肝移植手術圍術期高血糖或血糖波動與術後急性腎損傷的關係：一項回顧性觀察研究

Association Between Perioperative Hyperglycemia or Glucose Variability and Postoperative Acute Kidney Injury After Liver Transplantation: A Retrospective Observational Study

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背景：肝移植術中和術後早期的血糖調控較為困難。在重症患者中高血糖和血糖波動可能與急性腎損傷（AKI）的發生有關。通過此項回顧性研究來驗證以下假設：圍術期血糖水準（以時間加權的平均血糖水準和血糖波動值代表）是肝移植患者術後 AKI 發生的獨立相關因素。
方法：以肝移植術中和術後 48h 內的血糖水準為基準，根據時間加權的血糖平均水準將成人肝移植受體分成 4 組：正常血糖組（80-200 mg/dL）、輕度高血糖組（200-250 mg/dL）、中度高血糖組（250-300 mg/dL）和重度高血糖組（>300 mg/dL）。同時根據以血糖測值的標準差定義的血糖波動情況將患者分入 4 個分位數。主要預後指標為術後 AKI 的發生。
結果：肝移植術後 AKI 的發生更常見於圍術期血糖波動較大的患者（與第 1 四分位數相比，第 3 四分位數的比值比為 2.47, [95%置信區間，1.22-5]，P=0.012；與第 1 四分位數相比，第 4 四分位數的比值比為 2.16，[95%置信區間，1.05-4.42]，P = 0.035）。
結論：此研究提示圍術期血糖波動增加而非高血糖是肝移植受體術後 AKI 發生的獨立危險因素。
（戴依利　譯　陳傑　校）

BACKGROUND: Glucose control can be difficult in the intraoperative and immediate postoperative period of liver transplantation. Hyperglycemia and glucose variability have been associated with acute kidney injury (AKI) in critically ill patients. We performed a retrospective study to test the hypothesis that perioperative glucose levels represented by time-weighted average glucose levels andglucose variability are independently associated with the incidence of postoperative AKI in patients undergoing liver transplantation.
METHODS: On the basis of blood glucose levels during liver transplantation and the initial 48 hours postoperatively, adult livertransplant recipients were classified into 4 groups according to their time-weighted average glucose: normoglycemia (80-200 mg/dL), mild hyperglycemia (200-250 mg/dL), moderate hyperglycemia (250-300 mg/dL), and severe hyperglycemia (>300 mg/dL) group. Patients were also classified into quartiles depending on their glucose variability, defined as the standard deviation of glucosemeasurements. The primary outcome was postoperative AKI.
RESULTS: AKI after liver transplantation was more common in the patients with greater perioperative glucose variability (first versus third quartile; OR, 2.47 [95%CI, 1.22-5.00], P = .012; first versus fourth quartile; OR, 2.16 [95% CI, 1.05-4.42], P = .035).
CONCLUSIONS: Our study suggests that increased perioperative glucose variability, but not hyperglycemia, is independently associated with increased risk of postoperative AKI in liver transplantation recipients.

機械通氣病人脈搏血氧儀監測的進展

Advanced Uses of Pulse Oximetry for Monitoring Mechanically Ventilated

Patients

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脈搏血氧儀是臨床上監測手段中一項毋庸置疑的標準方法，它將分光光度測定法和容積描記法相結合檢測低氧血症，用於診斷、監測以及隨訪心血管疾病。脈搏血氧儀對機械通氣病人監測以及評估呼吸和迴圈狀態非常有用。一方面，通過關鍵的光譜衍生技術進行持續、無創動脈血氧飽和度（SpO_2）監測可以評估特定通氣治療方案下患者的氣體交換情況。測得資料有助於防止病人低氧，設置適當的呼吸機參數和吸入氣中氧濃度分數。然而，當患者吸入高於正常的氧時， SpO_2 可以掩蓋機械通氣患者存在的氧合不足。這種局限性來源於氧合血紅蛋白飽和度 S 型曲線，可以通過控制性、逐步降低吸入氧分數的方式改善，從而不需要採集血液就可獲得 SpO_2/FIO_2 圖形，進一步得出患者氣體交換、肺內分流、低通氣/血流比的粗略情況。另一方面， 光電容積脈搏波檢測的血氧功能很少被用於監測機械通氣患者的血液動力學。光電容積脈搏波分析的資料能提供正壓通氣期間心肺相互作用的有效、即時、無創資訊。血流動力學檢測和前負荷評估和血管阻力相關，前者主要依賴於光電容積脈搏波信號分析得到的呼吸變異度數值，而後者用於檢測光電容積脈搏波的振幅、波形、衍生指數的變化。本文提出並描述脈搏血氧儀衍生的監測功能，提出一個更全面的監測概念，即監測機械通氣患者生命體征時充分利用脈搏血氧測量。如果這樣高級的功能應用於臨床，現在的監測技術將會得到改進。未來的發展和臨床評估需要先進的脈搏監測手段。

(傅丹雲　譯　陳傑　校)

Pulse oximetry is an undisputable standard of care in clinical monitoring. It combines a spectrometer to detect hypoxemia with a plethysmograph for the diagnosis, monitoring, and follow-up of cardiovascular diseases.

These pulse oximetry capabilities are extremely useful for assessing the respiratory and circulatory status and for monitoring of mechanically ventilated patients. On the one hand, the key spectrography-derived function of pulse oximetry is to evaluate a patient's gas exchange that results from a particular ventilatory treatment by continuously and noninvasively measuring arterial hemoglobin saturation (SpO2). This information helps to maintain patients above the hypoxemic levels, leading to appropriate ventilator settings and inspired oxygen fractions. However, whenever higher than normal oxygen fractions are used, SpO2 can mask existing oxygenation defects in ventilated patients. This limitation, resulting from the S shape of the oxyhemoglobin saturation curve, can be overcome by reducing the oxygen fraction delivered to the patient in a controlled and stepwise manner. This results in a SpO2/FIO2 diagram, which allows a rough characterization of a patient's gas exchange, shunt, and the amount of lung area with a low ventilation/perfusion ratio without the need of blood sampling. On the other hand, the photoplethysmography-derived oximeter function has barely been exploited for the purpose of monitoring hemodynamics in mechanically ventilated patients.

The analysis of the photoplethysmography contour provides useful real-time and noninvasive information about the interaction of heart and lungs during positive pressure ventilation. These hemodynamic monitoring capabilities are related to both the assessment of preload dependency-mainly by analyzing the breath-by-breath variation of the photoplethysmographic signals-and the analysis of arterial impedance, which examines the changes in the plethysmographic amplitude, contour, and derived

indexes. In this article, we present and describe these extended monitoring capabilities and propose a more holistic monitoring concept that takes advantage of these advanced uses of pulse oximetry in the monitoring of ventilated patients. Today's monitors need to be improved if such novel functionalities were to be offered for clinical use. Future developments and clinical evaluations are needed to establish the true potential of these advanced monitoring uses of pulse.

急性深度缺氧對健康人的影響：評估脈搏血氧飽和度或組織血氧飽和度性能相關測試的安全性

Effects of Acute, Profound Hypoxia on Healthy Humans: Implications for Safety of Tests Evaluating Pulse Oximetry or Tissue Oximetry Performance

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長時間的缺氧可導致機體產生酸中毒、炎症反應、能量衰竭、細胞應激甚至是細胞死亡。然而，短暫的深度缺氧（定義為血氧飽和度維持 50%~70%大約 10 分鐘）與心血管系統疾病無關，而且可為健康人所耐受，並不會引起明顯的疾病效應。相反，慢性缺氧會產生一系列適應和應激的改變，這會導致對缺氧狀態或疾病的耐受性增加，比如適應高原生活或者減輕慢性高山病的症狀。在健康人中，短暫深度缺氧會增加分鐘通氣量和心輸出量，但對血液中生化物質含量幾乎沒有影響。急性深度缺氧的中樞神經系統症狀包括基於額葉/大腦中心連接中斷引起的注意力改變，短暫認知功能水準下降。不同的是，假使短暫深度缺氧不會降低心輸出量以及造成缺血，那麼在健康人中就會耐受良好，且無酸中毒或長期認知功能損害的表現。

(方洪偉　譯　陳傑　校)

Extended periods of oxygen deprivation can produce acidosis, inflammation, energy failure, cell stress, or cell death. However, brief profound hypoxia (here defined as SaO2 50%-70% for approximately 10 minutes) is not associated with cardiovascular compromise and is tolerated by healthy humans without apparent ill effects. In contrast, chronic hypoxia induces a suite of adaptations and stresses that can result in either increased tolerance of hypoxia or disease, as in adaptation to altitude or in the syndrome of chronic mountain sickness. In healthy humans, brief profound hypoxia produces increased minute ventilation and increased cardiac output, but little or no alteration in blood chemistry. Central nervous system effects of acute profound hypoxia include transiently decreased cognitive performance, based on alterations in attention brought about by interruptions of frontal/central cerebral connectivity. However, provided there is no decrease in cardiac output or ischemia, brief profound hypoxemia in healthy humans is well tolerated without evidence of acidosis or lasting cognitive impairment.

先天性中樞性肺通氣不足綜合征（CCHS）患者的麻醉評估：一項系統性回顧分析

Anesthetic Considerations for Patients With Congenital Central Hypoventilation Syndrome: A Systematic Review of the Literature

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先天性中樞性肺通氣不足綜合征（CCHS）是一種睡眠呼吸障礙疾病，其特徵為儘管存在進行性加重的高碳酸血症和低氧血症，睡眠期間呼吸驅動仍然不足。這種症狀是由於等位的同源基因 2B（PHOX2B）突變引起的。本篇綜述目的為對 CCHS 當前研究的資料進行系統性搜索，涉及圍手術期的注意事項，並對其分類、流行病學、病理生理、臨床表現、遺傳學和治療進行討論。對 2015 年 10 月之前在 Medline，EMBASE，Cochrane 系統評價資料庫和 Cochrane 對照試驗中心登記系統的資料進行了系統性搜索。結果限於以英語發表的人體研究。對研究標題和摘要進行篩查以確定與麻醉管理相關的 CCHS 研究。所有研究設計包括隨機對照試驗、觀察性研究、病例個案或系列報導。共搜索出 165 篇文章，其中 45 篇與圍術期管理相關。有 15 個相關病例報告歸類為以下內容：（1）鎮靜/麻醉後疾病的新發症狀;（2）對確診的 CCHS 患者實施的麻醉技術;（3）發生麻醉併發症的 CCHS 患者。回顧病例報告顯示患者的年齡範圍從新生兒到 59 歲。接受小手術前行鎮靜或麻醉後的疾病新發症狀常用於診斷。未確診 CCHS 發生的後遺症可導致併發症如下：低氧血症、低血氧飽和度、呼吸暫停、癲癇、計畫外入 ICU、住院時間延長和長期氣管切開。確診 CCHS 患者術後併發症較少。麻醉醫師需要警覺未確診的遲發性 CCHS，並將這種情況納入不明原因術後呼吸抑制的鑒別診斷中。麻醉管理應最大程度地減少使用進一步對呼吸抑制的藥物和確保充分監測以及時發現患者術後呼吸暫停。
(高浩　譯　陳傑　校)
Congenital central hypoventilation syndrome (CCHS) is a form of sleep-disordered breathing characterized by a diminished drive to breathe during sleep, despite progressive hypercapnia and hypoxia. The condition results from mutations in the paired-like homeobox 2B (PHOX2B) gene. The aim of this review was to conduct a systematic search of the current data on CCHS as it relates to perioperative considerations and to discuss the classification, prevalence, pathophysiology, presentation, genetics, and management of the condition. A systematic search of Medline, EMBASE, Cochrane Database of Systematic Reviews, and the Cochrane Central Register of Controlled Trials was done up to October 2015. The results were limited to human studies published in the English language. Study titles and abstracts were screened to identify studies relating to CCHS relevant to anesthetic care. All study designs including randomized controlled trials, observational studies, case reports, or case series were included. The searches yielded 165 articles, of which 45 were relevant to perioperative considerations. There were 15 relevant case reports categorized as pertaining to the following: (1) novel presentations of the condition after sedation/anesthesia; (2) anesthetic techniques used in patients with established CCHS; and (3) patients with CCHS who experienced anesthetic complications. Review of the case reports showed that patients ranged from neonates up to 59 years of age. Novel presentations of the disease after sedation or anesthesia for minor procedures often led to diagnosis. The sequelae of undiagnosed CCHS led to complications, such as hypoxia, desaturations, apneas, seizures, unplanned intensive care admissions, prolonged hospital stays, and long-term tracheostomies. There appeared to be few postoperative complications in patients with known CCHS. Anesthesiologists need to be aware of undiagnosed late-onset CCHS and include this condition in the differential diagnosis of patients with unexplained postoperative respiratory depression. Anesthetic techniques should minimize the use of agents that further depress respiration postprocedure and ensure adequate monitoring to detect postoperative apneas.

