the literature using the same threshold criteria but more stringent duration criteria, while our incidence of RD based on desaturation is consistent with previous estimates. We conclude that continuous respiratory monitoring is optimal for the safe administration of PCA, because any RD event can progress to respiratory arrest if undetected. Better alarm algorithms must be implemented to reduce the frequent alarms triggered by threshold criteria for RD.

(Anesth Analg 2007;105:412-8)



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ANESTHESIA & ANALGESIA

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Использование капнометрии у неинтубированных пациентов

First National Survey of Patient-Controlled Analgesia Practices

by

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Executive Summary

2013

On the positive side, survey findings also show that adverse events have been averted or costs and expenses reduced by hospitals that are continuously monitoring their patients with pulse oximetry and/or capnography. This demonstrates the critical importance of using continuous monitoring as a technological safety nets for patients. As well, it also points to a way hospitals may reduce their costs and expenses.

Использование капнометрии у неинтубированных пациентов

THE ACCURACY OF NON-INVASIVE NASAL CAPNOGRAPHY IN MORBIDLY OBESE PATIENTS AFTER BARIATRIC SURGERY

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Abstract

Study objective: to assess the accuracy of nasal capnography for the monitoring of ventilation in extubated morbidly obese patients, following bariatric surgery.

Design: prospective descriptive study.

Setting: Post-anesthesia care unit.

Patients: 25 consecutive morbidly obese patients admitted to the PACU after open bariatric surgery.

Intervention: Patients had a nasal cannula designed to administer oxygen (3 L/min) and to sample expired CO₂ by a coaxial catheter.

Measurements: Capnographic waveform, end-tidal CO₂ (ETCO₂) and respiratory rate (RRd) were displayed by a capnometer (Datex-Ohmeda). Arterial CO₂ pressure (PaCO₂) was measured by blood gas analysis. Respiratory rate was measured by visual inspection of chest breathing motions (RRm). Differences between PaCO₂ and ETCO₂ and

Conclusion: Limits of agreement between PaCO₂ and ETCO₂ pressure and between RRd and RRm are clinically acceptable. Nasal capnography is accurate for the monitoring of ventilation in extubated morbidly obese patients, following bariatric surgery.

Использование капнометрии у неинтубированных пациентов

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BJA

Accuracy of respiratory rate monitoring by capnometry using the Capnomask[®] in extubated patients receiving supplemental oxygen after surgery

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Editor's key points

- This study compared clinical monitoring of respiratory rate with thoracic bioimpedance and a new oxygen mask incorporating capnometry.
- The Capnomask[®] was similar to clinical observation and more accurate than bioimpedance even at high oxygen flow rates.
- If confirmed, these data suggest that the Capnomask[®] might be useful in postoperative patients breathing spontaneously.

Background. Respiratory monitoring is standard after anaesthesia and surgery. Abnormal respiratory rate is a sensitive indicator of respiratory problems, even in patients receiving supplemental oxygen, but the best method for its continuous measurement in spontaneously breathing patients is unclear. This study compared respiratory rate assessment by capnometry using a new oxygen mask with a carbon dioxide sampling port (Capnomask[®]) and thoracic impedance pneumography with clinical measurement (used as a reference method) in extubated patients receiving supplemental oxygen.

Methods. Adult males admitted to the post-anaesthesia care unit after general anaesthesia were studied. Immediately after extubation, a Capnomask[®] connected to a capnometer was positioned appropriately. Respiratory rate was measured by visual inspection of chest movement for 1 min, by capnometry, and thoracic impedance pneumography. One set of measurements was obtained for every patient receiving supplemental oxygen at different flow rates.

Results. Twenty men, mean (inter-quartile range) age 54 (23–66) yr and BMI 25 (21–31) kg m⁻², were studied. Compared with visual inspection, the bias and limits of agreement were 0.0 (1.0 to –1.0) bpm for the Capnomask[®] and –2.2 (2.0 to –6.5) bpm for the impedance pneumography. The accuracy of respiratory rate assessment using Capnomask[®] was not influenced by the supplemental oxygen flow rate.

