目標導向的心臟超聲在小兒圍手術期的應用

Focused Cardiac Ultrasound in the Pediatric Perioperative Setting

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Anesthesia & Analgesia: 2019 129 925-932

目標導向的心臟超聲檢查（FoCUS）已成為急診醫師的重要診斷工具。 FoCUS 可以對心臟進行即時視覺化，並與體格檢查相結合，可以在緊急情況下作為血液動力學監測專案對患者進行管理。大多數 FoCUS 的圍術期應用文獻集中在成年患者，關於其在兒科患者的應用報導很少。本文概述了兒科麻醉醫師在床旁使用的 FoCUS。對兒童 FoCUS 的不同臨床應用、技術方面和 FoCUS 結果的解釋進行了描述。也包括對相關培訓和能力的討論。兒科醫師和急診醫學醫師實施兒科 FoCUS 的障礙包括對其適應症缺乏瞭解及缺乏培訓的機會。兒科麻醉學中可能也存在類似的障礙，導致 FoCUS 的應用不足。然而，在兒科手術室中使用 FoCUS 可能會對嬰兒和兒童的監護產生積極影響，應予以鼓勵。

（高盼 譯　陳傑 校）

Focused cardiac ultrasonography (FoCUS) has become an important diagnostic tool for acute care physicians. FoCUS allows real-time visualization of the heart and, in combination with the physical examination, acts as a hemodynamic monitor to manage patient care in acute situations. Most of the available perioperative literature has focused on adult patients. Little has been published on the perioperative application of FoCUS for pediatricpatients. This article provides an overview of FoCUS used at the bedside by pediatric anesthesiologists. Variations in clinical applications, technical aspects, and interpretation of FoCUS findings in children are described. Discussion of training and competency is included. Barriers to implementation by pediatricintensivists and emergency medicine physicians include a lack of understanding of indications and training opportunities in pediatric FoCUS. It is likely that similar barriers exist in pediatric anesthesiology resulting inunderutilization of FoCUS. The use of FoCUS in the pediatric operating room, however, may positively impact care of infants and children and should be

encouraged.

影響病人對麻醉醫師滿意度的因素：來自大型綜合醫院的 51，676 份調查分析

Factors Affecting Patient Satisfaction With Their Anesthesiologist: An Analysis of 51,676 Surveys From a Large Multihospital Practice

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Anesthesia & Analgesia: 2019 129 951-959

背景:衛生保健品質日益受到關注的是對患者報告的結果(包括滿意度)的評估。由於麻醉監護是在圍術期監護背景下的,因此麻醉管理和患者體驗之間的直接關聯可能很難確定。作者分析了來自大型私人執業團體的麻醉特定患者滿意度調查資料,通過一項經驗證的患者滿意度調查工具來確認患者對麻醉醫師滿意度的患者、手術和麻醉特定的預測因素。作者假設某些決定麻醉人員滿意度的因素無法控制。

方法：作者回顧性地審查了麻醉患者滿意度調查表（APSQ）的回復，該調查表是對由美國麻醉合作者（一個覆蓋多個州的麻醉團體）所監護的患者進行線上管理的。APSQ 關注患者對麻醉醫師的滿意度和患者報告的結局,管理發生在出院後。匯總了 2016 年 5 月至 2016 年 11 月的回復,並使用多變數 Logistic 回歸評估了回復與患者、手術和臨床相關因素之間的關係。

結果：在研究期間接受監護的 629,220 名成年患者中，有 51,676 名回復了調查要求，患者總回復率為 9.3%。與回饋者相比，未回饋者年齡稍大且更多是是男性。多變數回歸後，患者或操作因素與麻醉醫師的患者評分無關。但是在其他滿意度問題方面，≥55 歲，住院（相對於門診）和夜間手術（下午 6 點至凌晨 6 點之間）的評分較低。

結論：資料表明，影響麻醉醫師滿意度評價的一些因素無法控制。需要進一步的工作來確定患者對其麻醉醫師滿意度評價的要素，並優化圍術期監護的這些方

面。

（高盼 譯　陳傑 校）

Background: An increasing focus of health care quality is the assessment of patient-reported outcomes, including satisfaction. Because anesthesia care occurs in the context of perioperative surgical care, direct associations between anesthetic management and patient experience may be difficult to identify. We analyzed anesthesia-specific patient satisfaction survey data from a large private practice group to identify patient, procedure, and anesthetic-specific predictors of patient satisfaction with their anesthesiologist, measured via responses to a validated patient satisfaction survey instrument. We hypothesized that some factors governing satisfaction with an anesthesia provider are beyond their ability to control.
Methods: We retrospectively reviewed responses to the Anesthesia Patient Satisfaction Questionnaire (APSQ), administered online to patients cared for by US Anesthesia Partners, a multistate anesthesia group practice. The APSQ focuses on patient satisfaction with their anesthesiologist and patient-reported outcomes and is administered after discharge. Responses from May to November 2016 were aggregated, and relationships between responses and patient, procedural, and clinician-related factors were assessed using multivariable logistic regression.
Results: Out of 629,220 adult patients cared for during the study period, 51,676 responded to the survey request for a 9.3% overall response rate for patients. Nonresponders were slightly older and more likely to be male than responders. After multivariable regression, no patient or procedural factor was associated with patient rating of their anesthesiologist. However, ≥55 years of age, inpatient (versus outpatient) setting, and nighttime surgery (between 6 PM and 6 AM) were associated with lower scores on other satisfaction questions.
Conclusions: Our data suggest that some factors governing satisfaction with an anesthesia provider are beyond their ability to control. Further work is needed to identify elements of patient satisfaction with their anesthesiologist and to optimize these aspects of perioperative care.

使用改良的超聲波飛行時間麻醉氣體流量計即時測量二元混合氣體中氙濃度:一項技術可行性研究

Real-Time Measurement of Xenon Concentration in a Binary Gas Mixture Using a Modified Ultrasonic Time-of-Flight Anesthesia Gas Flowmeter: A Technical Feasibility Study

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Anesthesia & Analgesia: 2019 129 985-990

背景：氙氣（Xe）是一種許可在某些國家使用的麻醉氣體。 Xe：氧氣（02）混合物中氣體的分數濃度（％）通常分別使用熱導率儀和燃料電池進行測量。在這種二元混合氣體中的聲速與組分氣體的分數濃度、溫度、壓力和摩爾品質有關。因此，作者進行了一項研究以評估開發一種新穎的可消毒設備的可行性，該設備使用超聲飛行時間來測量 02 中 Xe 的即時流量和部分氣體濃度。

方法：出於可行性研究的目的，作者從傳統的麻醉機上改裝了超聲波飛行時間流量計，以另外測量氧氣中 Xe 的即時分數濃度。在 5%-95%的範圍內，總共獲得了 5095 個 Xe%的讀數，並與金標準--商品化熱導率 Xe 分析儀同時測量的數值進行了比較。

結果：Xe（％）的超聲測量結果與熱導儀的測量結果一致，但是在測量範圍的中存在明顯的不連續性。 Bland-Altman 分析（括弧內為 95%置信區間）得出：平均差（偏倚）3.1%（2.9%-3.2%）；協議下限的 95%為-4.6%（-4.8%至-4.4%）;協議上限的 95%為 10.8%（10.5%-11.0%）。

結論：改良後的超聲波流量計可估算 Xe（％），但準確度水準不足以用於臨床。通過進一步的工作，有可能開發出一種能夠在臨床上可接受準確度範圍內執行流量計和二元氣體濃度測量的設備。

（高盼 譯　陳傑 校）

Background: Xenon (Xe) is an anesthetic gas licensed for use in some countries. Fractional concentrations (%) of gases in a Xe:oxygen (02) mixture are typically measured using a thermal conductivity meter

and fuel cell, respectively. Speed of sound in such a binary gasmixture is related to fractional concentration, temperature, pressure, and molar masses of the component gases. We therefore performed a study to assess the feasibility of developing a novel single sterilizable device that uses ultrasound time-of-flight to measure both real-timeflowmetry and fractional gas concentration of Xe in O2.

Methods: For the purposes of the feasibility study, we adapted an ultrasonic time-of-flight flowmeter from a conventional anesthetic machine to additionally measure real-time fractional concentration of Xe in O2. A total of 5095 readings of Xe % were taken in the range 5%-95%, and compared with simultaneous measurements from the gold standard of a commercially available thermal conductivity Xe analyzer.

Results: Ultrasonic measurements of Xe (%) showed agreement with thermal conductivity meter measurements, but there was marked discontinuity in the middle of the measurement range. Bland-Altman analysis (95% confidence interval in parentheses) yielded: mean difference (bias) 3.1% (2.9%-3.2%); lower 95% limit of agreement -4.6% (-4.8% to -4.4%); and upper 95% limit of agreement 10.8% (10.5%-11.0%).

Conclusions: The adapted ultrasonic flowmeter estimated Xe (%), but the level of accuracy is insufficient for clinical use. With further work, it may be possible to develop a device to perform both flowmetry and binary gas concentration measurement to a clinically acceptable degree of accuracy.

評價癌症患者術後留觀一夜的快速康復

Assessing Rapidity of Recovery After Cancer Surgeries in a Single Overnight Short-Stay Setting

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Anesthesia & Analgesia: 2019 129 1007-1013

背景：短期住院手術患者在醫院最多留觀一夜，尚不明確術後留觀時間是否是一項較好的評價快速康復的替代指標。作者假設：留觀時間可以作為手術後康復時間指標但不如出院時間指標更有價值。

方法：該佇列研究納入一所日間手術醫院 2016 年期間術後留觀一夜的患者，其中乳房切除術 891 例和前列腺切除術 538 例。評估手術開始時間和術後留觀時間

或出院時間之間的關係。

結果：接受乳房切除術和前列腺切除術的患者中，75%患者在上午 10 點到中午 12 點出院，術後留觀時間中位數為 20 小時。手術時間和留觀時間有顯著相關性。接受乳房切除術的患者，和上午 8 點手術相比，下午 6 點手術能預計減少 8.8 小時的術後留觀時間（95%置信區間， 8.3-9.3），然而出院時間僅延長 1.2 小時（95%置信區間, 0.77-1.6）。接受前列腺切除術的患者，估計差異為術後留觀時間減少 6.9 小時 (95%置信區間, 6.4-7.4)，出院時間延長 2.5 小時 (95% 置信區間, 2.0-3.0) 。

結論：短期住院背景下，用術後留觀時間評估預後效果不佳。評估留觀一夜的患者康復速度時，作者提倡使用經手術開始時間校正的出院時間。還應研究手術開始時間對術後留觀時間和出院時間的影響，以確定當其他日間手術術後需要留觀一夜時哪個指標更適合用於評價康復時間。

（梁俊 譯　陳傑 校）

BACKGROUND: In the short-stay surgery setting, where patients remain in hospital for a single overnight at most, it is unclear as to whether postoperative length of stay is a good surrogate for assessing rapidity of recovery. We hypothesized that length of stay would be a function of time of surgery and would be a poorer marker of recovery than time of discharge.
METHODS:A cohort of 891 mastectomy and 538 prostatectomy patients had a planned single overnight stay after surgery at an ambulatory surgical hospital during 2016. The relationship between surgical start time and postoperative length of stay or discharge time was assessed.
RESULTS: For both mastectomy and prostatectomy patients, 75% of patients were discharged between 10 AM and 12 noon and the median postoperative length of stay was 20 hours. There was a strong association between time of surgery and calculated length of stay. For mastectomies, having a surgery which begins at 6 PM vs 8 AM results in an estimated decrease of 8.8 hours (95% CI, 8.3-9.3) in postoperative length of stay but only 1.2 hours (95% CI, 0.77-1.6) later time of discharge. For prostatectomies, the estimated difference is a decrease of 6.9 hours (95% CI, 6.4-7.4) for

postoperative length of stay and 2.5 hours (95% CI, 2.0-3.0) later discharge time.
CONCLUSIONS: Postoperative length of stay is a poor outcome measure in a short-stay setting. When assessing rapidity of recovery for single overnight stay patients, we advocate the use of discharge time with adjustment for surgery start time. The effect of surgery start time on both postoperative length of stay and discharge time should be investigated to ascertain which is best to assess rapidity of recovery in other ambulatory care settings where recovery involves a single overnight stay.