腎臟缺血再灌注損傷過程中氧化應激的抑制

Inhibition of Oxidative Stress in Renal Ischemia-Reperfusion Injury

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背景：超氧化物、一氧化氮（NO）和過氧亞硝酸鹽是缺血再灌注（I/R）損傷發病機制中的重要介質。分別通過選擇性抑制超氧化物、NO 和過氧亞硝酸鹽，檢測別嘌呤醇（ALP）、黃嘌呤氧化酶抑制劑、N-硝基-L-精氨酸甲酯（L-NAME）和 5,10,15,20-四（N-甲基-4-吡啶基）卟啉鐵（III）（FeTMPyP）產生的腎臟保護作用。

方法：將雄性 Sprague-Dawley 大鼠隨機分為 5 組（每組 n = 6）。組 1 是假手術組。組 2 是腎 I/R 組（缺血 30min，隨後再灌注 24h）。在再灌注前 5min，組 3、4 和 5 中的大鼠分別接受 ALP，L-NAME 或 FeTMPyP 處理。評估血清肌酐（Cr）、血尿素氮（BUN）和腎組織丙二醛、超氧化物歧化酶、組織學變化、凋亡和單核細胞浸潤情況。此外在第二個獨立實驗中，將 ALP 和 L-NAME 的聯合處理與 FeTMPyP 處理進行比較。

結果：ALP、L-NAME 和 FeTMPyP 處理減少了由 I/R 損傷誘導的 Cr（對於三者，P = 0.0066）和 BUN（對於 ALP，P = 0.0066，對於 L-NAME，P = 0.013）增高並減少組織學損傷（P = 0.0066）。此外，ALP、L-NAME 和 FeTMPyP 處理通過減弱氧化應激反應的作用降低了丙二醛水準（P = 0.0066），減少腎小管細胞凋亡（P = 0.0066）並減少單核細胞浸潤（P = 0.0066）。與 FeTMPyP 處理相比，ALP 和 L-NAME 的聯合處理使 Cr 和 BUN 水準降低幅度更大（對於 Cr，P = 0.016;對於 BUN，P = 0.0079）。

結論：超氧化物、NO 和過氧亞硝酸鹽參與腎 I/R 損傷。通過減少過氧亞硝酸鹽形成，抑制過氧化物或 NO 生成或誘導過氧亞硝酸鹽分解，來減輕腎 I/R 損傷。

(邵甲雲　譯　陳傑　校)

BACKGROUND: Superoxide, nitric oxide (NO), and peroxynitrite are important mediators in the pathogenesis of ischemia-reperfusion(I/R) injury. We tested the renoprotective effects of allopurinol (ALP), a xanthine oxidase inhibitor, N-nitro-L-arginine methyl ester (L-NAME), and 5,10,15,20-tetrakis (N-methyl-4-pyridyl) porphyrinato iron (III) (FeTMPyP) by selective inhibition of superoxide, NO, and peroxynitrite, respectively.

METHODS: Male Sprague-Dawley rats were randomly assigned to 5 groups (n = 6 per group). Group 1 was a sham-operated group. Group 2 was the renal I/R group (30-minute ischemia followed by 24-hour reperfusion). Rats in groups 3, 4, and 5 received ALP, L-NAME, or FeTMPyP, respectively, at 5 minutes before the reperfusion. Serum creatinine (Cr), blood urea nitrogen (BUN), renal tissue malondialdehyde, superoxide dismutase, histological changes, apoptosis, and monocyte infiltration were evaluated. In addition, the combined treatment with ALP and L-NAME was compared with FeTMPyP in a second independent experiment.

RESULTS: The administration of ALP, L-NAME, and FeTMPyP diminished the increase in Cr (P = .0066 for all) and BUN (P = .0066 for ALP; and P = .013 for L-NAME) induced by I/R injury and decreased the histological damage (P = .0066 for all). In addition, ALP, L-NAME, and FeTMPyP attenuated the oxidative stress response as determined by a decrease in malondialdehyde level (P = .0066 for

all), apoptotic renal tubular cells (P = .0066 for all), and monocyte infiltration (P = .0066 for all). The combined treatment of ALP and L-NAME decreased Cr and BUN levels to a greater degree than FeTMPyP (P = .016 for Cr; P = .0079 for BUN). **CONCLUSIONS:** Superoxide, NO, and peroxynitrite are involved in renal I/R injury. The reduction of peroxynitrite formation, viainhibition of superoxide or NO, or the induction of peroxynitrite decomposition may be beneficial in renal I/R injury.

兒科雙側鼓膜切開術和置管術後肌肉注射芬太尼和酮咯酸可提供良好的疼痛控制：一項回顧性佇列研究

Intramuscular Fentanyl and Ketorolac Associated with Superior Pain Control After Pediatric Bilateral Myringotomy and Tube Placement Surgery: A Retrospective Cohort Study

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背景：雙側鼓膜切開術和壓力平衡管置入術（BMT）是兒童最常見的手術。對於 BMT 有多個麻醉方案，但何種方案能可靠地促進理想復蘇仍不清楚。本研究試圖評估不同麻醉方案，包括單藥（芬太尼或酮咯酸）或聯合用藥（芬太尼和酮咯酸）鎮痛治療，與主要預後指標---恢復室最高疼痛評分之間的關係。次要預後指標包括住院期間疼痛解救管理、復蘇時間和嘔吐發生率。
方法：對 3669 名，年齡在 6 個月至 7 歲之間，接受為期 16 個月的 BMT 手術術中注射芬太尼和/或酮咯酸的兒童進行主成分分析。常規麻醉管理包括術前口服咪達唑侖，通過面罩給予七氟醚和 N2O 或空氣混合氧氣進行全麻維持，並肌肉注射藥物行鎮痛。運用多變數分析研究鎮痛方案與以下預後之間的關係：恢復室最高 FLACC 評分（分為面部表情、腿部活動、體位、哭鬧及可安慰度方面）=0 或 7 到 10 分，羥考酮注射及出院時間。將人口統計變數、咪達唑侖暴露及機構位置（主要醫院 vs 日間手術中心）作為潛在混雜因素納入多變數分析。另外以相似納入標準對 2725 名兒童在隨後不重疊的 12 個月內術後嘔吐發生情況進行分析。芬太尼和酮咯酸劑量反應相關性作為選擇的預後變數進行評估。
結果：FLACC 最低 = 0，FLACC 最高為 7 到 10 分，羥考酮解救與聯合用藥還是酮咯酸單藥使用密切相關：優勢比為 4.98（95%可信區間[CI]，4.04-5.93），分別是 0.13（95%可信區間，0.10-0.16）和 0.11（98.3% CI，0.09-0.14），每項 P<0.01)。年齡、西班牙裔、咪達唑侖暴露和機構位置有輕微相關；性別或種族無相關。接受高劑量芬太尼（≥0.75 mg/kg）和酮咯酸(≥0.75 mg/kg)患者中的 90%沒有明顯疼痛、激動或痛苦。平均出院時間分別是 21±11min(酮咯酸組),26±16min(芬太尼組),和 24±14min（聯合用藥組)(P <.0001)。術後嘔吐發生率與酮咯酸(2.7%)還是聯合用藥(4.5%)(P =0.08)無差異。
結論：在這項兒科 BMT 相關的大樣本量、回顧性研究中，肌注芬太尼/酮咯酸聯合用藥與良好的恢復室鎮痛和減少羥考酮解救有關，而這並不明顯增加復蘇時間或嘔吐發生率。聯合 1.5-2 μg/kg 的芬太尼和 1 mg/kg 酮咯酸與理想的預後相關。聯合用藥對歐洲白種或非洲裔或拉美裔種族的兒童似乎同樣有效。
（李東星　譯　陳傑　校）

BACKGROUND: Bilateral myringotomy and pressure equalization tube insertion (BMT) is the most common surgery in children. Multiple anesthetic techniques for

BMT have been proposed, but that which reliably promotes ideal recovery remains unclear. We sought to assess associations between anesthetic regimens that included single-agent (fentanyl or ketorolac) or dual-agent (fentanyl and ketorolac) analgesic therapy and the primary outcome of maximal postanesthesia care unit (PACU) pain score. Secondary outcomes included in-hospital rescue analgesic administration, recovery time, and emesis incidence.
METHODS: Principal analysis was conducted on a retrospective cohort of 3669 children aged 6 months to <7 years who underwent BMT over a 16-month period and received intraoperative fentanyl and/or ketorolac. Routine anesthetic care included preoperative oral midazolam, general anesthesia via a mask maintained with sevoflurane and N2O or air in O2, and intramuscular analgesic administration. Multivariable analyses were performed examining relationships between analgesic regimen with the following outcomes: maximum PACU Face, Legs, Activity, Cry, and Consolability (FLACC) score = 0 or 7 to 10, oxycodone administration, and time to discharge readiness. Demographic variables, midazolam exposure, and location (main hospital vs ambulatory surgery center) were included in the multivariable analyses as potential confounders. Associations with postoperative vomiting were studied separately in 2725 children from a subsequent, nonoverlapping 12-month period using similar inclusion criteria. Fentanyl and ketorolac dose-response relationships were evaluated for selected outcome variables.
RESULTS: Maximum FLACC = 0, maximum FLACC score of 7 to 10, and oxycodone rescue were most strongly associated with dual-agent therapy versus single-agent ketorolac: odds ratios 4.89 (95% confidence interval [CI], 4.04-5.93), 0.13 (95% CI, 0.10-0.16), and 0.11 (98.3% CI, 0.09-0.14), respectively, $P < .001$ for each). Minor associations were found for age, Hispanic ethnicity, midazolam, and location, and none for sex or race. For subjects managed with higher dose fentanyl (≥1.5 μg/kg) and ketorolac (≥0.75 mg/kg), 90% had no demonstrable pain, agitation, or distress. Mean discharge readiness times were 21 ± 11 minutes (ketorolac), 26 ± 16 minutes (fentanyl), and 24 ± 14 minutes (dual) ($P < .0001$). Postoperative emesis incidences associated with ketorolac (2.7%) versus dual therapy (4.5%) were not different ($P = 0.08$).
CONCLUSIONS: In this large retrospective pediatric BMT study, combination intramuscular fentanyl/ketorolac was strongly associated with superior PACU analgesia and reduced need for oxycodone rescue without clinically significant increases in recovery time or emesis incidence. Combination fentanyl at 1.5 to 2 μg/kg and 1 mg/kg ketorolac was associated with optimal outcomes. Dual therapy appears similarly effective in children of either European Caucasian or African ancestry or of Hispanic ethnicity.