Conclusions. In extubated patients, continuous assessment of respiratory rate with the Capnomask[®] is more accurate than by thoracic impedance pneumography even when supplemental oxygen is delivered at a high flow rate.

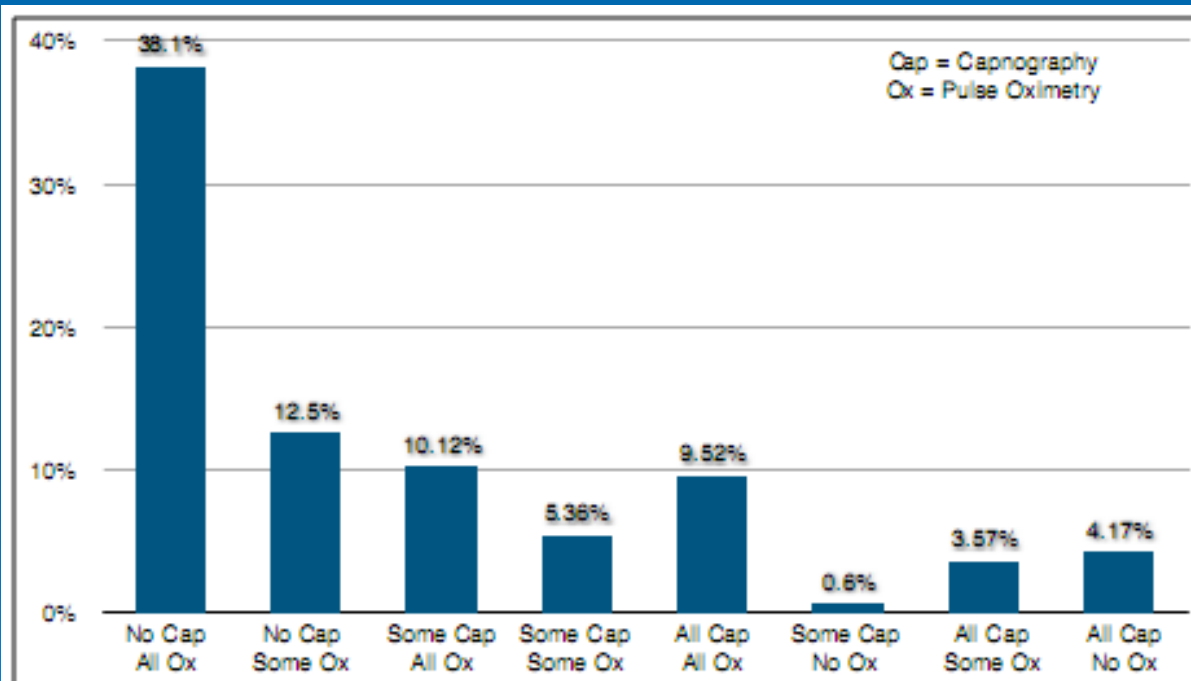
Keywords: capnography; physiological monitoring; postoperative care; postoperative complications; recovery room; respiratory depression

Accepted for publication: 16 September 2011

Conclusions. In extubated patients, continuous assessment of respiratory rate with the Capnomask is more accurate than by thoracic impedance pneumography even when supplemental oxygen is delivered at a high flow rate.

Проблемы мониторинга ETCO2

"APSF recommends that monitoring be continuous and not intermittent, and that continuous electronic monitoring with both pulse oximetry for oxygenation and capnography for the adequacy of ventilation be considered for all patients."



Проблемы п/о депрессии дыхания и способы решения

- RASU
- мониторы
- инцидентность п/о депрессии дыхания?
- при ранней экстубации – не давать спать
- перевод в ОРИТ «на раздышку»
- Как экстубировать и перевести безопасно?

Цели и задачи:

- оценить значимость капнографии в принятии решения о безопасном переводе экстубированных пациентов из операционной в палаты хирургических отделений;
- определить влияние различных методов анестезии на скорость послеоперационного восстановления вентиляции.