危重心臟移植患者術後管理的爭議

Controversies in the Postoperative Management of the Critically Ill Heart Transplant Patient

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Anesthesia & Analgesia: 2019 129 1023-1033

心臟移植受體在術後近期內極易發生一系列併發症。儘管手術技術、機械輔助迴圈（MCS）和免疫抑制的發展，仍有證據表明危重移植患者的最佳管理措施在很多方面是欠缺的。這篇綜述指出了在這些灰色領域中的一些爭議之處，以促進更好的討論和發展。

（梁俊 譯　陳傑 校）

Heart transplant recipients are susceptible to a number of complications in the immediate postoperative period. Despite advances in surgical techniques, mechanical circulatory support (MCS), and immunosuppression, evidence supporting optimal management strategies of the critically ill transplant patient is lacking on many fronts. This review identifies some of these controversies with the aim of stimulating further discussion and development into these gray areas.

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確認在三級醫療中心實施國家孕產婦安全聯盟的產科出血方案過程中的阻礙:德爾菲評價方法的應用

Identifying Barriers to Implementation of the National Partnership for Maternal Safety Obstetric Hemorrhage Bundle at a Tertiary Center:

Utilization of the Delphi Method

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Anesthesia & Analgesia: 2019 129 1045-1050

背景：2015 年，國家孕產婦安全聯盟(NPMS)在美國開展了產科出血治療方案，為分娩場所提供持續、確定的產後出血管理實踐指南。由於缺乏對大型三級分娩中心每個方案項目實施過程的描述，作者尋找多學科提供的治療方案實施過程中的執行缺陷和認識障礙。

方法：作者在德爾菲評價方法的基礎上開展了一項前瞻性、橫斷面、基於共識的研究。一個多學科專業小組由麻醉醫生、產科醫生、護士、手術技術人員組成，並參與了四項序列問卷調查。第一輪，確認小組成員決定的方案項目在目前是不充分且存在認識障礙。第二輪，在每個小組中建立專案的優先順序。第三輪在實施可行性和對患者積極的治療效果方面至少獲得 60%同意並對符合要求的項目進行排序。最後一輪揭示 4 個專業小組的全部意見，達成最後的共識。並作了描述性統計分析。

結果：總共有 38 名專家完成了這項研究（11 位麻醉醫生，11 位產科醫生，10 位護士和 6 位手術技術人員）。然而在作者分娩中心至少一個學科的專家認為所有 13 項 NPMS 產科出血治療方案的專案都是有缺陷的，4 個學科中至少有 3 個對於 6 個專案缺陷達成共識。確認實施障礙是存在的。被公認具有積極治療意義且存在可行性的專案如下：協定指導下的管理，中心為基礎的模擬訓練，失血定量化、團隊集結和任務彙報。

結論：NPMS 產科出血治療方案的建立是為了幫助美國分娩場所指導實踐和系統改進。德爾菲評價方法能確認存在缺陷的專案及對其實施的認識障礙，患者最為

受益和可行性最高的專案達成小組共識。多學科小組共識能指出缺陷並且促進有形轉化，提高大型、三級醫療分娩中心的分娩品質。許多機構也許會採用作者提出的技術來指導未來治療方案的實施。

（梁俊 譯　陳傑 校）

BACKGROUND: In 2015, the National Partnership for Maternal Safety (NPMS) developed an obstetric hemorrhage consensus bundle to provide birthing facilities in the United States with consistent, validated practice guidelines for postpartum hemorrhage management. The process of implementing each bundle element at a large tertiary labor and delivery unit has not been described; we sought to identify practice deficiencies and perceived barriers to bundle implementation among multidisciplinary providers.

METHODS: We conducted a prospective, cross-sectional, consensus-building study based on the Delphi method. A multidisciplinary expert panel comprised of anesthesiologists, obstetricians, nurses, and surgical technicians was assembled and participated in 4 sequential questionnaires. The first round identified bundle elements that experts determined as not currently adequate and perceived barriers to implementation. The second round established prioritization of elements within each professional group; and the third round ranked the elements with at least 60% agreement on feasibility of implementation and positive impact on patient care. The last round revealed responses across all 4 professional groups to derive a final consensus. Descriptive statistics were performed.

RESULTS: A total of 38 experts completed the study (11 anesthesiologists, 11 obstetricians, 10 nurses, and 6 surgical technicians). While all 13 (100%) NPMS obstetric bundle elements were described as deficient in our labor and delivery unit by a provider in at least 1 discipline, consensus among at least 3 of the 4 disciplines was achieved for 6 element deficiencies. Barriers to implementation were determined. The initiatives that achieved consensus as possessing high patient impact and implementation feasibility were protocol-driven management, unit-based simulation drills, blood loss quantification, and team huddles and debriefings.

CONCLUSIONS: The NPMS obstetric hemorrhage bundle was created to help guide practice and systems improvement for US birthing facilities. The Delphi method enabled identification of deficient elements and perceived barriers to element implementation, as well as group consensus on elements with highest patient impact and feasibility. Multidisciplinary group consensus can identify deficiencies and promote tangible, quality improvements in a large, tertiary-care labor and delivery unit.

Institutions may utilize our described technique to guide implementation of future care bundles.

小兒先天性心臟病手術氣管插管部位操作行為的研究:氣管插管部位對圍術期預後的影響-胸外科醫師協會先天性心臟病麻醉分會的資料庫分析

A Study of Practice Behavior for Endotracheal Intubation Site for Children With Congenital Heart Disease Undergoing Surgery: Impact of Endotracheal Intubation Site on Perioperative Outcomes—An Analysis of the Society of Thoracic Surgeons Congenital Cardiac Anesthesia Society Database

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Anesthesia & Analgesia: 2019 129 1061-1068

背景：在接受體外迴圈手術的成年人中，由於鼻竇炎和感染風險更低，因此口插管比鼻插管更有優勢。在兒童中，由於術後鎮靜需求和意外拔管的風險更低，鼻插管是更常見的方法，有時是首選方法。這項研究旨在描述接受體外迴圈手術的兒科人群鼻插管現狀，並評估鼻插管相對于口插管的風險/收益。

方法：納入 2010 年 1 月至 2015 年 12 月期間胸外科醫師協會先天性心臟病手術資料庫中<18 歲的患者。排除術前氣管插管，氣管切開術或已知氣道異常的患者。多變數模型用於評估氣管插管途徑與感染風險（傷口感染，縱隔炎，敗血症，肺炎和心內膜炎）的綜合指標之間的相關性。納入協變數以調整重要的患者特徵（例如體重，年齡，合併症），病例複雜性和中心效應。次要結果包括插管時間，住院時間和氣道併發症（包括意外拔管）。作者還對大型中心（> 100 例/年）中<12 個月的兒童進行了亞組分析，以檢驗手術時感染風險如何隨年齡變化。

結果：新生兒的鼻插管手術占 41％，嬰兒為 38％，學齡兒童為 15％，青少年為 2％。僅在新生兒中，鼻插管對意外拔管具有保護作用（P = 0.02）。嬰兒和新生兒的多變數分析表明，經鼻插管的途徑與各種感染的發生（相對危險度[RR]為

0.84； 95%CI 為 0.59-1.18）或住院時間減少無關（RR 為 0.992； 95%CI）（0.947-1.039），但與插管時間減少有關（RR，0.929； 95%CI，0.869-0.992）。僅限於大型中心的結果顯示約在 6 至 12 個月之間的年齡與插管途徑之間存在顯著 A 的相互作用，發生感染的風險有差異（P = 0.003）。

結論：雖然大齡兒童與成人人群的鼻插管趨勢相似，感染風險都會增加，但新生兒和嬰兒的鼻插管似乎沒有類似的風險。新生兒和嬰兒的鼻插管也可能與插管時間減少有關，但與住院時間無關。需要進行前瞻性研究以更好地理解這些複雜的關聯。

（沈悅 譯　陳傑 校）

BACKGROUND: In adults undergoing cardiopulmonary bypass surgery, oral intubation is typically preferred over nasal intubation due to reduced risk of sinusitis and infection. In children, nasal intubation is more common and sometimes preferred due to perceived benefits of less postoperative sedation and a lower risk for accidental extubation. This study sought to describe the practice of nasal intubation in the pediatric population undergoingcardiopulmonary bypass surgery and assess the risks/benefits of a nasal route against an oral one.

METHODS: Patients<18 years of age in the Society of Thoracic Surgeons Congenital Heart Surgery Databasebetween January 2010 and December 2015 were included. Patients with a preoperative endotracheal tube, tracheostomy, or known airway anomalies were excluded. Multivariable modeling was used to assess theassociation between route of tracheal intubation and a composite measure of infection risk (wound infection, mediastinitis, septicemia, pneumonia, and endocarditis). Covariates were included to adjust for important patient characteristics (eg, weight, age, comorbidities), case complexity, and center effects. Secondary outcomes included length of intubation, hospital length of stay, and airway complications including accidental extubations. We also performed a subanalysis in children <12 months of age in high-volume centers (>100 cases/y) examining how infection risk may

change with age at the time of surgery.
RESULTS: Nasal intubation was used in 41% of operations in neonates, 38% in infants, 15% in school-aged children, and 2% in adolescents. Nasal intubation appeared protective for accidental extubation only in neonates (P = 0.02). Multivariable analysis in infants and neonates showed that the nasal route of intubation was not associated with the infection composite (relative risk [RR], 0.84; 95% CI, 0.59–1.18) or a shorter length ofstay (RR, 0.992; 95% CI, 0.947–1.039), but was
associated with a shorter intubation length (RR, 0.929; 95% CI, 0.869–0.992). Restricting to high-volume centers
showed a significant interaction between age
and intubationroute with a risk change for infection occurring between approximately 6–12 months of age (P = 0.003).
CONCLUSIONS: While
older children undergoing nasal intubation trend similar to the adult population with an increased risk of infection, nasal intubation in neonates and infants does not appear to carry a similar risk. Nasal intubation in neonates and infants may also be associated with a shorter intubation length but not a shorter length of stay. Prospective studies are required to better understand these complex associations.