連續外周神經阻滯：證據更新以及與新型、替代性鎮痛模式的比較

Continuous Peripheral Nerve Blocks: An Update of the Published Evidence and Comparison With Novel, Alternative Analgesic Modalities

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Anesthesia & Analgesia: 2017 124 308–335

連續周圍神經阻滯（CPNB）由一個經皮插入的導管，其尖端接近目標神經/神經叢，通過尖端給予局部麻醉藥以提供長時的阻滯效果，也可通過藥物滴定而達到預期阻滯效果。在 1946 年進行首次發表之後的幾十年，大量連續周圍神經阻滯的相關文獻發佈，其中大部分是在 2011 年的“麻醉與鎮痛”雜誌中發表。一

項 CPNB 相關循證綜述作為近期更新在期間發表。新的阻滯部位包括內收肌管、胸肌間、腰方肌、齶、尺、深淺腓神經。值得注意的是新適應證包括提供外傷性肋骨/股骨骨折後、肩周炎手法治療後以及懷孕期間腹壁疼痛的鎮痛治療。最新出版的證據表明在超聲引導聯合神經刺激儀引導下的導管置入顯示其優勢，儘管可用來指導操作者關於超聲引導導管置入（例如最佳的針-神經定位）的新資料有限。根據先前自動化、重複注射較基礎速率注射更好的建議，在過去的幾年缺乏資料支援。現在越來越多的一次性輸注泵允許對基礎速率、負荷量、鎖定時間進行調整，可與電子可程式設計輸注泵相媲美，可以通過互聯網遠端操控泵，是一個有前途的研究領域。現在大型前瞻性的研究文章表明連續周圍神經阻滯期間主要併發症相對較少，雖然隨機對照研究證明實際的住院時間縮短很少。最近的證據表明，跟股神經連續阻滯相比，內收肌管連續阻滯引起的股四頭肌無力更少，提高了移動/活動能力。新公佈的資料表明，短時的術後 CPNB 可減少慢性、持續性術後疼痛的發病率和/或降低嚴重程度。一些新的跟周圍神經阻滯相關的併發症已確定，雖然大樣本量前瞻性試驗提供了關於不良事件發生率的資料。最後，正在開發和研究大量的替代鎮痛模式，對四項此類技術進行描述，並將其與周圍神經阻滯進行對比，包括用一種新的佐劑行單次周圍神經阻滯，布比卡因脂質體行傷口浸潤和周圍神經阻滯，冰凍與神經冰凍以及經皮周圍神經刺激。

（朱碧君　譯　陳傑　校）

A continuous peripheral nerve block (CPNB) consists of a percutaneously inserted catheter with its tip adjacent to a target nerve/plexus through which local anesthetic may be administered, providing a prolonged block that may be titrated to the desired effect. In the decades after its first report in 1946, a plethora of data relating to CPNB was published, much of which was examined in a 2011 Anesthesia & Analgesia article. The current update is an evidence-based review of the CPNB literature published in the interim. Novel insertion sites include the adductor canal, interpectoral, quadratus lumborum, lesser palatine, ulnar, superficial, and deep peroneal nerves. Noteworthy new indications include providing analgesia after traumatic rib/femur fracture, manipulation for adhesive capsulitis, and treating abdominal wall pain during pregnancy. The preponderance of recently published evidence suggests benefits nearly exclusively in favor of catheter insertion using ultrasound guidance compared with electrical stimulation, although little new data are available to help guide practitioners regarding the specifics of ultrasound-guided catheter insertion (eg, optimal needle-nerve orientation). After some previous suggestions that automated, repeated bolus doses could provide benefits over a basal infusion, there is a dearth of supporting datapublished in the past few years. An increasing number of disposable infusion pumps does now allow a similar ability to adjust basal rates, bolus volume, and lockout times compared with their electronic, programmable counterparts, and a promising area of research is communicating with and controlling pumps remotely via the Internet. Large, prospective studies now document the relatively few major complications during ambulatory CPNB, although randomized, controlled studies demonstrating an actual shortening of hospitalization duration are few. Recent evidencesuggests that, compared with femoral infusion, adductor canal catheters both induce less quadriceps femoris weakness and improve mobilization/ambulation, although the relative analgesia afforded by each remains in dispute. Newly published data demonstrate that the incidence and/or severity of chronic, persistent postsurgical pain may, at times, be decreased with a short-term postoperative CPNB. Few new CPNB-related

complications have been identified, although large, prospective trials provide additional data regarding the incidence of adverse events. Lastly, a number of novel, alternative analgesic modalities are under development/investigation. Four such techniques are described and contrasted with CPNB, including single-injection peripheral nerveblocks with newer adjuvants, liposome bupivacaine used in wound infiltration and peripheral nerveblocks, cryoanalgesia with cryoneurolysis, and percutaneous peripheral nerve stimulation.

先天性心臟病兒童紫紺和旋轉式血栓彈力計（ROTEM）之間的關係：一項回顧性佇列研究

The Association Between Cyanosis and Thromboelastometry (ROTEM) in Children With Congenital Heart Defects: A Retrospective Cohort Study

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Anesthesia&Analgesia: 2017 124 23–29

背景：先天性心臟病兒童的凝血功能與健康兒童有量與質的差別。繼發於紅細胞增多症和紅細胞變形性增加，紫紺可能是這類人群凝血改變的一個重要混雜因素，這對解釋經歷大手術的先天性心臟病兒童圍術期血栓形成有潛在意義。這項研究的主要目標是評估先心兒童紫紺與凝血功能（使用 ROTEM 監測）之間的關係。

方法：在這項回顧性佇列研究中，他們研究了 2014 年 4 月至 2015 年 4 月這 12 個月期間經歷過先心手術的兒童，其中圍術期使用抗血小板藥和抗凝藥的兒童排除在外，入選的兒童按照是否出現紫紺（依據氧合血紅蛋白，含量≤85%即定義為紫紺）分類。應用多變數線性回歸分析來決定紫紺和血栓彈力計結果（結局指標，纖維蛋白原/纖維蛋白原聚合物[FibTEM]最大凝血塊穩固性[MCF])調整潛在的混雜因素）之間的關係。

結果：分析佇列中的 320 個兒童共 345 個血栓彈力計曲線。22%(76/345)的兒童有紫紺型先心病。先心病紫紺兒童相對于非紫紺兒童凝血塊穩固性（使用 FibTEM 分析來測量）降低，中位數差異 (95% 可信區間) 中間期 [2 (0–3) mm; P = .01],凝血塊穩固性最大值 [2 (1–3) mm; P = .01]。調整混雜因素（血細胞比容、血小板計數和性別）之後，紫紺和纖維蛋白原/纖維蛋白原聚合物凝血塊穩固性之間的相關性不明顯(A10, P = .7; MCF, P = .7)。調整混雜因素後，紫紺和實際活化的凝血塊穩固性之間有明顯的相關性(A10, P = .03; MCF, P = .02)，但與其他的 TEM 結果無關。

結論：紫紺兒童凝血塊穩固性相對於非紫紺兒童降低，但是紫紺和凝血塊穩固性的相關性是由組間血細胞比容、血小板計數和性別之間的差異引起的。這個發現將有助於指導這類易發人群凝血病的識別和治療。

（王亞楠譯 薛張綱校）

BACKGROUND: Children with congenital heart defects (CHD) have quantitative and qualitative differences in coagulation compared with healthy children. Secondary to polycythemia andincreased deformability of red blood cells, cyanosis may be an important confounding factor foraltered whole-blood coagulation in this population with potential implications for interpretingintraoperative thromboelastometry (TEM) for children with CHD undergoing major surgery. Theprimary aim of the study was to evaluate the association between cyanosis in children with CHDand measures of

whole-blood coagulation determined using TEM (ROTEM [Tem International,GmbH, Munich, Germany]).
METHODS: In this retrospective cohort study, children who underwent congenital cardiac surgery in a 12-month period between April 2014 and 2015 were investigated. Children who werereceiving antiplatelet or anticoagulant medications in the preoperative period were excluded.Eligible children were categorized by the presence of cyanosis, defned as an oxyhemoglobinconcentration ≤85%. Multivariable linear regression analyses were used to determine the relationship between cyanosis and TEM outcomes (primary outcome, fibrinogen/fibrin polymerization [FibTEM] maximal clot firmness [MCF]) adjusting for potential confounding factors.
RESULTS: Three hundred forty-five TEM profiles from 320 children were included in the cohortfor analysis. Twenty-two percent (76/345) of children had cyanotic CHD. Clot firmness measured using the FibTEM assay was decreased in cyanotic children compared with noncyanotic children, median difference (95% confdence interval) interim [2 (0–3) mm; P = .01], and maximal [2 (1–3) mm; P = .01] clot frmness. The association between cyanosis and fibrinogen/fibrin polymerization clot frmness was not signifcant (A10, P = .7; MCF, P = .7) after adjusting for confounding factors (hematocrit, platelet count, and sex). There was a signifcant association between cyanosis and intrinsically activated clot firmness (A10, P = .03; MCF, P = .02), but not other TEM outcomes, after adjusting for confounding factors.
CONCLUSIONS: Cyanotic children had decreased clot firmness in the fibrinogen/fibrin polymerization component of the clot compared with noncyanotic children, but the association between cyanosis and clot frmness was accounted for by differences in hematocrit, platelet count, and sex between groups. These fndings will help guide the identifcation and treatment of coagulopathy in this vulnerable population.