Материал и методы

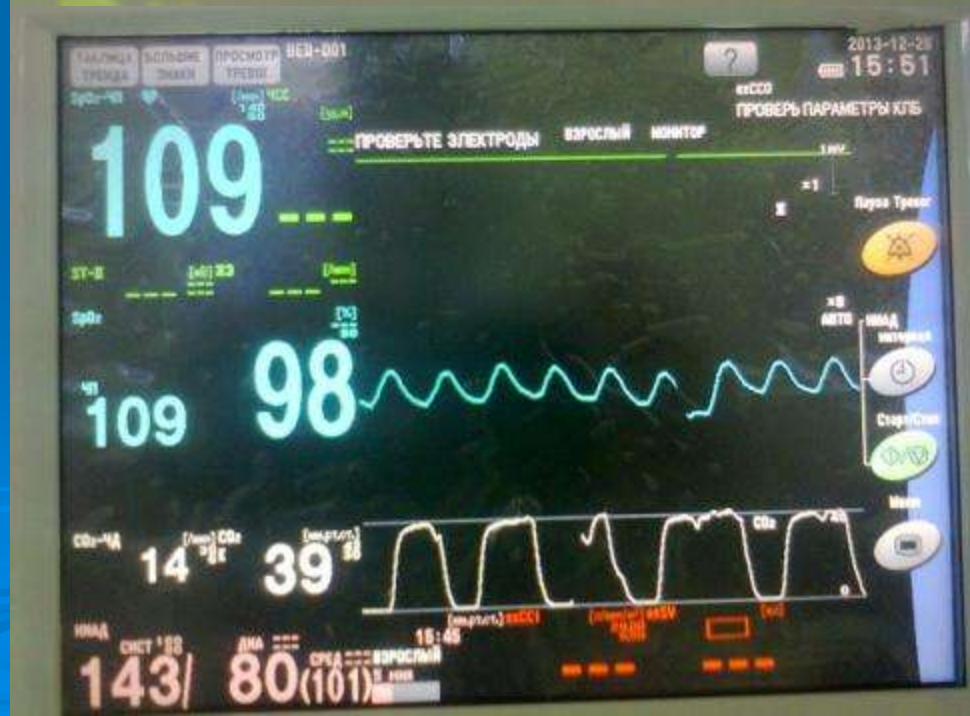
В исследование были последовательно включены 40 пациентов, оперированных на щитовидной железе.

Средняя продолжительность операции - 110 ± 35 мин.

В зависимости от метода анестезии пациенты были разделены на две группы (ТВВА, СЕВ).

Послеоперационная капнография проводилась на мониторе Vismo (Nihon Kohden, Japan).

Vismo (Nihon Kohden, Japan)



ТВВА
n=20

пропофол 4
мг/кг/час

СЕВ
n=20

севофлуран
МАК 2,5–3
%,

фентанил
10/5/3
мкг/кг/час

фентанил
3 мкг/кг/час

атракурий
0,5 мг/кг/час

Оценивались:

1

- Время от окончания операции до перехода пациента к спонтанному дыханию.