8. 紅細胞輸注在小兒原位肝移植中的應用：幾十年來的不同之處

Red Blood Cell Transfusion in Pediatric Orthotopic Liver Transplantation: What a Difference a Few Decades Make

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Anesthesia & Analgesia: 2019 129 1087-1092

背景：兒童肝移植通常與凝血病和大量失血有關。相關資料有限。在這項觀察性回顧性研究中，作者評估了 9 年期間在單中心進行肝移植的小兒患者的輸血相關實踐。

方法：回顧性收集匹茲堡大學醫學中心匹茲堡兒童醫院的患者資料。納入所有從 2008 年 1 月至 2017 年 6 月進行肝移植的患者。主要和次要預後指標分別是輸注的紅細胞（RBC）量和死亡率。

結果：從 2008 年 1 月到 2017 年 6 月，納入 271 例患者的 278 例肝移植。初次移

植 259 例，二次移植 15 例，三次移植 4 例。移植時的平均年齡為 6.9 歲。膽道閉鎖，楓糖尿症，尿素迴圈缺陷和肝腫瘤是主要適應症，分別占移植的 66（23.7％），45（16.2％），24（8.6％）和 23（8.3％）。76 例（27.3％）未進行 RBC 輸血。在輸血者中，有 181 例（89.6％）需要的輸血量小於 1 個單位血量（BV）。所有病例輸血量中位數為 0.21 個 BV（範圍，0-9； Q1，0； Q3，0.45）。與大於 12 個月大的兒童(0.12 BV)相比，嬰兒輸血量的趨勢更大(中位數為 0.46 BV)。根據診斷，需要最高中位數輸血量的是全腸胃外營養相關的肝衰竭患者（3.41 BV），其次是重複移植患者（0.6 BV）。與二次移植（0.43 BV）和一次移植（0.18 BV）相比，三次移植（中位數為 2.71 BV）對初次移植與重複移植的比較顯示出更高的輸血量。 271 例患者中有 4 例（1.5％）在入院期間因肝移植死亡。 271 名患者中有 9 名（3.3％）死於移植後。總死亡率為 4.8％。

結論：與以往報導的趨勢相反，對當前輸血方法的評估表明，大多數接受肝移植的患者接受的紅細胞懸浮液＜1 BV。四分之一以上的移植根本不需要輸血。大量輸血需求的風險因素包括年齡較小，與腸全胃外營養相關的肝衰竭和多次移植。

（沈悅 譯　陳傑 校）

BACKGROUND: Liver transplantation in children is often associated with coagulopathy and significant bloodloss. Available data are limited. In this observational retrospective study, we assessed transfusion practices inpediatric patients undergoing liver transplantation at a single institution over the course of 9 years.

METHODS: Data were retrospectively collected from patient medical records at the Children's Hospital of Pittsburgh of University of Pittsburgh Medical Center. All patients who underwent liver transplantation from January 2008 to June 2017 were included. Primary and secondary outcomes were volume of red blood cells (RBCs) transfused and mortality, respectively.

RESULTS: From January 2008 to June 2017, there were 278 liver transplants in 271 patients. The number of primary transplants were 259, second retransplants 15, and third retransplants. Average age at transplantation was 6.9 years. Biliary atresia, maple syrup urine disease, urea cycle defect, and liver tumor were the leading indications accounting for 66 (23.7%), 45 (16.2%), 24 (8.6%), and 23 (8.3%) of transplants, respectively. Seventy-six cases (27.3%) did not require RBC transfusions. Among those transfused, 181 (89.6%) of the cases required <1 blood volume (BV). The median BV transfused among all cases was 0.21 (range, 0–9; Q1, 0; Q3, 0.45). There is a trend toward higher volume transfusions among infants (median, 0.46 BV) compared to children >12 months of age (0.12 BV). By diagnosis, the group requiring the highest median volume transfusion was patients with total parenteral nutrition–related liver failure (3.41 BV) followed by patients undergoing repeat transplants (0.6 BV). Comparison of primary versus repeat transplants shows atrend toward higher volume transfusions in third transplants (median, 2.71 BV), compared to second transplants (0.43 BV) and primary transplants (0.18 BV). Four of 271 patients (1.5%) died during admission involving livertransplantation. Nine of 271 patients (3.3%) died subsequently. Total mortality was 4.8%.

CONCLUSIONS: In contrast to historically reported trends, evaluation of current transfusion practices reveals that most patients undergoing liver transplantation receive <1 BV of packed RBCs. More than 1 in 4 transplantations require no transfusion at all. Risk factors for greater transfusion need include younger age, total parenteral nutrition–related liver failure, and repeat transplantation.

小兒麻醉中黑人兒童的成人化

Adultification of Black Children in Pediatric Anesthesia

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Anesthesia & Analgesia: 2019 129 1118-1123

背景：麻醉監護中存在無意識的種族偏倚。作者假設黑人兒童接受吸入誘導的頻率更低，從兒童生活中獲得的支持更少，有家人陪同誘導的機會更少，口服咪達唑侖的處方藥更少。

方法：作者回顧性收集了 2012 年 1 月 1 日至 2018 年 1 月 1 日年齡在 18 歲以下

患者的資料，包括年齡、性別、種族、身高、體重、ASA 分級、手術和身份去識別的麻醉主治醫師。預後指標包括面罩與靜脈誘導、咪達唑侖術前用藥、童年生活訪視和家人陪伴情況。使用多變數 logistic 回歸模型評估佇列中所有預後之間的種族差異。

結果：共有 33,717 名白種人和 3901 名黑人兒童符合研究條件。對於主要預後指標，10-14 歲的黑人兒童接受面罩誘導的可能性是高加索兒童的 1.3 倍（調整後的優勢比[AOR]為 1.3； 95%置信區間[CI]為 1.1-1.6； P = .001） 。童年生活訪視相關的文獻很少（<0.5%），無法進行分析。 <15 歲的黑人兒童有家人陪伴進行誘導的可能性比高加索人至少低 31%（AOR 範圍為 0.4-0.6； 95%CI 範圍為 0.31-0.84； P <.010）。 <5 歲的黑人兒童術前接受咪達唑侖的可能性比高加索人低 13%（AOR，0.9； 95%CI，0.8-0.9； P = 0.012）。

結論：這項研究表明，在誘導期緩解焦慮的策略存在差異，成人化可能是造成這種偏倚的原因之一。 10 至 14 歲的黑人兒童接受吸入誘導以減輕焦慮的可能性是白種人的 1.3 倍。但黑人兒童在圍術期接受咪達唑侖術前用藥或者家人陪伴誘導的可能性更小。造成這種差異的原因尚不清楚，需要進一步的前瞻性研究以充分理解這種差異。

（沈悅 譯　陳傑 校）

BACKGROUND: Unconscious racial bias in anesthesia care has been shown to exist. We hypothesized that black children may undergo inhalation induction less often, receive less support from child life, have fewer opportunities to have a family member present for induction, and receive premedication with oral midazolam less often.

METHODS: We retrospectively collected data on those <18 years of age from January 1, 2012 to January 1, 2018 including age, sex, race, height, weight, American Society of Anesthesiologists (ASA) physical status,

surgical service, and deidentified anesthesiology attending physician. Outcome data included mask versus intravenous induction, midazolam premedication, child life consultation, and family member presence. Racial differences between all outcomes were assessed in the cohort using a multivariable logistic regression model.

RESULTS: A total of 33,717 Caucasian and 3901 black children were eligible for the study. For the primary outcome, black children 10–14 years were 1.3 times more likely than Caucasian children to receive mask induction (adjusted odds ratio [AOR], 1.3; 95% confidence interval [CI], 1.1–1.6; $P = .001$). Child life consultation was poorly documented (<0.5%) and not analyzed. Black children <15 years of age were at least 31% less likely than Caucasians to have a family member present for induction (AOR range, 0.4–0.6; 95% CI range, 0.31–0.84; $P < .010$). Black children <5 years of age were 13% less likely than Caucasians to have midazolam given preoperatively (AOR, 0.9; 95% CI, 0.8–0.9; $P = .012$).

CONCLUSIONS: This study suggests that disparities in strategies for mitigating anxiety in the peri-induction period exist and adultification may be 1 cause for this bias. Black children 10 to 14 years of age are 1.3 times as likely as their Caucasian peers to be offered inhalation induction to reduce anxiety.

However, black children are less likely to receive premedication with midazolam in the perioperative period or to have family members present at induction. The cause of this difference is unclear, and further prospective studies are needed to fully understand this difference.

活動追蹤器監測步行是評價術後恢復品質的準確、可靠的方式嗎？一項前瞻性佇列效度研究

Is Activity Tracker–Measured Ambulation an Accurate and Reliable Determinant of Postoperative Quality of Recovery? A Prospective Cohort Validation Study

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Anesthesia & Analgesia: 2019 129 1144-1152

背景：恢復品質（quality of recovery, QOR）測試工具是用以評估病人術後恢復至基線健康水準的能力。術後步行對恢復品質是否有影響、有多大影響仍不清楚，一部分原因是臨床條件下缺少有效的工具來評價步行活動。本佇列研究以剖

宮產產婦為研究物件，判斷活動追蹤器對於早期術後步行活動監測的準確性和可靠性，並且探究術後步行和恢復品質間的聯繫。

方法：該前瞻性佇列研究納入了 2015 年 7 月至 2017 年 6 月行剖宮產的產婦 200 例，產後立即佩戴腕式活動追蹤器。追蹤器 24 小時後回收，同時進行恢復品質評估（QoR-15 量表）。採用多變數線性回歸和 Spearman 相關性（ρ）來分析恢復品質和不同協變數（包括步行）之間的關係。共 48 名產婦，每人佩戴兩個追蹤器且同時使用計步器計步完成行走活動，用組內相關係數（ICC）評估準確度和設備間、設備內的可靠性。

結果：與計步器相比，活動追蹤器準確度更高（ICC=0.93），且設備間、設備內的可靠性更高（ICC 分別為 0.98 和 0.96）。相關性分析顯示，早期步行與剖宮產後 QoR-15 評分中等程度相關，ρ 值（95%置信區間）為 0.56（0.328-0.728）。回歸分析表明步行活動是剖宮產後 QoR-15 評分的決定性因素，其效果估計值（95%置信區間）相當於 0.002（0.001-0.003）。步行活動也和 QoR-15 量表中除心理支援外的其他部分有關。病人能接受的狀態（行走良好的主觀閾值）是 24 小時內 287 步。