心臟毒性的止吐藥胃複安和多潘立酮阻滯心臟鈉離子的電壓門控通道
Cardiotoxic Antiemetics Metoclopramide and Domperidone Block Cardiac Voltage-Gated Na+ Channels

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Anesthesia & Analgesia:2017 124 52–60

背景：胃複安和多潘立酮分別作為促進胃動力和止吐的藥物常常被用於臨床實踐。儘管多潘立酮的副作用更小而作為一線藥物，但使用兩種藥物對心臟的副作用已有報導。心臟鈉離子通道通常是心臟治療毒性作用的靶點。因此，這項研究的目的是為了觀察胃複安和多潘立酮對心臟毒性作用的差異是否與阻滯鈉離子通道相關。
方法：通過採用整體細胞膜片鉗記錄技術來觀察胃複安和多潘立酮對人體腎臟胚胎 293 細胞上 Nav1.5α 亞單位以及新生小鼠心肌細胞鈉電流的影響。
結果：與胃複安(IC50 458 ± 28 μM; 95% CI, 403-513)相比，多潘立酮(IC50 85 ± 25 μM; 95%置信區間[CI], 36-134) 對 Nav1.5 通道的阻滯作用更強。這兩種藥物在 10-1HZ 誘發使用依賴的阻滯，穩定快慢失活，並且從失活狀態恢復過來是有延遲的。然而，與多潘立酮比較，胃複安引起相當小的影響。兩種藥物均會對小鼠心肌細胞鈉電流產生較強和使用依賴的阻滯，並且在這個系統中，多潘立酮(IC50 312 ± 15 μM; 95% CI, 22-602)和胃複安(IC50 250 ± 30 μM; 95% CI, 191-309)誘發相似程度的較強阻滯。

總結：我們的資料表明與臨床相關的多潘立酮和胃複安的心臟毒性是一種較強的類似於局麻藥抑制心臟鈉通道（包含 Nav1.）的作用。這些資料提示 Nav1.5 可能是一種迄今為止對於一些心血管副作用未被認識的分子機制，例如，由促進胃動力和止吐藥物引起的惡性心律失常。
（羅塏梃譯 薛張綱校）

Background：Metoclopramide and domperidone are prokinetic and antiemetic substances often used in clinical practice. Although domperidone has a more favorable side effect profile and is considered the first-line agent, severe cardiac side effects were reported during the administration of both substances. Cardiac Na channels are common targets of therapeutics inducing cardiotoxicity. Therefore, the aim of this study was to investigate whether the differential cardiotoxicities of metoclopramide and domperidone correlate with the block of Na channels.
METHODS: Effects of metoclopramide and domperidone on the human α-subunit Nav1.5 expressed in human embryonic kidney 293 cells and on Na currents in neonatal rat cardiomyocytes were investigated by means of whole-cell patch clamp recordings
RESULTS: Tonic block of resting Nav1.5 channels was more potent for domperidone (IC50 85 ± 25 μM; 95% confidence interval [CI], 36-134) compared with metoclopramide (IC50 458 ± 28 μM; 95% CI, 403-513). Both agents induced use-dependent block at 10 and 1 Hz, stabilized fast and slow inactivation, and delayed recovery from inactivation. However, metoclopramide induced considerably smaller effects compared with domperidone. Na currents in rat cardiomyocytes displayed tonic and use-dependent block by both substances, and in this system, domperidone (IC50 312 ± 15 μM; 95% CI, 22-602) and metoclopramide (IC50 250 ± 30 μM; 95% CI, 191-309) induced a similar degree of tonic block.
CONCLUSIONS: Our data demonstrate that the clinically relevant cardiotoxicity of domperidone and metoclopramide corresponds to a rather potent and local anesthetic-like inhibition of cardiac Na channels including Nav1.5. These data suggest that Nav1.5 might be a hitherto unrecognized molecular mechanism of some cardiovascular side effects, for example, malignant arrhythmias of prokinetic and antiemetic agents.

組織血氧测量法和臨床預後

Tissue Oximetry and Clinical Outcomes

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Anesthesia & Analgesia:2017 124 72–82

目前為止已經發明了很多不同的技術來測量組織氧飽和度，其目的是用來識別組織缺氧和指導治療來避免患者受傷害。在一些特殊的病例中，比如在急性腦缺血期間，組織血氧測量法可能不能清楚地預示組織氧合下降。然而一個器官（如腦或肌肉）中，組織血氧飽和度降低與整體預後，如死亡率，ICU 滯留時間長短，遠隔器官功能障礙之間的因果關係仍值得推測。在這篇綜述中，我們描述了從組織血氧測量法來預測臨床預後當前的一些證據並同時意識到了一些需要解決的問題，比如如何闡明組織氧合和預後之間聯繫。我們主要關注的是用近紅外光譜來評估組織如腦和肌肉深部的動脈和靜脈血氧飽和度的靜脈加權混合的擴展應用。我們的分析發現在一些領域還需要投入更多的工作：建立組織氧飽和度降低的閾值預測-特定器官的相關損傷，定義改善組織氧合干預措施

的類型，確定這些干預措施對臨床預後的效果。此外，應該做一些設計良好的前瞻性研究，這些研究能檢測出一個假設即監測一個器官的氧合狀態能預測其他器官預後。最後，我們提倡更多工作應該去確定組織氧合的一些區域變化並且改善技術對重要器官氧合的測量甚至成像。這些研究將有助於確立組織氧合的監測和成像並將成為高危患者重症監護的常規，因為這些監測會提供輸出，這些輸出能指導改善臨床預後的治療。

（鄒麗雲譯 薛張綱校）

A number of different technologies have been developed to measure tissue oxygenation, with the goal of identifying tissue hypoxia and guiding therapy to prevent patient harm. In specific cases, tissue oximetry may provide clear indications of decreases in tissue oxygenation such as that occurring during acute brain ischemia. However, the causation between tissue hemoglobin-oxygen desaturation in one organ (eg, brain or muscle) and global outcomes such as mortality, intensive care unit length of stay, and remote organ dysfunction remains more speculative. In this review, we describe the current state of evidence for predicting clinical outcomes from tissue oximetry and identify several issues that need to be addressed to clarify the link between tissue oxygenation and outcomes. We focus primarily on the expanding use of near-infrared spectroscopy to assess a venous-weighted mixture of venous and arterial hemoglobin-oxygen saturation deep in tissues such as brain and muscle. Our analysis finds that more work is needed in several areas: establishing threshold prediction values for tissue desaturation–related injury in specific organs, defining the types of interventions required to correct changes in tissue oxygenation, and defining the effect of interventions on outcomes. Furthermore, well-designed prospective studies that test the hypothesis that monitoring oxygenation status in one organ predicts outcomes related to other organs need to be done. Finally, we call for more work that defines regional variations in tissue oxygenation and improves technology for measuring and even imaging oxygenation status in critical organs. Such studies will contribute to establishing that monitoring and imaging of tissue oxygenation will become routine in the care of high-risk patients because the monitors will provide outputs that direct therapy to improve clinical outcomes.

比較用 **exspiron** 無創呼吸量監測和二氧化碳監測儀測量有自主呼吸志願者的呼吸狀態變化的研究

A Comparison of Measurements of Change in Respiratory Status in Spontaneously Breathing Volunteers by the ExSpiron Noninvasive Respiratory Volume Monitor Versus the CapnostreamCapnometer

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背景：當前呼吸監測技術，如脈搏血氧儀和二氧化碳監測儀都能有效的識別插管的患者呼吸道危害的早期信號。當被適當地使用時，脈搏血氧儀將警告監護者血氧不足的危險。然而,去飽和作用落後於肺換氣不足和由於報警錯誤引起的報警疲勞會造成額外的問題。二氧化碳監測儀，用來測量呼末二氧化碳(Etco2)和呼吸頻率(RR)，沒有被普遍用於插管病人原因有多個,其中包括無法可靠地將 Etco2 與即將發生的呼吸道危害水準相聯繫和缺乏病人的順應性。與呼吸道危害相關的嚴重併發症繼續在麻醉學 2015 非正式主張報告中被證明。麻醉病人安全基金會已經強調了需要改進監測模式，以便“沒有病人會因阿片類誘導的呼吸道

損害而受到傷害。“最近，食品和藥品管理局批准了無創呼吸容量監測(RVM)可以連續、準確地監測實際通氣指標:潮氣量、RR 和分鐘通氣量(MV)。我們設計了本研究以比較二氧化碳監測儀與 RVM 檢測呼吸指標變化的性能。
方法：48 名受試志願者完成了研究。RVM 測量（MV 和 RR）和二氧化碳監測技術(Etco2 和 RR)同時被收集，均使用 2 種抽樣方法（鼻插管和喉舌通氣管內置 Etco2 感測器）。對於每個抽樣法，每個研究執行 6 次呼吸試驗在三種不同的呼吸頻率下，慢(5 次/分鐘)，正常的(12.6±0.6 次/分鐘)，和快速[25 次/分鐘])。所有資料提出了均值±SEM，除非另有指示。
結果：在規定的呼吸頻率的過渡下，在 37.7±1.4 秒時 RVM 達到了一個新的 MV 的穩態值而 ETCO2 變化明顯變慢，在 2.5-minute 閾值前經常無法達到一個新的漸近線。在平穩的呼吸下 RMV 和二氧化碳監測儀測量的 RRs 顯著相關（R= 0.98±0.01，偏差=二氧化碳監測儀基礎 RR–RVM 基礎 RR = 0.21±1.24 [SD] /分鐘）。正如預期的那樣，MV 變化與 Etco2 的變化密切相關。然而，在規定的 RR 轉換後的 MV 的大變化導致的 Etco2 變化相對較小（儀器靈敏度 =ΔETCO2 /ΔMV =−0.71±0.11 和−0.55±0.11mmHg/L/分鐘,分別在鼻插管和氣管內取樣）。鼻插管 ETCO2 測量平均為 4 mmHg 低於氣管內測量。
結論：用 RVM 測量 MV 比二氧化碳監測儀更快速和更大程度的反映插管患者的呼吸道變化。早期監測就可以早期干預以便於減少由於呼吸抑制引起的併發症及其嚴重程度。
（童頡譯 薛張綱校）
BACKGROUND: Current respiratory monitoring technologies such as pulse oximetry and capnography have been insufcient to identify early signs of respiratory compromise in nonintubated patients. Pulse oximetry, when used appropriately, will alert the caregiver to an episode of dangerous hypoxemia. However, desaturation lags signicantly behind hypoventilation and alarm fatigue due to false alarms poses an additional problem. Capnography, which measures end-tidal CO2 (Etco2) and respiratory rate (RR), has not been universally used for nonintubated patients for multiple reasons, including the inability to reliably relate Etco2 to the level of respiratory and lack of patient compliance. Serious complications related to respiratory compromise continue to occur as evidenced by the Anesthesiology 2015 Closed Claims Report. The Anesthesia Patient Safety Foundation has stressed the need to improve monitoring modalities so that “no patient will be harmed by opioid-induced respiratory depression.” A recently available, Food and Drug Administration–approved noninvasive respiratory volume monitor (RVM) can continuously and accurately monitor actual ventilation metrics: tidal volume, RR, and minute ventilation (MV). We designed this study to compare the capabilities of capnography versus the RVM to detect changes in respiratory metrics.
METHODS: Forty-eight volunteer subjects completed the study. RVM measurements (MV and RR) were collected simultaneously with capnography (Etco2 and RR) using 2 sampling methods (nasal scoop cannula and snorkel mouthpiece with in-line Etco2 sensor). For each sampling method, each subject performed 6 breathing trials at 3 different prescribed RR slow [5 min−1], normal [12.6 ± 0.6 min−1], and fast [25 min−1]). All data are presented as mean ± SEM unless otherwise indicated.
RESULTS: Following transitions in prescribed RRs, the RVM reached a new steady state value of MV in 37.7 ± 1.4 seconds while Etco2 changes were notably slower, often failing to reach a new asymptote before a 2.5-minute threshold. RRs as measured by RVM and capnography during steady breathing were strongly correlated

(R = 0.98 ± 0.01, bias = Capnograph-based RR – RVM-based RR = 0.21 ± 1.24 [SD] min−1). As expected, changes in MV were negatively correlated with changes in Etco2. However, large changes in MV following transitions in prescribed RR resulted in relatively small changes in Etco2 (instrument sensitivity = ΔEtco2/ΔMV = −0.71 ± 0.11 and −0.55 ± 0.11 mm Hg per 1 L/min for nasal and in-line sampling, respectively). Nasal cannula Etco2 measurements were on average 4 mm Hg lower than in-line measurements.
CONCLUSIONS: RVM measurements of MV change more rapidly and by a greater degree than capnography in response to respiratory changes in nonintubated patients. Earlier detection could enable earlier intervention that could potentially reduce frequency and severity of complications due to respiratory depression.