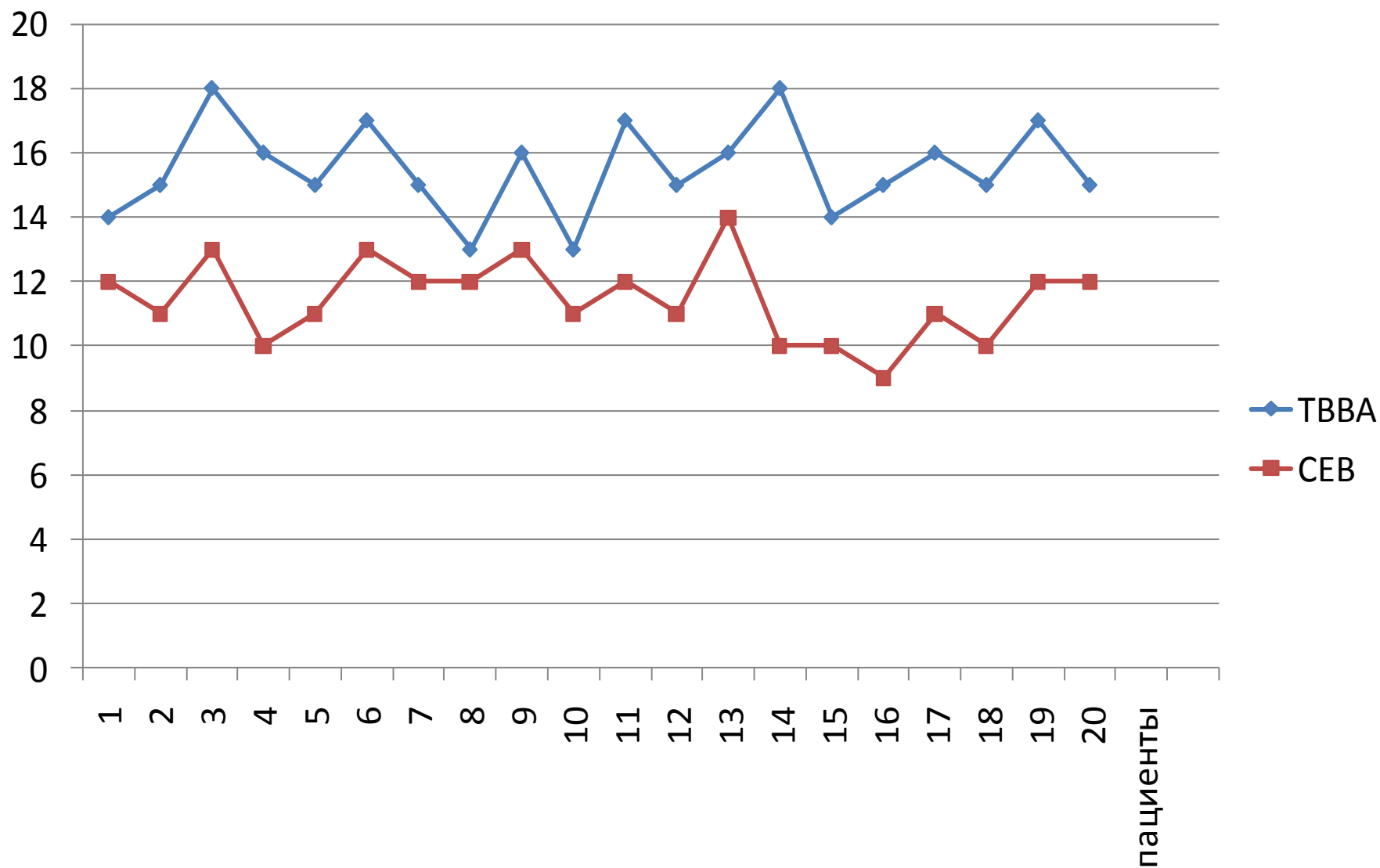
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- Нарушение вентиляции после экстубации:
 - - ЧД < 8 /мин;
 - - $Sa O_2 < 90$ /мин;
 - - $30 < et CO_2 > 50$ мм.рт.ст