結論：本研究證實了活動追蹤器在臨床條件下評估步行情況的準確性和可靠性，並且提出術後步行活動是術後恢復品質的決定因素。此研究也表明，能夠提高步行品質的干預手段或能提升恢復品質，但是還需更多研究來探究其中的因果關係。

（鄒沅芫 譯　陳傑 校）

BACKGROUND: Quality of recovery (QOR) instruments measure patients' ability to return to baseline health status after surgery. Whether, and the extent to which, postoperative ambulation contributes to QOR is unclear, in part due to the lack of valid tools to measure ambulation in

clinical settings. This cohort study of the cesarean delivery surgical model examines the accuracy and reliability of activity trackers in quantifying early postoperative ambulation and investigates the correlation between ambulation and QOR.
METHODS: A prospective cohort of 200 parturients undergoing cesarean delivery between July 2015 and June 2017 was fitted with wrist-worn activity trackers immediately postpartum. The trackers were collected 24 hours later, along with QOR assessments (QoR-15 scale). The relationship between QOR and various covariates, including ambulation, was explored using multivariable linear regression and Spearman correlation (ρ). Forty-eight parturients fitted with 2 trackers also completed a walk exercise accompanied by a step-counting assessor, to evaluate accuracy, inter-, and intradevice reliability using interclass correlation (ICC).
RESULTS: Compared to step counting, activity trackers had high accuracy (ICC = 0.93) and excellent inter- and intradevice reliability (ICC = 0.98 and 0.96, respectively). Correlation analysis suggested that early ambulation is moderately correlated with postcesarean QoR-15 scores, with a ρ (95% confidence interval) equivalent to 0.56 (0.328-0.728). Regression analysis suggested that ambulation is a determinant of postcesarean QoR-15 scores, with an effect estimate (95% confidence interval) equivalent to 0.002 (0.001-0.003). Ambulation was also associated with all QoR-15 domains, except psychological support. The patient's acceptable symptom state (subjective threshold for good ambulation) in the first 24 hours was 287 steps.
CONCLUSIONS: This study demonstrated the accuracy and reliability of activity trackers in measuring ambulation in clinical settings and suggested that postoperative ambulation is a determinant of postoperative QOR. A hypothetical implication of our findings is that interventions that improve ambulation may also help to enhance QOR, but further research is needed to establish a causal relationship.

全身麻醉改變了小鼠腸道菌群的多樣性和構成

General Anesthesia Alters the Diversity and Composition of the Intestinal Microbiota in Mice

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Anesthesia & Analgesia: 2019 129 e126-e129

有研究表明腸道菌群失調可導致免疫反應改變，增加感染的可能性；同樣腸道菌群的狀態可能對圍術期情況有重要的提示作用。作為同類中的首個研究，作者對

全麻小鼠模型 16s rRNA（核糖體 RNA）進行了測序和分析，以探究揮發性麻醉藥對腸道菌群的多樣性和構成產生的影響。異氟烷暴露 4 小時後，作者觀察到菌群多樣性下降。分類改變包括幾種共生細菌（包括梭菌）的消失。這些資料證實，揮發性麻醉藥可能會導致術後腸道菌群失調。

（鄒沅芫 譯　陳傑 校）

Dysbiosis of the intestinal microbiota has been shown to result in altered immune responses and increased susceptibility to infection; as such, the state of the intestinal microbiome may have profound implications in the perioperative setting. In this first-in-class study, we used 16s ribosomal RNA sequencing and analysis in a mouse model of general anesthesia to investigate the effects of volatile anesthetics on the diversity and composition of the intestinal microbiome. After 4-hour exposure to isoflurane, we observed a decrease in bacterial diversity. Taxonomic alterations included depletion of several commensal bacteria including Clostridiales. These data identify volatile anesthetics as potential contributors to microbial dysbiosis in the postoperative patient.

關於幽門狹窄嬰兒胃管/鼻胃管置入最佳時機的回顧性佇列研究

Retrospective Cohort Study on the Optimal Timing of Orogastric Tube/Nasogastric Tube Insertion in Infants With Pyloric Stenosis.

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Anesthesia & Analgesia: October 2019 - Volume 129 - Issue 4 - p 1079-1086

背景：嬰兒肥厚性幽門狹窄可引起胃內容物聚積。幽門狹窄的患者經常在術前放置胃管（OGT）或鼻胃管（NGT）以防止反流誤吸。然而，胃內容物流失的加劇可能導致水電解質紊亂，從而延誤手術時間，此外，胃管的放置會增加術後嘔吐的風險。目前，沒有關於這些患者放置胃管/鼻胃管的循證指南。本研究探索

了進入手術室前放置胃管/鼻胃管是否與為了糾正電解質紊亂而延長手術時間有關。次要研究結果包括有無早期放置胃管/鼻胃管的患者從手術到出院的時間，以及術後 6 小時能進食的概率。

方法：在這項多中心回顧性佇列研究中，資料摘自 2013 年 3 月至 2016 年 6 月因肥厚性幽門狹窄行幽門切開的 481 例患兒病例。本研究構建了多變數線性回歸和 Cox 比例風險模型，以研究胃管/鼻胃管放置時機與術前準備時間增加（定義為從住院到第一次實驗室指標正常的時間）之間的相關性，以及從手術到出院增加的時間。多變數 logistic 回歸用於評估早期胃管/鼻胃管放置與術後 6 小時進食之間的關係。本研究針對地點差異分析進行了調整。

結果：通過回歸分析，根據地點差異進行調整，在所有電解質異常的患者中，放置胃管/鼻胃管的患者需要更長的時間使血清電解質的水準達到可接受手術的水準（兩組相差 19.2 小時；95%可行區間為 10.05-28.41；P<.001）。總體而言，經過地點差異調整後，進入手術室前就放置胃管/鼻胃管的患者從手術到出院的時間長於術前未放置胃管/鼻胃管的患者（兩組相差 38.8 小時；95%可行區間為 25.35-52.31）。經過地點差異、校正胎齡和基線血清電解質水準調整後，術前放置胃管/鼻胃管與術後 6 小時進食不耐受無關。

結論：幽門狹窄的患者入院時放置胃管/鼻胃管需要更長的時間糾正術前電解質紊亂，因此，術前準備的時間更長。術前放置胃管/鼻胃管還與術後住院時間延長有關，但不增加術後 6 小時進食不耐受的風險。

（劉施雯 譯 潘豔、薛張綱校）

BACKGROUND: Hypertrophic pyloric stenosis in infants can cause a buildup of gastric contents. Orogastric tubes (OGTs) or nasogastric tubes (NGTs) are often placed in patients with pyloric stenosis before surgical management to prevent aspiration. However, exacerbation of gastric losses may lead to electrolyte

abnormalities that can delay surgery, and placement has been associated with increased risk of postoperative emesis. Currently, there are no evidence-based guidelines regarding OGT/NGT placement in these patients. This study examines whether OGT/NGT placement before arrival in the operating room was associated with a longer time to readiness for surgery as defined by normalization of electrolytes. Secondary outcomes included time from surgery to discharge and ability to tolerate feeds by 6 hours postoperatively in patients with and without early OGT/NGT placement.

METHODS: In this multicenter retrospective cohort study, data were extracted from the medical records of 481 patients who underwent pyloromyotomy for infantile hypertrophic pyloric stenosis from March 2013 to June 2016. Multivariable linear regression and Cox proportional hazard models were constructed to evaluate the association between placement of an OGT/NGT at the time of admission with increased time to readiness for surgery (defined as the time from admission to the first set of normalized laboratory values) and increased time from surgery to discharge. Multivariable logistic regression was used to evaluate the association between early OGT/NGT placement and the ability to tolerate oral intake at 6 hours postsurgery. Analyses were adjusted for site differences.

RESULTS: Among patients admitted with electrolyte abnormalities, those with an OGT/NGT placed on presentation required more time until their serum electrolytes were at acceptable levels for surgery by regression analysis (19.2 hours difference; 95% confidence interval, 10.05-28.41; $P < .001$), after adjusting for site. Overall, patients who had OGTs/NGTs placed before presentation in the operating room had a longer length of stay from surgery to discharge than those without (38.8 hours difference; 95% confidence interval, 25.35-52.31; $P < .001$), after adjusting for site. OGT/NGT placement before surgery was not associated with failure to tolerate oral intake within 6 hours of surgery after adjusting for site, corrected gestational age, and baseline serum electrolytes.

CONCLUSIONS: OGT/NGT placement on admission for pyloric stenosis is associated with a longer time to electrolyte correction in infants with abnormal laboratory values on presentation and, subsequently, a longer time until they are ready for surgery. It is also associated with longer postoperative hospital stay but not an increased risk of feeding intolerance within 6 hours of surgical repair.

高流量鼻氧可提高接受全身麻醉的病態肥胖患者的安全呼吸暫停時間：一項隨機對照試驗

High-Flow Nasal Oxygen Improves Safe Apnea Time in Morbidly Obese Patients Undergoing General Anesthesia: A Randomized Controlled Trial

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Anesthesia & Analgesia: 2019 129 1130-1136

背景：全身麻醉的病態肥胖患者在麻醉誘導過程中有低氧血症的風險。在麻醉誘導過程中使用高流量鼻氧可以延長非肥胖外科患者的安全呼吸暫停時間。本研究的主要目的是比較在麻醉誘導過程中給予高流量鼻氧或常規面罩氧合的病態肥胖手術患者的安全呼吸暫停時間。

方法：獲得研究倫理委員會的批准。納入年齡≥18 歲、體重指數≥40 $kg \cdot m^{-2}$ 的擇期手術患者。有嚴重合併症、胃反流疾病、已知的困難氣道或鼻塞患者被排除在外。獲得知情同意後，對患者進行隨機分組。干預組(高流量鼻氧)以 40$L \cdot min^{-1}$ 的 100%鼻氧預充氧 3 分鐘；對照組使用 100%氧通過面罩進行預充氧，目標為呼末 O_2 >85%。麻醉誘導採用異丙酚、瑞芬太尼和羅庫溴銨。未進行面罩通氣。予羅庫溴銨 2 分鐘後，行可視喉鏡檢查。如果喉鏡分級為 I 級或 II 級，則保持喉鏡並繼續研究；如為 III 級或 IV 級，則該患者被排除研究。在呼吸暫停期間，高流量鼻氧患者以 60 $L \cdot min^{-1}$ 吸入鼻氧；對照組患者不接受補充氧氣。當脈搏血氧飽和度(SpO_2)下降到 95%或呼吸暫停時間為 6 分鐘時，達到安全的呼吸暫停時間，為主要結果。然後給病人插管。組間比較採用 T 核對總和 χ^2 分析。P <0 .05 被認為具有顯著差異。

結果：40 名患者完成了這項研究。各組間基線參數具有可比性。與對照組比較，高流量鼻氧組安全呼吸暫停時間明顯延長(261.4±77.7 秒 vs 185.5± 52.9 秒；均值差[95% CI] 75.9 [33.3-118.5]；P = 0.001)，插管前後最低動脈血氧飽和度更高(91.0± 3.5 vs 88.0± 4.8；均值差[95% CI]， 3.1 [0.4-5.7]；P =0 .026)。