七氟醚減弱長期大鼠急性肺損傷模型氧合障礙

Sevoflurane Abolishes Oxygenation Impairment in a Long-Term Rat Model of Acute Lung Injury

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背景：急性肺損傷（ALI）病人通常需要機械通氣，故而需要鎮靜。對於這種病人，首選靜脈途徑給藥。然而，越來越多的證據表明吸入麻醉藥（比如七氟醚）是也不錯的選擇。在這項研究中，我們在動物 ALI 模型中評估了分別使用七氟醚和異丙酚長時間鎮靜（24 小時）的肺部和全身效應。
方法：在成年雄性 Wistar 大鼠支氣管內使用脂多糖（LPS）造成急性肺損傷模型，機械通氣並使用七氟醚或異丙酚鎮靜不同時長，最多至 24 小時。監測生命體征並進行動脈血氣分析。通過分析支氣管肺泡灌洗液（BALF）、血和肺組織及炎症細胞中的細胞活素（單核細胞趨化蛋白 1 [MCP-1]、細胞因數誘導的中性粒細胞趨化蛋白 1[CINC-1]、白介素[IL-6]、IL-12/12a、轉化生長因數 β 和白介素 10）來評價炎症反應。通過濕幹比、BALF 中的白蛋白和總蛋白含量間接評估肺泡毛細血管屏障。
結果：9 小時通氣和鎮靜後，LPS/七氟醚 (LPS-S)組氧合指數較 LPS/ (LPS-P)異丙酚組高，24 小時後達到了分別達到了 400 ± 67、262 ± 57 mm Hg(P < .001)。七氟醚組動物 BALF 中細胞數在 18 小時(P = .001)和 24 小時(P < .001)都較丙泊酚組少。BALF 中 CINC-1 和 IL-6 在 LPS-S 較 LPS-P 低(CINC-1: 2.7 ± 0.7 vs 4.0 ± 0.9 ng/mL; IL-6: 9.2 ± 2.3 vs 18.9 ± 7.1 pg/mL, both P < .001)，而 IL-10 和 MCP-1 在兩張中並沒有差別。同時，LPS-P 組 CINC-1、IL-6、IL-12a、IL-10 的 mRNA 都明顯高於 LPS-S 組。MCP-1 和轉化生長因數 β 在兩組沒有區別。LPS-S 組濕幹比較低(5.4 ± 0.2 vs 5.7 ± 0.2, P = .016)。兩組 BALF 中的總蛋白含量沒有差別。
結論：在 LPS 誘導的 ALI 模型中，使用七氟醚長時間鎮靜較異丙酚改善了氧合，並減弱了炎症反應。我們的研究表明，對於急性肺損傷的病人，使用七氟醚鎮靜或許可以改善肺功能。
（方婕譯 薛張綱校）

BACKGROUND: Patients experiencing acute lung injury (ALI) often need mechanical ventilation for which sedation may be required. In such patients, usually the first choice an intravenously administered drug. However, growing evidence suggests that volatile anesthetics such as sevoflurane are a valuable alternative. In this

study, we evaluate pulmonary and systemic effects of long-term (24-hour) sedation with sevoflurane compared with propofol in an in vivo animal model of ALI.
METHODS: Adult male Wistar rats were subjected to ALI by intratracheal lipopolysaccharide (LPS) application, mechanically ventilated and sedated for varying intervals up to 24 hours with either sevoflurane or propofol. Vital parameters were monitored, and arterial blood gases were analyzed. Inflammation was assessed by the analysis of bronchoalveolar lavage fluid (BALF), cytokines (monocyte chemoattractant protein-1 [MCP-1], cytokine-induced neutrophil chemoattractant protein-1 [CINC-1], interleukin [IL-6], IL-12/12a, transforming growth factor-β, and IL-10) in blood and lung tissue and inflammatory cells. The alveolocapillary barrier was indirectly assessed by wet-to-dry ratio, albumin, and total protein content in BALF. Results are presented as mean ± standard deviation.
RESULTS: After 9 hours of ventilation and sedation, oxygenation index was higher in the LPS/sevoflurane (LPS-S) than in the LPS/propofol group (LPS-P) and reached 400 ± 67 versus 262 ± 57 mm Hg after 24 hours ($P < .001$). Cell count in BALF in sevoflurane-treated animals was lower after 18 hours ($P = .001$) and 24 hours ($P < .001$) than in propofol controls. Peak values of CINC-1 and IL-6 in BALF were lower in LPS-S versus LPS-P animals (CINC-1: 2.7 ± 0.7 vs 4.0 ± 0.9 ng/mL; IL-6: 9.2 ± 2.3 vs 18.9 ± 7.1 pg/mL, both $P < .001$), whereas IL-10 and MCP-1 did not differ. Also messenger RNAs of CINC-1, IL-6, IL-12a, and IL-10 were significantly higher in LPS-P compared with LPS-S. MCP-1 and transforming growth factor-β showed no differences. Wet-to-dry ratio was lower in LPS-S (5.4 ± 0.2 vs 5.7 ± 0.2, $P = .016$). Total protein in BALF did not differ between P-LPS and S-LPS groups.
CONCLUSIONS: Long-term sedation with sevoflurane compared with propofol improves oxygenation and attenuates the inflammatory response in LPS-induced ALI. Our findings suggest that sevoflurane may improve lung function when used for sedation in patients with ALI.

大部分婦科手術後預防手術部位感染的共識

Consensus Bundle on Prevention of Surgical Site Infections After Major Gynecologic Surgery

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在美國，手術部位感染是最常見的併發症。在生育年齡女性中的手術類型裡，子宮切除術是僅次於剖腹產術的最多見的術式之一。因此，對於接受婦科手術的女性患者預防手術部位感染的是患者安全包的理想主題。該安全包的主要目的是為了提供可在任何手術環境中實施的建議，來努力減少手術部位感染的發生率。這個安全包由婦女保健中的患者安全委員會所召集的多學科小組發展的。該安全包分為四個方面：準備，識別和預防，反應，報告和系統學習。除了對操作的建議外，每個方面都強調外科團隊中所有成員之間的溝通和團隊合作。儘管安全包內的組成部分被設計為適於在各種臨床環境中工作，但我們還是要鼓勵各體系內的標準化操作。
（李桂婷譯 薛張綱校）
Surgical site infections are the most common complications of surgery in the United States. Of surgeries in women of reproductive age, hysterectomy is one of the most frequently performed, second only to cesarean birth. Therefore, prevention of surgical

site infections in women undergoing gynecologic surgery is an ideal topic for a patient safety bundle. The primary purpose of this safety bundle is to provide recommendations that can be implemented into any surgical environment in an effort to reduce the incidence of surgical site infection. This bundle was developed by a multidisciplinary team convened by the Council on Patient Safety in Women's Health Care. The bundle is organized into four domains: Readiness, Recognition and Prevention, Response, and Reporting and Systems Learning. In addition to recommendations for practice, each of the domains stresses communication and teamwork between all members of the surgical team. Although the bundle components are designed to be adaptable to work in a variety of clinical settings, standardization within institutions is encouraged.

寨卡病毒和患者血液管理

Zika Virus and Patient Blood Management

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偶發性寨卡病毒只發生在非洲和亞洲，直到 2007 年在密克羅尼西亞（大洋洲）爆發。在 2013 至 2014 年間，幾個外太平洋島嶼報導了局部性爆發。不久之後，該病毒傳入巴西，可能來自於法屬波利尼西亞和其他參賽國家的運動員。通過蚊子叮咬傳播，在免疫力低下的人群中傳播。同樣作為一種黃病毒，寨卡病毒由在美國中南部的伊蚊傳播，它也是西尼祿病毒、登革熱、基孔肯雅熱病毒的傳播媒介。在不到一年的時間裡，巴西的醫生報導，患小頭症的新生兒數量增加了許多倍。儘管最初懷疑寨卡病毒流行與出生缺陷之間的因果關係，但是大量的基礎和臨床研究證據證實了這種關係。在美國，到 2016 年中期，疾病控制和預防中心收到了超過 4000 例旅遊相關感染。此外，在波多黎各和佛羅里達發生了許多地方蚊子傳播的感染。考慮到病毒引起的病毒血症中，80%的感染者都沒有症狀，如果單獨採用捐獻者篩選而沒有測試，則無症狀血液捐獻者引起的輸血傳播可能性高。在巴西，已經有 2 例血小板輸注感染。儘管有研究性核酸實驗測試捐贈者，但並非所有的血液中心最初都被要求參加。隨後，美國食品和藥物管理局在 2016 年 8 月發佈了一項指南，建議對捐獻者的寨卡病毒進行常規的核酸檢測。在本報告中，我們總結了寨卡病毒在懷孕期間的潛在破壞性影響及對成人格林巴厘綜合征的影響。此外，我們督促臨床醫生和輸血醫學專家實施圍術期患者血液管理策略，以避免血液成分輸注出現新的病原體風險，這裡是指寨卡病毒。最終，正如世界衛生組織所說的，目前全球的威脅是，未來不可避免的面臨著其他血源性病原體的爆發，圍術期患者血液管理的原則和實踐，不僅為我們的患者減少已知的輸血相關風險，而且減少未知的輸血相關風險。

（李倩倩譯 薛張綱校）

Sporadic Zika virus infections had only occurred in Africa and Asia until an outbreak inMicronesia (Oceania) in 2007. In 2013 to 2014, several outer Pacific Islands reported local outbreaks. Soon thereafter, the virus was likely introduced in Brazil from competing athletes from French Polynesia and other countries that participated in a competition there. Transmission is thought to have occurred through mosquito bites and spread to the immunologically naive population. Being also a flavivirus, the Zika virus is transmitted by the Aedes mosquito that is endemic in South and Central America that is also the vector of West Nile virus, dengue, and chikungunya. In less

than a year, physicians in Brazil reported a many-fold increase in the number of babies born with microcephaly. Despite initial skepticism regarding the causal association of the Zika virus epidemic and birth defects, extensive basic and clinical research evidence has now confirmed this relationship. In the United States, more than 4000 travel-associated infections have been reported by the middle of 2016 to the Centers for Disease Control and Prevention. Furthermore, many local mosquito-borne infections have occurred in Puerto Rico and Florida. Considering that the virus causes a viremia in which 80% of infected individuals have no symptoms, the potential for transfusion transmission from an asymptomatic blood donor is high if utilizing donor screening alone without testing. Platelet units have been shown to infect 2 patients via transfusion in Brazil. Although there was an investigational nucleic acid test available for testing donors, not all blood centers were initially required to participate. Subsequently, the US Food and Drug Administration issued a guidance in August 2016 that recommended universal nucleic acid testing for the Zika virus on blooddonors.In this report, we review the potentially devastating effects of Zika virus infection during pregnancy and its implication in cases of Guillain-Barre syndrome in adults. Furthermore, we urge hospital-based clinicians and transfusion medicine specialists to implement perisurgical patient blood management strategies to avoid blood component transfusions with their potential risks of emerging pathogens, illustrated here by the Zika virus. Ultimately, this current global threat, as described by the World Health Organization, will inevitably be followed by future outbreaks of other bloodborne pathogens; the principles and practices of perioperative patient bloodmanagement will reduce the risks from not only known, but also unknown risks of blood transfusion for our patients.