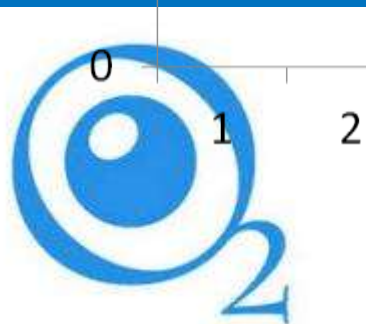
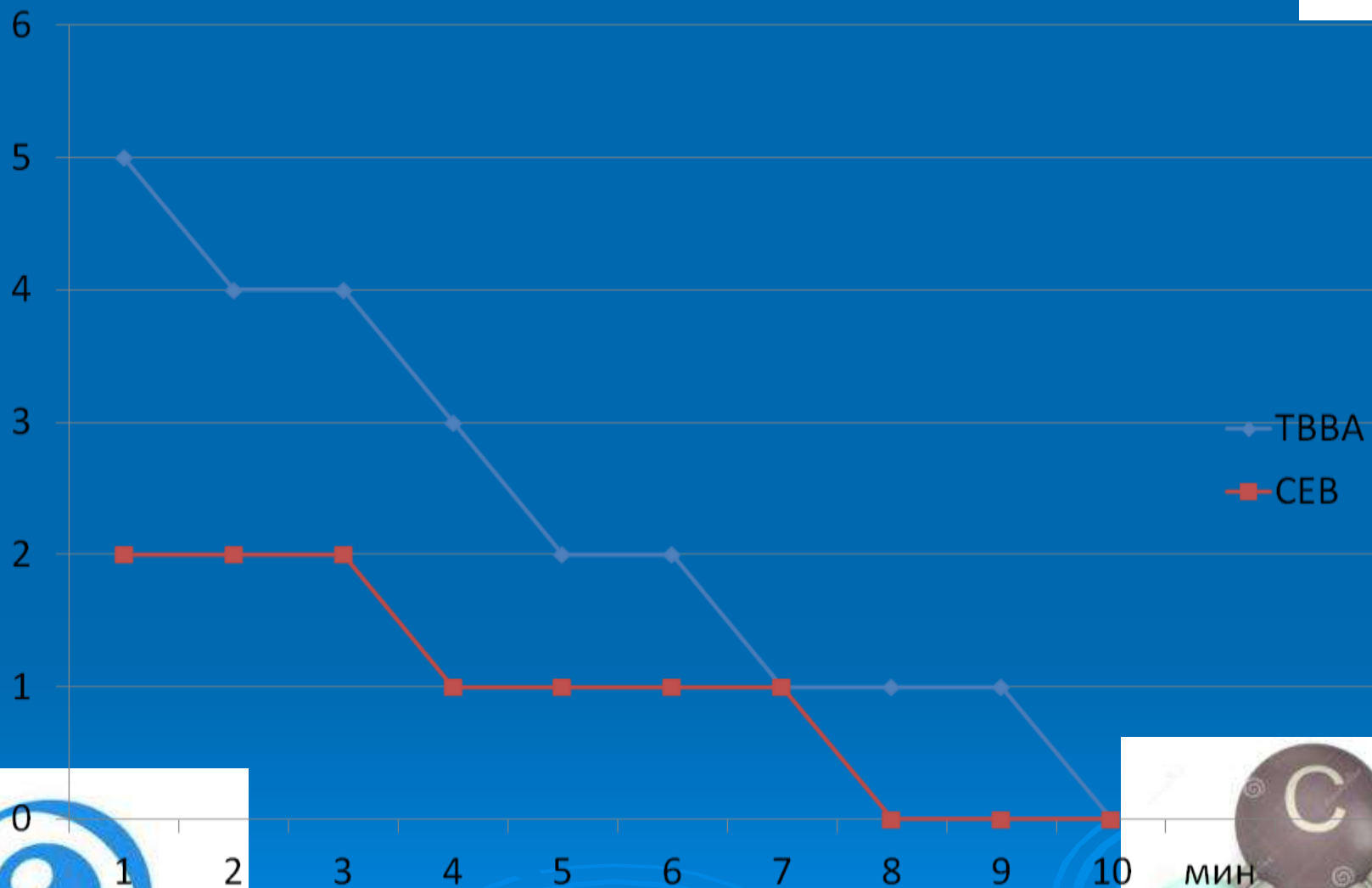
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- Время нормализации капнографической кривой;
- Инцидентность диспноэ в течении 1-го часа после перевода