結論：與常規氧合相比，高流量鼻氧合可使麻醉誘導過程中病態肥胖患者的安全呼吸暫停時間延長 76 秒(40%)，最低動脈血氧飽和度提高。對於病態肥胖的外科病人，應該考慮高流量給氧治療。

(劉配配 譯潘豔、薛張綱校)

BACKGROUND: Morbidly obese patients undergoing general anesthesia are at risk of hypoxemia during anesthesia induction. High-flow nasal oxygenation use during anesthesia induction prolongs safe apnea time in nonobese surgical patients. The primary objective of our study was to compare safe apnea time, between patients given high-flow nasal oxygenation or conventional facemask oxygenation during anesthesia induction, in morbidly obese surgical patients.
METHODS: Research ethics board approval was obtained. Elective surgical patients ≥18 years with body mass index ≥40 $kg \cdot m^{-2}$ were included. Patients with severe comorbidity, gastric reflux disease, known difficult airway, or nasal obstruction were excluded. After obtaining informed consent patients were randomized. In the intervention (high-flow nasal oxygenation) group, preoxygenation was provided by 100% nasal oxygen for 3 minutes at 40 $L \cdot minute^{-1}$; in the control group, preoxygenation was delivered using a facemask with 100% oxygen, targeting end-tidal O_2 >85%. Anesthesia was induced with propofol, remifentanil, and rocuronium. Bag-mask ventilation was not performed. At 2 minutes after rocuronium, videolaryngoscopy was performed. If the laryngoscopy grade was I or II, laryngoscope was left in place and the study was continued; if grade III or IV was observed, the patient was excluded from the study. During the apnea period, high-flow nasal oxygenation patients received nasal oxygen at 60 $L \cdot minute^{-1}$; control group patients received no supplemental oxygen. The primary outcome, safe apnea time, was reached when oxygen saturation measured by pulse oximetry (SpO_2) fell to 95% or maximum 6 minutes of apnea. The patient was then intubated. T tests and χ^2 analyses were used to compare groups. $P < .05$ was considered significant.
RESULTS: Forty patients completed the study. Baseline parameters were comparable between groups. Safe apnea time was significantly longer (261.4 ± 77.7 vs 185.5 ± 52.9 seconds; mean difference [95% CI], 75.9 [33.3–118.5]; P = .001) and the minimum peri-intubation Spo2 was higher (91.0 ± 3.5 vs 88.0 ± 4.8; mean difference [95% CI], 3.1 [0.4–5.7]; P = .026) in the high-flow nasal oxygenation group compared to the control group.
CONCLUSIONS: High-flow nasal oxygenation, compared to conventional oxygenation, provided a longer safe apnea time by 76 seconds (40%) and higher minimum SpO_2 in morbidly obese patients during anesthesia induction. High-flow oxygenation use should be considered in morbidly obese surgical patients.

血漿催產素個體差異與剖宮產術後切口疼痛的關係

Association of Interindividual Variation in Plasma Oxytocin With Postcesarean Incisional Pain

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Anesthesia & Analgesia: 2019 129 1130-1136

已知催產素具有鎮痛作用且其含量在圍產期被上調。這項初步研究調查了血漿催產素與剖宮產術後切口疼痛的關係。在術前 1 小時以及術後 1 小時和 24 小時，從 18 例擇期剖宮產的患者分別抽取血漿樣品，通過酶聯免疫吸附試驗進行檢測分析。在術後 1 天、8 周、3 個月以及 6 個月評估疼痛情況。結果顯示，術後 24 小時的切口疼痛程度與術後 1 小時和 24 小時血漿催產素水準成反比，較低的疼痛與較高的血漿催產素水準相關(p -0.52 and -0.66; P < .05)。

（高璿 譯 潘豔、薛張綱校）

Oxytocin has known antinociceptive effects and is upregulated perinatally. This pilot study investigated the association of plasma oxytocin and postcesarean incisional pain. Plasma samples from 18 patients undergoing elective cesarean delivery were drawn at 1 hour preoperatively and 1 and 24 hours postoperatively and analyzed by using enzyme-linked immunosorbent assay. Pain was assessed at 1 day, 8 weeks, 3 months, and 6 months postoperatively. Incisional pain at 24 hours was inversely correlated with 1- and 24-hour oxytocin levels, with higher plasma oxytocin associated with lower pain (p -0.52 and -0.66; P < .05).

手術室無線電心電圖監測器的設計與評估：一項初步研究

Design and Evaluation of a Wireless Electrocardiogram Monitor in an Operating Room: A Pilot Study.

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Anesthesia & Analgesia: 2019 129 991-996

背景:有線心電圖監護儀是當前圍術期監護的重要組成部分。無線監控裝置可以減少病人身上的電線數量，從而改善麻醉中病人的管理。然而，人們擔心電刀產生的電磁場可能會干擾手術室中的無線信號。為了評估這個問題的嚴重程度，我們開發了一個藍牙心電圖儀，並將其心電圖軌跡與我們手術室中標準有線心電圖儀進行對比。

方法:我們捕捉了 10 例接受手術患者的藍牙心電圖和標準心電圖軌跡，並分析比較了 P 波，QRS 波，T 波，以及 ST 段距基線水準。同時還評估了電刀對藍牙心電圖和標準心電圖記錄的影響。

結果:藍牙心電圖與標準心電圖在 P 波，QRS 波，T 波持續時間(差值分別為 0.006、

0.004、0.017 秒)，ST 段距基線水準(0.02 mV)方面無臨床相關差異。P 波，QRS 波和 T 波持續時間差值分別為-0.035 ~ 0.047 秒、-0.03 ~ 0.038 秒和-0.112 ~ 0.078 秒，ST 段距基線水準為-0.13 ~ 0.17 mV，平均差值接近於零。電刀的使用均能中斷藍牙心電圖和標準的心電圖信號，但對藍牙心電圖信號沒有電磁干擾作用。

結論:藍牙無線心電圖用於手術室是可靠的。電刀產生的是電偽影，而不是電磁偽影，從而對有線和無線心電圖的影響是相似的。

（陳聿同 譯 潘豔、薛張綱校）

BACKGROUND: Wired electrocardiogram monitors are an important component of current perioperative monitoring. Wireless monitoring units could help reduce the number of cables attached to patients and thus improve anesthesia ergonomics and patient management. However, there is concern that electromagnetic interference generated by electrosurgical units may prevent effective wireless signals in the operating room. To evaluate the extent of this problem, we developed a Bluetooth electrocardiogram prototype monitor and compared its electrocardiogram traces to those captured with a standard wired electrocardiogram monitor in our operating room.

METHODS: Bluetooth electrocardiogram and standard electrocardiogram traces captured from 10 patients undergoing surgical procedures that required use of an electrosurgical unit were compared by analysis of the durations of the P wave, QRS complex, and T wave and the position of the ST segment from the isoelectric line. The impact of the electrosurgical units on the Bluetooth electrocardiogram and S-electrocardiogram recordings was also assessed.

RESULTS: There were no clinically relevant differences in P wave, QRS complex, or T-wave durations (0.006, 0.004, and 0.017 seconds, respectively) between Bluetooth electrocardiogram and standard electrocardiogram or in the position of the ST segment from the isoelectric line (0.02 mV). Mean differences were near zero, and Bland-Altman limits of agreement for individual differences were narrow (-0.035 to 0.047, -0.03 to 0.038, and -0.112 to 0.078 seconds for P wave, QRS complex, and T-wave durations, respectively, and -0.13 to 0.17 mV for ST segment position). Electrosurgical units use electrically disrupted Bluetooth electrocardiogram and standard electrocardiogram signals, but there was no electromagnetic interference effect on the Bluetooth electrocardiogram signals.

CONCLUSIONS: Wireless electrocardiogram using Bluetooth can be reliably used in the operating room. The electrosurgical unit induces electric rather than electromagnetic artifacts, thus affecting wired and wireless electrocardiogram in a similar fashion.

脊髓星形膠質細胞中的 GCs-SGK1-ATP 信號通路影響術前焦慮引起的術後痛覺

過敏

The GCs-SGK1-ATP Signaling Pathway in Spinal Astrocytes Underlied Presurgical Anxiety-Induced Postsurgical Hyperalgesia

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Anesthesia & Analgesia: 2019 129 1163-1169

背景：接受手術治療的患者通常會感到焦慮。越來越多的證據表明，術前焦慮與更嚴重的術後疼痛有關。通過建立一個動物模型，即將 Sprague-Dawley 大鼠暴露于單次長時間應激（SPS）程式中，以誘發類似術前焦慮的行為。實驗表明術前焦慮不僅會加劇且延長了術後痛苦，但其潛在機制尚不清楚。

方法：給 C + Cort 組、I + Cort 組、A + Cort 組和 AI + Cort 組的大鼠注射皮質酮。給 C + RU486 組、I + RU486 組、A + RU486 組和 AI + RU486 組的大鼠注射米非司酮（RU486）。給 C + GSK650394 組和 AI + GSK650394 組的大鼠注射 GSK650394。C + FC1 組和 AI + FC1 組的大鼠在 SPS 前 30 分鐘、切開前 30 分鐘以及術後第 1、2、3、4 和 5 天均注射氟檸檬酸（FC）。術後第 7、8、9、10、11、12 和 13 天向 FC2 和 AI + FC2 組注射 FC。在 SPS 手術前 24 小時和術後 1 至 28 天評估足爪退縮的機械閾值。通過酶聯免疫吸附測定法測定皮質酮。通過 Western 印跡觀察血清/糖皮質激素調節激酶 1（SGK1），白介素-1β 和腫瘤壞死因數-α 的表達。用 ATP 測定試劑盒測定三磷酸腺苷（ATP）的濃度。

結果：這項研究表明，SPS 升高了星形膠質細胞的血漿糖皮質激素和 ATP 釋放，意味著術前焦慮引起的術後痛覺過敏的機械性疼痛超敏反應依賴於 GCs-SGK1-ATP 信號通路。星形膠質細胞中 SGK1 蛋白水準隨著糖皮質激素的刺激而增加，並增強了 ATP 的細胞外釋放。此外，脊髓星形膠質細胞在痛敏持續狀態中起到關鍵作用。在持續階段靶向脊髓星形膠質細胞可阻止病理性進展。