慢性坐骨神經病變和同時存在的慢性機械性異常疼痛能減少大鼠的自發性轉輪運動

Chronic Sciatic Neuropathy in Rat Reduces Voluntary Wheel-Running Activity WithConcurrent Chronic Mechanical Allodynia

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背景：多種操作產生的周圍神經病的動物模型用於評估是否存在病理性疼痛狀態，例如異常性疼痛。儘管刺激誘發的行為測定被頻繁使用並且對於檢查異常性疼痛（即對輕度機械觸摸的敏感性; von Frey 纖維測試）是很重要的，但是反映總體功能的其他測量不僅是對刺激誘導反應性測量的補充，也是對疼痛模型如何影響生活品質獲得完全理解的關鍵，這是疼痛一般功能相關的臨床方面。在炎症和肌肉疼痛的齧齒動物模型中，自發性轉輪運動超越了刺激性誘導的行為測定，成為一般功能的可靠指數。臨床上，有關疼痛強度增加的報導發生在夜晚，這段時期通常是晝夜迴圈中活動減少的時間段。因此，在廣泛使用的慢性外周神經性疼痛即坐骨神經慢性壓迫性損傷（CCI）的齧齒動物模型中，我們檢測大鼠在非活動期期間轉輪運動的改變是否比其在晝夜週期的活動期更強。

方法：在成年雄性 SD 大鼠中，在使用易於進行的轉輪（1 小時/天，連續 7 天）來測量基礎活動水準之前採用 von Frey 試驗評估輕度機械觸摸的基礎（BL）後爪閾值反應來量化行進距離。轉輪活動 BL 值表示為總行進距離

（m）。整體實驗設計是在 BL 測量之後，大鼠經歷假手術或 CCI 手術，然後在術後長達 18 天內重複進行評估後爪閾值和轉輪活動水準。具體來說，在晝夜週期的最初階段（在前 2 小時內），大鼠在（1）無活性組（n = 8 /組）或（2）活性組（n = 8 /組）中分別進行轉輪水準的評估（每次實驗總時間 1 小時）。另一組 CCI 處理的大鼠（n = 8 /組）暴露於鎖定的轉輪，以控制轉輪運動對異常性疼痛的潛在影響。1 小時的轉輪期將以 20 分鐘為間隔進一步檢查，以確定 1 小時試驗的開始，中間和最後部分活動模式可能存在的差異。通過測量轉輪運動中 BL 到行進距離的變化來評估神經病變對活動水準的影響。

結果：雖然在晝夜週期中，檢測非活動期組和活動期組大鼠轉輪距離的 BL 值沒有不同，但是與非活動期的假手術對照相比，坐骨神經 CCI 減少了轉輪活動水準。此外，與假手術對照相比，在具有自由輪和鎖定輪配置的大鼠中，在手術誘導神經病變後的所有時間點都觀察到雙側低閾值機械性異常疼痛。與假手術相比，在晝夜週期的活動期期間檢測到轉輪活動的大鼠，其 CCI 中的異常性疼痛加倍。相反，當在晝夜週期的活動期檢測活性水準時，在任何時間點，CCI 處理的大鼠與假手術對照相比沒有觀察到轉輪運動水準的顯著降低。最後，在晝夜週期的非活動期，1 小時試驗期內的轉輪運動模式在每個 20 分鐘階段都相對一致。

結論：與非神經性假性對照相比，在晝夜迴圈的非活動期期間，在 CCI 大鼠中觀察到轉輪運動有顯著且穩定的減少。無論何時檢測轉輪運動或者它們是否在轉輪，所有大鼠中都持續存在強烈的異常性疼痛，這表明急性轉輪運動不改變使用 von Frey 纖維測試所測量的慢性低強度機械性異常性疼痛。總的來說，這些資料證明，有限重複暴露的急性轉輪運動本身不會改變異常性疼痛，並提供與測量刺激誘導的神經性疼痛互補的行為測定。

（張楠譯 薛張綱校）

BACKGROUND: Animal models of peripheral neuropathy produced by a number of manipulations are assessed for the presence of pathologic pain states such as allodynia. Although stimulus-induced behavioral assays are frequently used and important to examine allodynia (ie, sensitivity to light mechanical touch; von Frey fiber test), other measures of behavior that reflect overall function are not only complementary to stimulus-induced responsive measures, but are also critical to gain a complete understanding of the effects of the pain model on quality of life, a clinically relevant aspect of pain on general function. Voluntary wheel-running activity in rodent models of inflammatory and muscle pain is emerging as a reliable index of general function that extends beyond stimulus-induced behavioral assays. Clinically, reports of increased pain intensity occur at night, a period typically characterized with reduced activity during the diurnal cycle. We therefore examined in rats whether alterations in wheel-running activity were more robust during the inactive phase compared with the active phase of their diurnal cycle in a widely used rodent model of chronic peripheral neuropathic pain, the sciatic nerve chronic constriction injury (CCI) model.

METHODS: In adult male Sprague Dawley rats, baseline (BL) hindpaw threshold responses to light mechanical touch were assessed using the von Frey test before measuring BL activity levels using freely accessible running wheels (1 hour/day for 7 sequential days) to quantify the distance traveled. Running wheel activity BL values are expressed as total distance traveled (m). The overall experimental design was after BL measures, rats underwent either sham or CCI surgery followed by repeated behavioral reassessment of hindpaw thresholds and wheel-running activity levels for

up to 18 days after surgery. Specifically, separate groups of rats were assessed for wheel-running activity levels (1 hour total/trial) during the onset (within first 2 hours) of either the (1) inactive (n = 8/group) or (2) active (n = 8/group) phase of the diurnal cycle. An additional group of CCI-treated rats (n = 8/group) was exposed to a locked running wheel to control for the potential effects of wheel-running exercise on allodynia. The 1-hour running wheel trial period was further examined at discrete 20-minute intervals to identify possible pattern differences in activity during the first, middle, and last portions of the 1-hour trial. The effect of neuropathy on activity levels was assessed by measuring the change from their respective BLs to distance traveled in the running wheels.
RESULTS: Although wheel-running distances between groups were not different at BL from rats examined during either the inactive phase of the diurnal cycle or active phase of the diurnal cycle, sciatic nerve CCI reduced running wheel activity levels compared with sham-operated controls during the inactive phase. In addition, compared with sham controls, bilateral low-threshold mechanical allodynia was observed at all time points after surgical induction of neuropathy in rats with free-wheel and locked-wheel access. Allodynia in CCI compared with shams was replicated in rats whose running wheel activity was examined during the active phase of the diurnal cycle. Conversely, no significant reduction in wheel-running activity was observed in CCI-treated rats compared with sham controls at any time point when activity levels were examined during the active diurnal phase. Finally, running wheel activity patterns within the 1-hour trial period during the inactive phase of the diurnal cycle were relatively consistent throughout each 20-minute phase.
CONCLUSIONS: Compared with nonneuropathic sham controls, a profound and stable reduction of running wheel activity was observed in CCI rats during the inactive phase of the diurnal cycle. A concurrent robust allodynia persisted in all rats regardless of when wheel-running activity was examined or whether they ran on wheels, suggesting that acute wheel-running activity does not alter chronic low-intensity mechanical allodynia as measured using the von Frey fiber test. Overall, these data support that acute wheel-running exercise with limited repeated exposures does not itself alter allodynia and offers a behavioral assay complementary to stimulus-induced measures of neuropathic pain.

術前糖化血紅蛋白(HbA1c)和術後血糖變異性在心臟單瓣膜手術中與手術後 30 天主要不良事件之間的關係

The Association Between Preoperative Hemoglobin A1C and Postoperative Glycemic Variability on 30-Day Major Adverse Outcomes Following Isolated Cardiac Valvular Surgery

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Anesthesia & Analgesia:2017 124 16–22

背景：術前糖化血紅蛋白(HbA1c)和術後血糖變異性對實施血糖控制的冠狀動脈旁路移植手術後主要不良事件(MAEs)有預測價值。但是，術前糖化血紅蛋白(HbA1c)和術後血糖變異性對心臟單瓣膜手術的影響還不明確。在本研究中，我們擬在心臟單瓣膜手術中明確（a）術前糖化血紅蛋白 (HbA1c)能鑒別主要不良事件(MAEs)高危患者和（b）術後血糖變異性與主要不良事件(MAEs)相關。

方法：經倫理批准，本前瞻性、單中心、觀察性佇列研究選取 2008 年 1 月至 2013 年 12 月行單瓣膜手術的年齡大於 18 歲的患者。患者一般情況資料、術中資料和術後主要不良事件(MAEs)資料提取自胸外科協會（STS）資料庫。主要結果 MAEs 是一個複合資料，包含住院期間死亡、心肌梗死、再次手術、胸骨感染、心臟壓塞、肺炎、中風或腎功能衰竭。術後血糖變異性通過變異指數進行評價。患者通過糖化血紅蛋白(HbA1c)水準（<6.5% 或 ≥6.5%）進行分層，資料採用多因素 logistic 回歸進行分析。

結果：入選的 763 名患者中，109(14.3%)名患者術前糖化血紅蛋白(HbA1c)水準 ≥6.5%。HbA1c 水準≥6.5%患者組年齡較大(70 [63-79] 與 66 [56-75]，P < .001)，且血脂異常(83.5% 與 57.0%，P < .001)和充血性心力衰竭(39.5% 與 27.8%，P = .01)發生的風險更高，該組胸科協會發病率和死亡率風險評分顯著增高(0.18 [0.13-0.27] 與 0.13 [0.09-0.21]，P < .001)。但是兩組 MAEs 發生率相近(13.8% in HbA1c ≥6.5% 與 11.0% in HbA1c <6.5%， P = .40)。多因素 logistic 回歸分析提示術前糖化血紅蛋白(HbA1c)水準≥6.5%(odds ratio [OR] 1.48， 95% confidence interval [CI]： 0.78-2.82； P = .23)與術後血糖變異性(CV per quartile； OR 1.05，95% CI：0.85-1.30； P = .67)均未發現與 MAEs 有相關性。但術前糖化血紅蛋白(HbA1c)水準≥6.5%與術後血糖變異性增加相關(0.173 [0.129-0.217] 與 0.141 [0.106-0.178]，P < .0001)。

結論：本研究並沒有發現術前糖化血紅蛋白(HbA1c)及術後血糖變異性在心臟單瓣膜手術中與術後 MAEs 有相關性。特別值得注意的是，與我們之前在 CABG 患者中發現的結果相反，術後血糖變異性與 MAEs 並無關聯。以後的研究應該在 CABG 患者中重點關注術後血糖變異性降低與 MAEs 降低之間的聯繫，而該聯繫並不一定適用於其他心臟手術。

（陳峰譯 李士通校）

BACKGROUND: Preoperative hemoglobin A1c (HbA1c) and postoperative glycemic variability predict major adverse events (MAEs) after coronary artery bypass grafting in a protocolized glycemic control setting. However, the influence of preoperative HbA1c and postoperative glycemic variability in isolated cardiac valvular surgery is unknown. In this study, we sought to establish (a) whether preoperative HbA1c could identify patients at increased risk of MAEs and (b) whether postoperative glycemic variability was associated with MAEs after isolated cardiac valvular surgery.