Результаты: время экстубации

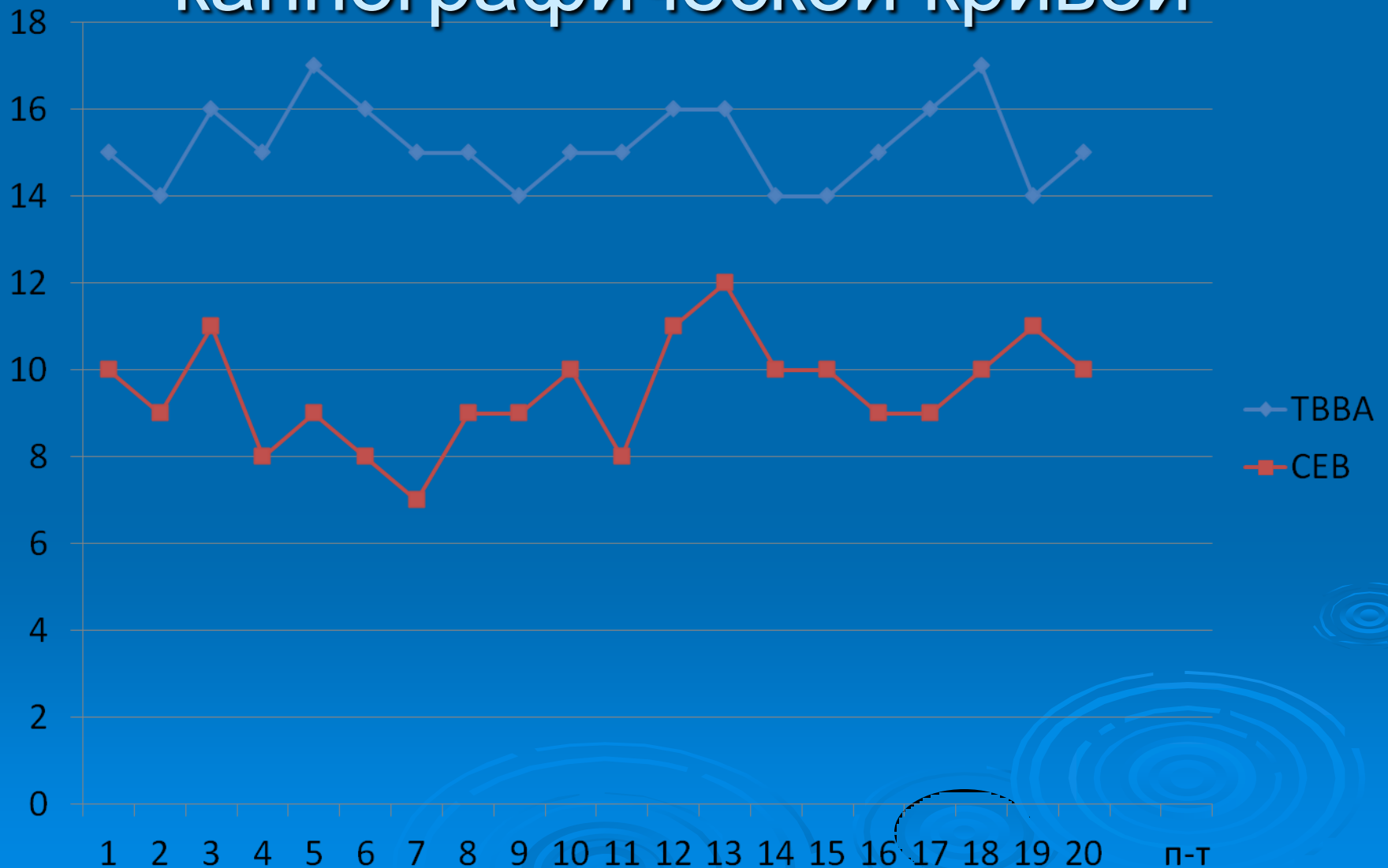


Результаты: периоды диспноэ





Время нормализации капнографической кривой



Выводы:

Назальная капнография является надежным методом мониторинга вентиляции у экстубированных пациентов, позволяющим точно определить время безопасного перевода больных из операционной в палату хирургического отделения.

Безопасная анестезия в Украине



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