結論：這些資料表明一個重要的信號通路影響了術前焦慮引起的術後疼痛敏感

性。

（李瑋珊 譯 潘豔、薛張綱校）

BACKGROUND: Patients undergoing surgery often feel anxious. Accumulating evidence indicated that presurgical anxiety was related to the more severe postsurgical pain. An animal model was established that exposed Sprague-Dawley rats to a single-prolonged stress (SPS) procedure to induce presurgical anxiety-like behaviors. The experiment revealed that presurgical anxiety not only aggravated but also prolonged postsurgical pain. However, the underlying mechanisms were unknown.
METHODS: The rats in group C + Cort, group I + Cort, group A + Cort, and group AI + Cort were injected with corticosterone. The rats in group C + RU486, group I + RU486, group A + RU486, and group AI + RU486 were injected with mifepristone (RU486). The rats in group C + GSK650394 and group AI + GSK650394 were injected with GSK650394. The rats in group C + FC1 and group AI + FC1 were injected with fluorocitrate (FC) 30 minutes before SPS, 30 minutes before incision, and on postoperative days 1, 2, 3, 4, and 5. The rats in group C + FC2 and group AI + FC2 were injected with FC on postoperative days 7, 8, 9, 10, 11, 12, and 13. The paw withdrawal mechanical threshold was assessed 24 hours before SPS and from postoperative days 1 to 28. The level of corticosterone was determined by enzyme-linked immunosorbent assay. The expression of serum/glucocorticoid regulated kinase 1 (SGK1), interleukin-1β, and tumor necrosis factor-α was visualized by Western blot. The concentrations of adenosine triphosphate (ATP) were measured by ATP assay kit.
RESULTS: This study showed SPS elevated plasma glucocorticoids and ATP release from astrocytes, which meant the mechanical pain hypersensitivity in presurgical anxiety-induced postsurgical hyperalgesia was dependent on GCs-SGK1-ATP signaling pathway. SGK1 protein level in astrocytes was increased in response to the glucocorticoid stimuli and enhanced the extracellular release of ATP. Furthermore, spinal astrocytes played a key role in the maintenance. Targeting spinal astrocytes in maintenance phase prevented the pathological progression.
CONCLUSIONS: These data suggested an important signaling pathway that affected the pain sensitivity after operation caused by presurgical anxiety.

安大略省癡呆患者機械通氣率：一項基於人群的佇列研究

Rates of Mechanical Ventilation for Patients With Dementia in Ontario: A Population-Based Cohort Study

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Anesthesia & Analgesia: 2019 129 e122-e125

背景：在美國，接受有創性機械通氣的老年癡呆症患者的數量正在增加，而在這一人群中，重症監護干預措施的潛在益處和危害的平衡尚不清楚。在本報告中，我們描述了加拿大安大略省癡呆和非癡呆老年人使用侵入性機械通氣的趨勢，並提供了到 2025 年使用侵入性機械通氣的預測。我們發現，老年癡呆患者的侵入性機械通氣率的增長速度快於其他老年人(非癡呆)人群。

癡呆發生率隨年齡呈指數增長。目前，加拿大估計有 564,000 人患有癡呆，並且預測這一數字將在 15 年內加倍。這種進行性的、經常被忽視的終末期疾病以重要的認知和功能損害為特徵，經常導致住院和進入重症監護病房，並且這些措施不會顯著改善存活率。在重症監護病房中進行的干預，例如有創性機械通氣，往往是可以挽救患者生命的。但是在許多患有癡呆的個體中，這些措施的益處上不明確，並且可能是患者轉歸的障礙。急性呼吸衰竭需要有創性機械通氣是進入重症監護病房的常見原因。我們試圖確定加拿大癡呆患者的有創性機械通氣率是否在以與美國相同的速率增加，或者有創性機械通氣的模式是否有所不同。我們還對 2025 年的這些速率進行了預測，以提供對該人群中有創性機械通氣的預期用途的估計。

方法：對加拿大安大略省年齡高於 65 歲的患者的住院人數進行統計，採用 2005 年至 2014 年間安大略省醫療保險計畫提交的醫生帳單，排除了確定的慢性機械通氣診斷患者。然後，我們使用了一種已經驗證用於安大略省人口級健康管理資料集的演算法來識別先前診斷為癡呆症的患者。根據該演算法，癡呆的診斷標準是兩年時間至少 30 天內，對 1 次入院或 3 名醫生提出的相關診斷，或者是應用過任何膽鹼酯酶抑制劑的配方藥。這項研究得到了 Sunnybrook 健康科學中心的研究倫理委員會的批准，其中包括征得患者個人同意。利用加拿大統計局和安大

略省財政部獲得的人口估計和預測，我們計算了 2005 年至 2014 年所有年齡大於 65 歲患者的有創性機械通氣人口比率，並根據癡呆診斷結果將其分層。根據 2005 至 2014 年觀察到的比率趨勢和人口預測，我們估計了 2015 年至 2025 年期間需要有無癡呆的侵入性機械通氣患者的人數。本文在流行病學指南中加強對觀察性研究的報導。

結果：該佇列由 199016 名年齡高於 65 歲的患者組成，他們於 2005 年至 2014 年在安大略省住院並接受了有創性機械通氣。在這些病人中，有 17065 人(8.6%)曾被診斷為癡呆。癡呆患者的平均機械通氣時間(SD)稍長，非癡呆組為 7.0 天(22.2 天)，6.1 天(16.0 天)，P<0.001。接受氣管切開術的癡呆患者和非癡呆患者的比例相當(分別為 6.2%和 6.3%，p=0.75)。在所有癡呆症患者中，44.3%在醫院死亡，25.0%出院，29.3%在長期護理或複雜的繼續護理設施中出院。接受有創性機械通氣的老年患者住院的絕對人數增加了 33.7%(從 2005 年的 17612 人增加到 2014 年的 23540 人)，這一人口的平均絕對年增長率為 3.3%。接受有創性機械通氣治療的癡呆患者人數幾乎翻了一番，從 2005 年的 1181 人增至 2014 年的 2329 人，平均絕對年增長率為 7.8%。非癡呆患者的絕對年增長率為 2.9%。

結論：預計到 2025 年，接受無癡呆的侵入性機械通氣的老年患者將是 2005 年的 2 倍(30866 比 16431)，而接受有創性機械通氣的老年癡呆患者將是 2005 年的 4 倍(5043 比 1181)。2005 年，所有有創機械通氣癡呆患者的比例為 6.7%，2014 年增至 9.9%。到 2025 年，估計癡呆症患者將占所有接受有創機械通氣(表)的老年患者的 14.0%。

(盧旭 譯 潘豔、薛張綱校)

BACKGROUND: Rates of dementia increase exponentially with age. Currently, there are an estimated 564,000 individuals in Canada living with dementia, and

projections suggest that this number will double within 15 years.1 The trajectory of this progressive, and sometimes underrecognized, terminal disease is characterized by important cognitive and functional impairment, leading to complications that frequently result in hospitalizations and admission to intensive care units, without substantial improvement in survival.2 Interventions performed in an intensive care unit environment, such as invasive mechanical ventilation, can be lifesaving. But in many individuals with dementia, these procedures have unclear benefit and may be a barrier to providing quality end-of-life care.2,3 Acute respiratory failure requiring invasive mechanical ventilation is a common cause of admission to intensive care unit.4 A previous study in the United States demonstrated that the use of invasive mechanical ventilation by those age 65 and older is increasing over time, especially in patients with a previous diagnosis of dementia.5 In the present study, we sought to determine whether the rates of invasive mechanical ventilation in patients with dementia in Canada are increasing at the same rate as in the United States or whether patterns of invasive mechanical ventilation are different in a health care system with more constrained critical care resources.5,6 We also generated projections of these rates through 2025 to provide estimates of the expected use of invasive mechanical ventilation in this population.

METHODS We identified the number of hospitalizations for patients ⩾65 years of age that included receipt of invasive mechanical ventilation in Ontario, Canada, using physician billing codes submitted to the Ontario Health Insurance Plan for invasive mechanical ventilation from 2005 to 2014.7 We excluded patients with a diagnosis of chronic mechanical ventilation, identified by the International Classification of Diseases, Tenth Revision, Clinical Modification code (Z99.11). We then used an algorithm that has been validated for use with Ontario population-level health administrative datasets to identify patients with a prior diagnosis of dementia.8 According to this algorithm, a diagnosis of dementia was based on having a relevant diagnosis from 1 hospital encounter or 3 physician billing claims within a 2-year period separated by at least 30 days, or a filled prescription for any cholinesterase inhibitor. The study was approved by the research ethics board of Sunnybrook Health Sciences Centre, including a waiver for individual patient consent because the data sets were linked using unique encoded identifiers and analyzed at the Institute for Clinical Evaluative Sciences. Using population estimates and projections obtained from Statistics Canada and the Ontario Ministry of Finance, we calculated population rates of invasive mechanical ventilation from 2005 to 2014 for all patients ⩾65 years of age and stratified these according to the presence of a diagnosis of dementia. Using the observed rate trends for 2005 to 2014 and population projections, we estimated the number of patients requiring invasive mechanical ventilation with and without dementia from 2015 out to 2025. This article adheres to Strengthening the Reporting of Observational studies in Epidemiology guidelines.

RESULTS The cohort consisted of 199,016 patients ⩾65 years of age who were hospitalized and received invasive mechanical ventilation from 2005 to 2014 in Ontario. Of these patients, 17,065 (8.6%) had a previous diagnosis of dementia. The mean (SD) duration of mechanical ventilation was slightly longer among patients with

dementia: 7.0 days (22.2 days) vs 6.1 days (16.0 days) among those without dementia, P < .001. The proportions of dementia and nondementia patients who received a tracheostomy were comparable (6.2% vs 6.3%, respectively, P = .75). Among all patients with dementia, 44.3% died in the hospital, 25.0% were discharged home, and 29.3% were discharged to either longterm care or complex continuing care facilities. The absolute number of hospitalizations in elderly patients receiving invasive mechanical ventilation increased 33.7% (from 17,612 in 2005 to 23,540 in 2014 in Ontario), at an average absolute annual growth rate of 3.3% in this population. The number of patients with dementia who received invasive mechanical ventilation nearly doubled, from 1181 in 2005 to 2329 in 2014, at an average absolute annual growth rate of 7.8% (Figure). For nondementia patients, the absolute annual growth rate was 2.9%. Projecting to 2025, 2 times as many elderly patients will receive invasive mechanical ventilation without dementia compared with 2005 (30,866 vs 16,431), and >4 times as many patients with dementia will receive invasive mechanical ventilation compared with 2005 (5043 vs 1181).
CONCLUSIONS: The percentage of all invasive mechanical ventilation patients with dementia was 6.7% in 2005, and it increased to 9.9% in 2014 (Table). By 2025, it is estimated that patients with dementia will account for 14.0% of all elderly patients who receive invasive mechanical ventilation (Table).

為實行小兒喉裂修補術提供兒科圍手術期家庭醫療模式綜合護理協調途徑

Implementing a Pediatric Perioperative Surgical Home Integrated Care Coordination Pathway for Laryngeal Cleft Repair.