METHODS: Patients >18 years of age undergoing isolated valve surgery from January 2008 to December 2013 were enrolled in this prospective, single-center, observational cohort study with IRB approval. Patient demographics, intraoperative data, and postoperative MAEs were extracted from the institutional Society of Thoracic Surgery (STS) database. The primary outcome, MAEs, was a composite of in-hospital death, myocardial infarction, reoperations, sternal infection, cardiac tamponade, pneumonia, stroke, or renal failure. Glycemic variability in the postoperative period was assessed by the coefficient of variation. Patents were stratified by HbA1c levels (<6.5% or ≥6.5%) and assessed using multivariable logistic regression.

RESULTS: Of the enrolled 763 patients, 109 (14.3%) had a preoperative HbA1c level ≥6.5%. Patients with HbA1c ≥6.5% were older (70 [63-79] vs 66 [56-75], P < .001) and had a higher incidence of dyslipidemia (83.5% vs 57.0%, P < .001) and congestive heart failure (39.5% vs 27.8%, P = .01). The calculated STS risk score for morbidity and mortality was also statistically higher in this group (0.18 [0.13-0.27] vs

0.13 [0.09-0.21], P < .001). The occurrence of MAEs was similar between the 2 groups (13.8% in HbA1c ≥6.5% vs 11.0% in HbA1c <6.5%, P = .40). Multivariate logistic regression analysis revealed that neither preoperative HbA1c ≥ 6.5% (odds ratio [OR] 1.48, 95% confidence interval [CI]: 0.78-2.82; P = .23) nor postoperative glycemic variability (CV per quartile; OR 1.05, 95% CI: 0.85-1.30; P = .67) was found to be associated with MAEs. An HbA1c ≥ 6.5% was associated with the increased glycemic variability in the postoperative period (0.173 [0.129-0.217] vs 0.141 [0.106-0.178], P < .0001).
CONCLUSIONS: This study did not show an association between preoperative HbA1c and postoperative glycemic variability with MAEs after isolated cardiac valvular surgery. Specifically, lack of association between postoperative glycemic variability and MAEs is noteworthy and is in contrast to our previous finding in CABG patients. Future studies should focus a targeted glycemic variability reduction in CABG patients and evaluate the reduction in MAEs, without risk of employing a one-size fits all approach when approaching other cardiac procedures.

曲馬多的趨勢：藥理學，代謝和濫用

Trends in Tramadol: Pharmacology, Metabolism, and Misuse

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曲馬多是一種獨特的鎮痛藥物，可用於多種製劑，由於其單胺能再攝取抑制劑和阿片樣物質受體激動劑活性的特性遂在世界範圍內越來越多地被用作治療急性和慢性疼痛的高親和性阿片樣物質藥物的替代物。它是被細胞色素 P450（CYP）酶 CYP2D6 和 CYP3A4 代謝為其更有效的阿片樣鎮痛代謝物，特別是 O-脫甲基化產物 M1 的前藥。給定劑量的曲馬多的阿片樣鎮痛藥效力受個體的 CYP 遺傳學影響，其中不良代謝者經歷很少轉化為活性 M1 阿片樣物質代謝物和具有高代謝分佈的個體或超代謝劑，經歷最大的阿片樣鎮痛作用。 CYP 新陳代謝的重要性導致採用電腦臨床決策支援，藥物基因組學工具指導主要醫療中心的曲馬多治療。曲馬多的同時阿片樣物質激動劑作用和血清素（5-HT）和去甲腎上腺素再攝取抑制作用導致獨特的副作用特徵和重要的藥物相互作用，必須考慮。曲馬多的突然停止增加了阿片樣物質和 5-羥色胺 - 去甲腎上腺素再攝取抑制劑戒斷綜合征的風險。該綜述提供了關於曲馬多的藥理學、藥代動力學、CYP 遺傳多態性、藥物相互作用、毒性、撤回和非法使用等更新的重要資訊。（顧明露譯 李士通校）

Tramadol is a unique analgesic medication, available in variety of formulations, with both monoaminergic reuptake inhibitory and opioid receptor agonist activity increasingly prescribed worldwide as an alternative for high-affinity opioid medication in the treatment of acute and chronic pain. It is a prodrug that is metabolized by cytochrome P450 (CYP) enzymes CYP2D6 and CYP3A4 to its more potent opioid analgesic metabolites, particularly the O-demethylation product M1. The opioid analgesic potency of a given dose of tramadol is influenced by an individual's CYP genetics, with poor metabolizers experiencing little conversion to the active M1 opioid metabolite and individuals with a high metabolic profile, or ultra-metabolizers, experiencing the greatest opioid analgesic effects. The importance of the CYP metabolism has led to the adoption of computer clinical decision support with pharmacogenomics tools guiding tramadol treatment in major medical centers.

Tramadol’s simultaneous opioid agonist action and serotonin (5-HT) and norepinephrine reuptake inhibitory effects result in a unique side effect profile and important drug interactions that must be considered. Abrupt cessation of tramadol increases the risk for both opioid and serotonin–norepinephrine reuptake inhibitor withdrawal syndromes. This review provides updated important information on the pharmacology, pharmacokinetics, CYP genetic polymorphisms, drug interactions, toxicity, withdrawal, and illicit use of tramadol.

應用醫療器械資訊學在發展安全可交互操作醫療系統的標準中的必要性

The Need to Apply Medical Device Informatics in Developing Standards for Safe Interoperable Medical Systems

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Anesthesia & Analgesia:2017 124 127–135

在用戶強烈要求增加可互通性得背景下，醫療設備和健康資訊技術系統越來越需要增加可互通性。鑒於這些觀點，我們必須制定相關的安全標準。在這篇文章中，我們描述了目前的醫療器械標準的發展和這些標準對醫療設備資訊學的必要性。醫療器械資訊應從廣泛的臨床場景收集，為安全醫療設備的可互通性奠定基礎。這五個臨床病例表明了醫療器械資訊學的作用，如果醫療器械標準的發展能夠得到應用的話，可以幫助促進安全可交互操作醫療設備系統的發展。這些例子說明了沒有能夠獲取重要信號和設備屬性資訊的臨床教訓。我們提供的建議是關於歷史上獨立的標準發展小組與其它健康資訊學之間的協調，其中一些獨立的標準發展小組是專注于安全和有效性。我們覺得需要在共同的利益相關者和描述組織結構者之間建立理解來促進合作，以便於設備之間能相互作用，也能使相關的安全資訊得到發展。
（顧明露譯 李士通校）

Medical device and health information technology systems are increasingly interdependent with users demanding increased interoperability. Related safety standards must be developed taking into account these systems' perspective. In this article, we describe the current development of medical device standards and the need for these standards to address medical device informatics. Medical device information should be gathered from a broad range of clinical scenarios to lay the foundation for safe medical device interoperability. Five clinical examples show how medical device informatics principles, if applied in the development of medical device standards, could help facilitate the development of safe interoperable medical device systems. These examples illustrate the clinical implications of the failure to capture important signals and device attributes. We provide recommendations relating to the coordination between historically separate standards development groups, some of which focus on safety and effectiveness and others focus on health informatics. We identify the need for a shared understanding among stakeholders and describe organizational structures to promote cooperation such that device-to-device interactions and related safety information are considered during standards development.

應用電腦模型實現閉環新生兒氧氣治療

Applying Computer Models to Realize Closed-Loop Neonatal Oxygen Therapy

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背景：在自動化新生兒氧療的背景下，本文描述了一個通過電腦模型來驗證的想法轉換為一個電腦模型驅動的設備的一個概念。電腦建模整個新生兒氧氣治療系統可以通過提供一個驗證平臺和加速演算法開發促進閉環控制演算法的發展。
方法：在本文中，我們展示了一組數學建模系統的組成：患者體內運輸的氧氣,氧氣機，控制器和脈搏血氧計。此外，在產品製造的約束下，新生兒氧氣輸送元件的一個理想化的模型可以有效地集成到一個設備的控制演算法，稱為自我調整模型。在本文中，手控和閉環氧療效果按以下順序的重要性定義了 3 種標準：氧濃度正常（目標 SpO_2 ± 2.5%）、低氧（低於正常氧濃度）、高氧（高於正常氧濃度）分別的持續時間百分比； 60 秒內動脈血氧飽和度<85% 和>95%的次數；手動調整的次數。
結果：對於 7 名低體重早產兒進行氧療，從臨床的角度比較三種閉環控制演算法（狀態機，比例、積分、微分，自我調整模型）與手動氧療，結果如下。與手動療法相比,所有的閉環控制演算法顯著增加病人氧濃度正常的時間，減少高氧的時間($P < 0.05$)。所有的閉環控制演算法也顯著減少了手動調整的數量($P < 0.05$)。
結論：雖然 3 種控制演算法的表現相同，自我調整模型因其易用性，可能具有最好的效用。
（黃堯卿譯 李士通校）
BACKGROUND: Within the context of automating neonatal oxygen therapy, this article describes the transformation of an idea verified by a computer model into a device actuated by a computer model. Computer modeling of an entire neonatal oxygen therapy system can facilitate the development of closed-loop control algorithms by providing a verification platform and speeding up algorithm development.
METHODS: In this article, we present a method of mathematically modeling the system's components: the oxygen transport within the patient, the oxygen blender, the controller, and the pulse oximeter. Furthermore, within the constraints of engineering a product, an idealized model of the neonatal oxygen transport component may be integrated effectively into the control algorithm of a device, referred to as the adaptive model. Manual and closed-loop oxygen therapy performance were defined in this article by 3 criteria in the following order of importance: percent duration of SpO_2 spent in normoxemia (target SpO_2 ± 2.5%), hypoxemia (less than normoxemia), and hyperoxemia (more than normoxemia); number of 60-second periods <85% SpO_2 and >95% SpO_2; and number of manual adjustments.
RESULTS: Results from a clinical evaluation that compared the performance of 3 closed-loop control algorithms (state machine, proportional-integral-differential, and adaptive model) with manual oxygen therapy on 7 low-birth-weight ventilated preterm babies, are presented. Compared with manual therapy, all closed-loop control algorithms significantly increased the patients' duration in normoxemia and reduced hyperoxemia ($P < 0.05$). The number of manual adjustments was also significantly reduced by all of the closed-loop control algorithms ($P < 0.05$).
CONCLUSIONS: Although the performance of the 3 control algorithms was equivalent, it is suggested that the adaptive model, with its ease of use, may have the best utility.

瞭解睡眠呼吸暫停綜合征的表現形式：將其應用於麻醉、手術和圍術期用藥

Understanding Phenotypes of Obstructive Sleep Apnea: Applications in Anesthesia, Surgery, and Perioperative Medicine

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睡眠呼吸暫停綜合征(OSA)是一種常見的潛在的長期主要神經認知的睡眠呼吸紊亂, 並伴有心血管後遺症。OSA 的病理生理改變存在於不同的個體間，包含不同潛在的機制。其中一些包括上呼吸道解剖，上呼吸道擴張肌肉如頦舌肌的有效性，不同個體的喚醒閾值，呼吸系統控制系統的固有穩定性決定 OSA 的發病機理。OSA 是一種常見的潛在的長期主要神經認知的睡眠呼吸紊亂，圍術期醫護人員應引起關注。例如，OSA 病人的高喚醒閾值可能對鎮靜和止痛藥很敏感，圍術期存在更高風險的呼吸抑制。OSA 病人存在固有呼吸紊亂，而氧療法能幫助其穩定呼吸。OSA 病人仰臥位有上呼吸道塌陷的傾向，而避免仰臥位能減輕呼吸道梗阻。

此綜述對 OSA 臨床相關症狀和表現做了描述。持續氣道正壓可用于治療大多數病人，但病人的耐受性和堅持便是個問題。以病人為中心的個體化治療對將來 OSA 潛在治療方法的研究將是個重點，這將有效減少疾病負擔，提高治療效果。（廖汝婷譯 李士通校）

Obstructive sleep apnea (OSA) is a prevalent sleep-disordered breathing with potential long-term major neurocognitive and cardiovascular sequelae. The pathophysiology of OSA varies between individuals and is composed of different underlying mechanisms. Several components including the upper airway anatomy, effectiveness of the upper airway dilator muscles such as the genioglossus, arousal threshold of the individual, and inherent stability of the respiratory control system determine the pathogenesis of OSA. Their recognition may have implications for the perioperative health care team. For example, OSA patients with a high arousal threshold are likely to be sensitive to sedatives and narcotics with a higher risk of respiratory arrest in the perioperative period. Supplemental oxygen therapy can help to stabilize breathing in OSA patients with inherent respiratory instability. Avoidance of supine position can minimize airway obstruction in patients with a predisposition to upper airway collapse in this posture. In this review, the clinically relevant endotypes and phenotypes of OSA are described. Continuous positive airway pressure (CPAP) therapy is the treatment of choice for most patients with OSA but tolerance and adherence can be a problem. Patient-centered individualized approaches to OSA management will be the focus of future research into developing potential treatment options that will help decrease the disease burden and improve treatment effectiveness.

產科患者血液管理國內外指南：一項定性評估

National and International Guidelines for Patient Blood Management in Obstetrics: A Qualitative Review

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發達國家產後出血(PPH)需要輸血比例逐步增加。因此,麻醉醫師被要求協助嚴重產後大出血患者的管理。急救員,包括麻醉醫師,可以採用國內協會或其他機構的患者血液管理(PBM)建議。然而,目前尚不清楚國內外產科產後出血指南是否包括患者血液管理。我們定性評估了由以下國家產科協會和國際組織發表的PBM建議：美國婦產科大學;英國皇家婦產科學院,澳大利亞和紐西蘭皇家婦產科學院;加拿大的婦產科協會;一個來自奧地利、德國和瑞士的跨學科組織專家團,一個國際多學科共識組織,法國大學婦產科。我們也回顧了由國家孕婦安全合作夥伴發表的產後出血指南。基於本文評估，我們確認了國內外協會的輸血和患者血液管理指南的重要差異。根據PBM非產科設置的進步,產科協會應該確定其在產科設置的適用性。醫療、產科和麻醉的合作也可以說明規範輸血和確定產科PBM指南。
（黃婷譯 李士通校）

In developed countries, rates of postpartum hemorrhage (PPH) requiring transfusion have been increasing. As a result, anesthesiologists are being increasingly called upon to assist with the management of patients with severe PPH. First responders, including anesthesiologists, may adopt Patient Blood Management (PBM) recommendations of national societies or other agencies. However, it is unclear whether national and international obstetric societies' PPH guidelines account for contemporary PBM practices. We performed a qualitative review of PBM recommendations published by the following national obstetric societies and international groups: the American College of Obstetricians and Gynecologists; The Royal College of Obstetricians and Gynecologists, United Kingdom; The Royal Australian and New Zealand College of Obstetricians and Gynecologists; The Society of Obstetricians and Gynecologists of Canada; an interdisciplinary group of experts from Austria, Germany, and Switzerland, an international multidisciplinary consensus group, and the French College of Gynaecologists and Obstetricians. We also reviewed a PPH bundle, published by The National Partnership for Maternal Safety. On the basis of our review, we identified important differences in national and international societies' recommendations for transfusion and PBM. In the light of PBM advances in the nonobstetric setting, obstetric societies should determine the applicability of these recommendations in the obstetric setting. Partnerships among medical, obstetric, and anesthetic societies may also help standardize transfusion and PBM guidelines in obstetrics.

關於大量輸血協議：一項來自美國醫學研究中心的調查
Massive Transfusion Protocols: A Survey of Academic Medical Centers in the United States

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背景：很多醫院都已經採用了大量輸血協議，這可能對提高血製品的輸注結果以及減少沒必要的血製品輸注數量有好處。然而，在這些協議中，關於血製品的輸注數量和種類沒有明確的指導。各個醫院的大量輸血協議也可能很不同。
方法：一個簡短的、以網路為基礎的調查被送到學術中心的血庫醫療主管單位以瞭解每個單位大量輸血協定的具體細節。
結果：我們一共發出了 107 份調查問卷，其中收到的完成份數是 56 份，（52%

的回執率）。所有回復的單位都有採用大量輸血協議。幾乎所有(n = 55, 98.2% [95% 可信區間是 90.6%–99.7%])的單位會依據他們的協定輸注一定數量和比率的血液製品，僅包括很少部分的以實驗為指導的輸血治療。最常見的目標是，紅細胞與血漿之比是 1:1 (n = 39, 69.9% [95% 可信區間是 56.7%–80.1%]在回執調查裡).大多數會提供 6 個甚至更多單位的紅細胞在大量輸血的第一個階段。
結論：收到回執的所有單位中全部都有大量輸血協定。儘管缺乏關於大量輸血的發佈指導，這個調查結果顯示在輸血製品數量和目標輸注率還是有很大的統一性。
(解健譯 李士通校)

BACKGROUND: Massive transfusion protocols (MTPs) have been adopted in many hospitals, and they may improve outcomes, as well as decrease the number of blood products transfused. However, there are no specific guidelines regarding the number and types of products that should be included in these protocols. MTPs may vary from hospital to hospital.
METHODS: A short, web-based survey was sent to blood bank medical directors at academic institutions to learn details about MTPs.
RESULTS: A total of 107 survey requests were sent, and 56 were completed (52% response rate). All who responded had an MTP in place. Nearly all (n = 55, 98.2% [95% CI, 90.6%–99.7%]) base their protocol on delivery of fixed amounts and ratios of blood products, with only a minority incorporating any elements of laboratory-directed therapy. The most common target, red blood cell (RBC):plasma ratio, is 1:1 (n = 39, 69.9% [95% CI, 56.7%–80.1%] of respondents). The majority (n = 36, 64.3% [95% CI, 51.2%–75.6%]) provide 6 or more units of red blood cells in the first MTP packet.
CONCLUSIONS: One-hundred percent of survey respondents had an MTP in place. Despite a lack of published guidelines regarding MTPs, the survey results demonstrated substantial uniformity in numbers of products and target transfusion ratios.

開放腎切除術後硬膜外鎮痛、連續手術部位的鎮痛和病人自控鎮痛藥嗎啡的有效性對於術後疼痛管理和痛覺過敏、康復以及健康相關的生活品質的研究：一個前瞻性隨機對照研究

Effectiveness of Epidural Analgesia, Continuous Surgical Site Analgesia, and Patient-Controlled Analgesic Morphine for Postoperative Pain Management and Hyperalgesia, Rehabilitation, and Health-Related Quality of Life After Open Nephrectomy: A Prospective, Randomized, Controlled Study
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背景：沒有公認有效的技術來優化減少疼痛分數和防止腎切除術後持續的術後疼痛。我們比較接受連續手術部位鎮痛(CSSA)，硬膜外鎮痛(EA)和對照組(病人自控鎮痛藥嗎啡)在開放腎切除術的患者。
方法：60 個病人被隨機分成三組，手術部位鎮痛組硬膜外組以及對照組在術後 72 小時。所有患者，如果必要時接受病人自控鎮痛藥嗎啡。痛覺過敏評估在術後第一、第二和第三天。慢性疼痛的特點對於 1 和 3 個月的生活品質進行了分

析。主要的結果是在 24 小時內疼痛評分。次要的結果是對於嗎啡的使用量、術後康復、痛覺過敏、慢性疼痛發生率,和生活品質參數關係。

結果：EA、CSSA 和對照組在 24 小時均值±標準差疼痛值分別為 2.4±1.7，2.4±1.7，4.2±1.2（P <0.01），EA 和 CSSA 組咳嗽發生率較低。嗎啡總消費量高於對照組。EA 和 CSSA 組康復參數改善得更快。在 48 小時內 EA 組和對照組痛覺過敏的中位數的值為 36.4 釐米和 52 釐米之間（P = 0. 01）；72 小時之內，EA 組、CSSA 組和對照組分別為 40 釐米、39.5 釐米和 59 釐米（P = 0.002）。CSSA 組減少 1 個月時疼痛的嚴重程度和痛覺過敏，並且優化手術後 3 個月的生活品質(主要的生理成績，P = 0.005)。

結論：CSSA 和 EA 顯著改善術後鎮痛，減少術後嗎啡消費，傷口痛覺過敏，加速開放腎切除術後患者康復。CSSA 顯著減少手術後 1 個月的殘餘疼痛和優化手術後 3 個月生活品質參數。

（吳昕菀譯 李士通校）

BACKGROUND: There is no widely recognized effective technique to optimally reduce pain scores and prevent persistent postoperative pain after nephrectomy. We compared continuous surgical site analgesia (CSSA), epidural analgesia (EA), and a control group (patient-controlled analgesic morphine) in patients undergoing open nephrectomy.

METHODS: Sixty consecutive patients were randomized to be part of EA, CSSA, or control groups postoperatively for 72 hours. All patients received patient-controlled analgesic morphine, if needed. Hyperalgesia was assessed on the first, second, and third postoperative days. Chronic pain characteristics and quality of life were analyzed at 1 and 3 months. The primary outcome was the pain score at 24 hours. Secondary outcomes were morphine consumption, postoperative rehabilitation, hyperalgesia, chronic pain incidence, and quality-of-life parameters.

RESULTS: At 24 hours, mean ± standard deviation pain values at rest (2.4 ± 1.7, 2.2 ± 1.2, and 4.2 ±1.2, respectively, in EA, CSSA, and control groups, P <.001) and during coughing was lower in the EA and CSSA groups. Total morphine consumption was higher in the control group. Rehabilitation parameters improved sooner in the EA and CSSA groups. Median values of area of hyperalgesia differed at 48 hours between the EA group and the control group (36.4 cm) and (52 cm) (P = .01) and at 72 hours among the EA group, CSSA group, and the control group (40 cm, 39.5 cm, and 59 cm, respectively; P = .002). CSSA reduced the severity of pain and hyperalgesia at 1 month and optimized quality of life 3 months after surgery (role physical scores, P = .005).

CONCLUSIONS: CSSA and EA significantly improve postoperative analgesia, reduce postoperative morphine consumption, area of wound hyperalgesia, and accelerate patient rehabilitation after open nephrectomy. CSSA significantly reduces the severity of residual pain 1 month after surgery and optimizes quality-of-life parameters 3 months after surgery.