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Anesthesia & Analgesia: 2019 129 1053-1060

背景：小兒圍手術期家庭醫療模式(PPSH)是一種綜合護理模式，其目的是通過將注意力從患者接觸水準轉移到總體的外科護理階段，從而提供更好的患者護理和價值。到目前為止，還沒有針對複雜氣道疾病的 PPSH 模型。據推測，發展一種用於喉裂修復的 PPSH 將降低該人群術後較高的醫療資源佔用率。

方式：該研究獲得了機構審查委員會的批准，以便進行資料收集和分析。在 PPSH 開發階段，聚集了由麻醉師、外科醫生、護理人員、資訊技術專家和財務管理人員組成的多學科團隊。制定了標準化的圍手術期(術前、術中和術後)方案，重點關注術前風險分層。術前出現共病≥1 例的患者術後轉至重症監護病房(ICU)，

未出現嚴重全身性疾病的患者轉至低危監護區過夜觀察。PPSH 協議的成功是通過品質結果和價值測量來定義的。

結果：PPSH 計畫包括 120 例患者，PPSH 前期組包括 115 例在實施新方法之前進行喉裂修復的患者。對 PPSH 前期組患者進行回顧性分析，將施行 PPSH 後的患者分為 ICU 候選人或低危監護候選人。在 79 例 PPSH 前期患者中，有 70 例(89%)被轉至 ICU (P <0 .001)。回顧性分析發現，採用 PPSH 風險分層，PPSH 前期組可縮短 143 天的 ICU 床位佔用。PPSH 前期組觀察到的手術時間(P =0 .034)和住院時間(P =0 .015)稍長。30 天的意外再入院率與新的 PPSH 計畫無關(P = .093)。兩組患者均未出現緊急插管或其他預期的併發症。PPSH 觀察組患者的總住院費用與 PPSH 前觀察組患者相比沒有降低(差異= 8%;95% ，置信區間，-7%~23%)。

結論：明確的喉裂修補術前篩查方案可以減少術後 ICU 的入住率，而不影響患者的安全。而這些發現是否適用於其他複雜的氣道手術還需要進一步的研究。

（何黃威 譯 潘豔、薛張綱校）

BACKGROUND: The Pediatric Perioperative Surgical Home (PPSH) model is an integrative care model designed to provide better patient care and value by shifting focus from the patient encounter level to the overarching surgical episode of care. So far, no PPSH model has targeted a complex airway disorder. It was hypothesized that the development of a PPSH for laryngeal cleft repair would reduce the high rates of postoperative resource utilization observed in this population.
METHODS: Institutional review board approval was obtained for the purpose of data collection and analysis. A multidisciplinary team of anesthesiologists, surgeons, nursing staff, information technology specialists, and finance administrators was gathered during the PPSH development phase. Standardized perioperative (preoperative, intraoperative, and postoperative) protocols were developed, with a focus on preoperative risk stratification. Patients presenting before surgery with ≥1 predefined medical comorbidity were triaged to the intensive care unit (ICU) postoperatively, while patients without severe systemic disease were triaged to a lower-acuity floor for overnight observation. The success of the PPSH protocol was defined by quality outcome and value measurements.
RESULTS: The PPSH initiative included 120 patients, and the pre-PPSH period included 115 patients who underwent laryngeal cleft repair before implementation of

the new process. Patients in the pre-PPSH period were reviewed and classified as ICU candidates or lower acuity floor candidates had they presented in the post-PPSH period. Among the 79 patients in the pre-PPSH period who were identified as candidates for the lower-acuity floor transfer, 70 patients (89%) were transferred to the ICU (P < .001). Retrospective analysis concluded that 143 ICU bedded days could have been avoided in the pre-PPSH group by using PPSH risk stratification. Surgery duration (P = .034) and hospital length of stay (P = .015) were found to be slightly longer in the group of pre-PPSH observation unit candidates. Rates of 30-day unplanned readmissions to the hospital were not associated with the new PPSH initiative (P = .093). No patients in either group experienced emergent postoperative intubation or other expected complications. Total hospital costs were not lower for PPSH observation unit patients as compared to pre-PPSH observation unit candidates (difference = 8%; 95% confidence interval, -7% to 23%).
CONCLUSIONS:A well-defined preoperative screening protocol for patients undergoing laryngeal cleft repair can reduce postoperative ICU utilization without affecting patient safety. Further research is needed to see if these findings are applicable to other complex airway surgeries.

一款電子術後出院評分系統的研發與驗證

Development and Validation of an Electronic Postoperative Morbidity Score.
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Anesthesia & Analgesia: 2019 129 935-942

背景：鑒於電子病歷的眾多潛在優勢，它被廣泛應用於各大醫學中心。這需要開發客觀的指標來判斷患者術後是否可出院，類似於在沒有電子病歷的醫學中心進行的研究。我們研發了一款電子術後出院評分系統，以納入我們的電子病歷。

方法：我們回顧性地分析了 203 例接受擇期手術的體弱患者，並對其術後第 3 天是否可以出院進行了評分。同時我們還對很難用客觀指標描述的非電子評分系統進行了記錄。我們採用受試者曲線下面積比較了他們對需要延長住院時間或有複雜出院需求病人的辨別能力。

結果：在電子術後出院評分系統≥1 分的患者中，有 139 例(68%)出院。而原始的非電子評分系統則更加敏感，有 173 例(84%)出院。對比術後出院“金標準”評

分系統，我們採用逆向邏輯回歸對我們的指標進行了完善，最終版電子術後出院評分系統與最初版本在心臟科和神經科出院率的定義上有所不同。術後電子出院評分系統與非電子評分系統對需要延長住院時間（受試者曲線下面積:0.66 vs . 0.67）和有複雜出院需求病人（受試者曲線下面積:0.66 vs . 0.66）的辨別能力均無顯著差異（P > 0.05）。患者在術後第 3 天被評有電子術後評分或非電子評分均增加了延長住院時間的風險(P < 0.001)。

結論：我們提出了一種基於客觀電子指標的術後出院評分系統。其辨別能力似乎可與金標準的出院結果相媲美。電子術後出院評分可以在我們的電子病歷中對出院率進行定義，但還需要進一步的研究來評估其外部有效性。

(張森 譯 潘豔、薛張綱校)

BACKGROUND: Electronic health records are being adopted due to numerous potential benefits. This requires the development of objective metrics to characterize morbidity, comparableto studies performed in centers without an electronic health record. We outline the developmentof an electronic version of the postoperative morbidity score for integration into our electronichealth record.
METHODS: Two hundred and three frail patients who underwent elective surgery were reviewed. We retrospectively defined postoperative morbidity score on postoperative day 3. We also recorded potential electronic surrogates for morbidities that could not be easily extracted in an objective format. We compared discriminative capability (area under the receiver operator curve) for patients having prolonged length of stay or complex discharge requirements.
RESULTS: One hundred thirty-nine patients (68%) had morbidity in ≥1 postoperative morbidity score domain. Initial electronic surrogates were overly sensitive, identifying 173 patients (84%) as having morbidity. We refined our definitions using backward logistic regression against "goldstandard" postoperative morbidity score. The final electronic postoperative morbidity score differed from the initial version in its definition of cardiac and neurological morbidity. There was no significant difference in the discriminative capability between electronic postoperative morbidity score and postoperative morbidity score for either outcome (area under the receiver operator curve: 0.66 vs 0.66 for complex discharge requirement, area under the receiver operator curve: 0.66 vs 0.67 for a prolonged length of stay; P > .05 for both). Patients with postoperative morbidity score or electronic postoperative morbidity score–defined morbidity on day 3 had ncreased risk of prolonged length of stay (P < .001 for both).

CONCLUSIONS: We present a variant of postoperative morbidity score based on objective electronic metrics. Discriminative performance appeared comparable to gold-standard definitionsfor discharge outcomes. Electronic postoperative morbidity score may allow characterization ofmorbidity within our electronic health record, but further study is required to assess externalvalidity.

局麻藥通過多種機制抑制 TWIK 相關的雙控鉀通道

Polymodal Mechanism for TWIK-Related K+ Channel Inhibition by Local Anesthetic.

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Anesthesia & Analgesia: 2019 129 973-982

背景：局麻藥可以可逆地阻滯疼痛，並且可以抑制 TWIK 相關的雙控鉀通道（TREK-1）的電流。在局麻起效前，注射局麻藥會引起短暫的疼痛。TREK-1 是一種與麻醉劑有關的鉀通道，參與抑制疼痛調節，而 TREK-1 蛋白的 C 末端可能參與其中機制。但是局麻藥抑制 TREK-1 的分子機制尚未清楚。磷脂酶 D2（PLD2）可以與 TREK-1 的 C 末端結合，參與生成磷脂酸（PA），這個過程與 TREK-1 的啟動有關。

方法：我們將採用生理和細胞學方法分別對脂質介導的 TREK-1 直接抑制和間接抑制進行實驗。將純化的通道蛋白和人工膜重組，並檢測離子流，通過這種方法檢測局麻藥和 TREK-1 通道的直接結合作用。運用 PDL2 螢光產物生成的方法，檢測活細胞脂質的生成，再通過膜片鉗技術檢測活細胞離子通道的離子流，通過這兩種方法檢測 PA 介導的 TREK-1 通道抑制。最後，通過超分辨成像技術，在納米水準檢測麻醉藥誘導的 PLD2 往 TREK-1 通道的轉位。

結果：結果顯示，丁卡因、利多卡因和布比卡因直接結合並抑制 PLD2 的酶活性。PLD2 的失活間接抑制 TREK-1 的離子流。一些局麻藥還可以與 TREK-1 通道直接結合，部分阻擋開放的通道，相對於布比卡因和利多卡因，丁卡因的這種阻滯

作用相對較強。另外，局麻藥還可以破壞脂筏結構，如果不是因為局麻藥直接抑制酶的催化活性，破壞脂筏結構本應該可以啟動 PLD2。

結論：我們由實驗提出局麻藥抑制 TREK-1 通道包括：（1）主要抑制 PLD2 介導的脂質水解;（2）一些局麻藥可以部分阻滯開放的離子通道起到一定的抑制效果。通過對 PLD2 的抑制可以解釋 TREK-1 的 C 末端是如何在沒有與局麻藥相關的結構或結合位元點的情況下，參與調節離子通道。

（周修適 譯 潘豔、薛張綱校）

BACKGROUND: Local anesthetics cause reversible block of pain and robustly inhibit TWIK-related K channel (TREK-1) currents. Before local anesthesia onset, injection of local anesthetics can cause unwanted transient pain. TREK-1 is an anesthetic-sensitive potassium channel that when inhibited produces pain. A disordered C-terminal loop of TREK-1 is thought to contribute to anesthetic sensitivity, but the molecular basis for TREK-1 inhibition by local anesthetics is unknown. Phospholipase D2 (PLD2) is an enzyme that produces phosphatidic acid (PA) required for TREK-1 activation and also binds to the channel's C terminus.
METHODS: Here, we use biophysical and cellular techniques to characterize direct and indirect lipid-mediated mechanism for TREK-1 inhibition (respectively). We characterized direct binding of local anesthetic to TREK-1 by reconstituting the purified channel into artificial membranes and measuring ion flux. We characterized indirect PA-mediated inhibition of TREK-1 by monitoring lipid production in live whole cells using a fluorescent PLD2 product release assay and ion channel current using live whole-cell patch-clamp electrophysiology. We monitored anesthetic-induced nanoscale translocation of PLD2 to TREK-1 channels with super-resolution direct stochastic reconstruction microscopy (dSTORM).
RESULTS: We find local anesthetics tetracaine, lidocaine, and bupivacaine directly bind to and inhibit PLD2 enzymatic activity. The lack of PLD2 activity indirectly inhibited TREK-1 currents. Select local anesthetics also partially blocked the open pore of TREK-1 through direct binding. The amount of pore block was variable with tetracaine greater than bupivacaine and lidocaine exhibiting a minor effect. Local anesthetics also disrupt lipid rafts, a mechanism that would normally activate PLD2 were it not for their direct inhibition of enzyme catalysis.
CONCLUSIONS: We propose a mechanism of TREK-1 inhibition comprised of (1) primarily indirect PLD2-dependent inhibition of lipid catalysis and (2) limited direct inhibition for select local anesthetics through partial open pore block. The inhibition through PLD2 explains how the C terminus can regulate the channel despite being devoid of structure and putative binding sites for local anesthetics.

圍手術期葡萄糖輸注與術後噁心嘔吐的薈萃分析

Perioperative Dextrose Infusion and Postoperative Nausea and Vomiting: A Meta-analysis of Randomized Trials

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Anesthesia & Analgesia: 2019 129 943-950

背景：圍手術期靜脈注射葡萄糖有可能降低術後噁心和嘔吐的風險。在這項薈萃分析中，我們研究了術中或術後輸注葡萄糖預防術後噁心和嘔吐的作用。

方法：我們的研究小組檢索了 pubmed、embase、cochrane 圖書館和 google 學者資料庫，尋找相關的隨機對照試驗，檢查圍手術期靜脈注射葡萄糖預防術後噁心和嘔吐的應用。主要結果是術後噁心和嘔吐的發生率(在麻醉後復蘇室和術後 24 小時內)。次要結果包括術後止吐藥物的使用和血糖水準。

結果：我們的研究共納入 10 個隨機對照試驗（n=987 名患者），比較了圍手術期葡萄糖輸注（n=465）和安慰劑（n=522）使用情況。無論在術後恢復室（風險比為 0.91，95%可信區間為 0.73-1.15；p=0.44）還是術後 24 小時內（風險比為 0.76，95%可信區間為 0.55-1.04；p=0.09），圍術期外源性葡萄糖輸注均與術後噁心和嘔吐的顯著減少無關。儘管在最初的 24 小時內使用右旋葡萄糖可顯著減少止吐藥的使用（風險比為 0.55，95%CI 為 0.45-0.69；P<0.001），但與對照組相比，術後血糖水準有所升高。

結論：圍手術期使用葡萄糖與術後噁心和嘔吐沒有統計學上的顯著相關性。使用時，建議進行血糖監測以評估術後高血糖。有必要進行進一步的前瞻性試驗，以檢測輸注葡萄糖的時機對術後噁心嘔吐發生率和抗嘔吐補救藥物使用的潛在影響。

（吳潔譯 李士通校）

BACKGROUND: Perioperative IV dextrose infusions have been investigated for their potential to reduce the risk of postoperative nausea and vomiting. In this meta-analysis, we investigated the use of an intraoperative or postoperative infusion of dextrose for the prevention of postoperative nausea and vomiting.

METHODS: Our group searched PubMed, Embase, Cochrane library, and Google Scholar for relevant randomized controlled trials examining the use of perioperative IV dextrose for prevention of postoperative nausea and vomiting. The primary outcome was the incidence of postoperative nausea and vomiting (both in the postanesthesia care unit and within the first 24 h of surgery). Secondary outcomes included postoperative antiemetic administration and serum glucose level.

RESULTS: Our search yielded a total of 10 randomized controlled trials (n = 987 patients) comparing the use of a perioperative dextrose infusion (n = 465) to control (n = 522). Perioperative dextrose infusion was not associated with a significant reduction in postoperative nausea and vomiting in the postanesthesia care unit (risk ratio = 0.91, 95% CI, 0.73-1.15; P = .44) or within

the first 24 h (risk ratio = 0.76, 95% CI, 0.55-1.04; P = .09) of surgery. Although the use of dextrose was associated with a significant reduction in antiemetic administration within the first 24 h (risk ratio = 0.55, 95% CI, 0.45-0.69; P < .001), it also increased postoperative plasma glucose levels compared to controls.
CONCLUSIONS: The use of perioperative dextrose did not result in a statistically significant association with postoperative nausea and vomiting. When utilized, plasma glucose monitoring is recommended to assess for postoperative hyperglycemia. Further prospective trials are necessary to examine the potential impact of timing of administration of a dextrose infusion on incidence of postoperative nausea and vomiting and rescue antiemetic requirements.

腹腔內手動推注與微量泵入布比卡因與嗎啡需要量在幼兒體內的群體藥代動學研究

Population Pharmacokinetics of Intraperitoneal Bupivacaine Using Manual Bolus Atomization Versus Micropump Nebulization and Morphine Requirements in Young Children

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Anesthesia & Analgesia: 2019 129 963-972

背景：成人和兒童在腹腔鏡手術後均採用腹腔內注射局部麻醉藥進行術後鎮痛。布比卡因在兒童中的群體藥代動力學（PK）尚未確定。本研究的目的是（1）建立一個群體 PK 模型，比較通過手動推注和微量泵注方式給予布比卡因和（2）評估術中給予布比卡因的術後嗎啡需要量。我們假設兩種給藥方法的 PK 值和嗎啡需求量相似。

方法：這是一項前瞻性、連續性、觀察性研究。在機構審查委員會（IRB）批准和家長書面知情同意後，67 名 6 個月至 6 歲接受機器人輔助腹腔鏡泌尿外科手術的兒童在手術開始時接受了腹腔內布比卡因注射治療。所有患兒接受了總劑量為 1.25 mg/kg 的布比卡因，用 30 毫升生理鹽水稀釋，手動大於 30 秒一次性推注或未經稀釋的 0.5%布比卡因通過微泵由二氧化碳（CO2）氣腹針霧化後大於 10-17.4 分鐘吹入腹腔。術中 1～120min 選取 4 個時間點採集靜脈血樣。採用液相色譜-質譜聯用技術對樣品進行分析。採用非室模型和房室模型分析受訪者計算 PK 參數。用非線性回歸模型估算 PK 參數（主要結果）和用 mann-whitney u 檢驗嗎啡需求量（次要結果）。

結果：兩種用藥方式的患者特徵具有可比性。沒有觀察到神經毒性或心臟毒性的臨床症狀。手動推注的血漿藥物濃度峰值範圍為 0.39-2.44 微克/毫升，而微量泵霧化吹入的血漿藥物濃度峰值範圍為 0.25-1.07 微克/毫升。兩種給藥方法均採用 1 室模型描述腹腔內布比卡因 PK 值。手動推注相比，微泵霧化吹入給藥所致布比卡因最高血漿藥物濃度（Cmax）顯著降低，而且達到此 Cmax（Tmax）濃度所需時間較短（P<0.001）。用微泵霧化吹入的 PK 模型觀察和預測到的血漿藥物濃度較低和患者間變異性較少（p<0.001）。年齡、體重和性別等協變數校正後，微泵霧化吹入布比卡因的 Cmax 和 PK 曲線下面積（AUC）顯著較低（p<0.001）。無論採用何種布比卡因給藥方式，在所有時間點嗎啡的需求量都很低。術後 24 小時內無論手動推注還是微泵霧化吹入布比卡因，患兒靜脈注射/口服嗎啡（0.14 與 0.17 mg/kg，p=0.85）的累積需求量無差異。

結論：與手動腹腔內推注布比卡因相比，用微泵霧化腹腔內吹入布比卡因在獲得相似的臨床療效的同時，血漿濃度較低，患者間變異性較少，並可降低毒性反應風險。這是首次在兒童

中進行腹腔內布比卡因的人群藥代動力學研究，未來仍需隨機對照試驗來確定療效。
（吳潔譯 李士通校）

BACKGROUND: Intraperitoneal (IP) administration of local anesthetics is used in adults and children for postoperative analgesia after laparoscopic surgery. Population pharmacokinetics (PK) of IP bupivacaine has not been determined in children. Objectives of this study were (1) to develop a population PK model to compare IP bupivacaine administered via manual bolus atomization and micropump nebulization and (2) to assess postoperative morphine requirements after intraoperative administration. We hypothesized similar PK profiles and morphine requirements for both delivery methods.

METHODS: This was a prospective, sequential, observational study. After institutional review board (IRB) approval and written informed parental consent, 67 children 6 months to 6 years of age undergoing robot-assisted laparoscopic urological surgery received IP bupivacaine at the beginning of surgery. Children received a total dose of 1.25 mg/kg bupivacaine, either diluted in 30-mL normal saline via manual bolus atomization over 30 seconds or undiluted bupivacaine 0.5% via micropump nebulization into carbon dioxide (CO2) insufflation tubing over 10-17.4 minutes. Venous blood samples were obtained at 4 time points between 1 and 120 minutes intraoperatively. Samples were analyzed by liquid chromatography with mass spectrometry. PK parameters were calculated using noncompartmental and compartmental analyses. Nonlinear regression modeling was used to estimate PK parameters (primary outcomes) and Mann-Whitney U test for morphine requirements (secondary outcomes).

RESULTS: Patient characteristics between the 2 delivery methods were comparable. No clinical signs of neurotoxicity or cardiotoxicity were observed. The range of peak plasma concentrations was 0.39-2.44 μg/mL for the manual bolus atomization versus 0.25-1.07 μ g/mL for the micropumpnebulization. IP bupivacaine PK was described by a 1-compartment model for both delivery methods. Bupivacaine administration by micropump nebulization resulted in a significantly lower Highest Plasma Drug Concentration (Cmax) and shorter time to reach Cmax (Tmax) ($P < .001$) compared to manual bolus atomization. Lower plasma concentrations with less interpatient variability were observed and predicted by the PK model for the micropump nebulization ($P < .001$). Adjusting for age, weight, and sex as covariates, Cmax and area under the curve (AUC) were significantly lower with micropump nebulization ($P < .001$). Regardless of the delivery method, morphine requirements were low at all time points. There were no differences in cumulative postoperative intravenous/oral morphine requirements between manual bolusatomization an d micropump nebulization (0.14 vs 0.17 mg/kg; $P = .85$) measured up to 24 hours postoperatively.

CONCLUSIONS: IP bupivacaine administration by micropump nebulization demonstrated lower plasma concentrations, less

interpatient variability, low risk of toxicity, and similar clinical efficacy compared to manual bolus atomization. This is the first population PK study of IP bupivacaine in children, motivating future randomized controlled trials to determine efficacy.

標準型和增強型脈搏血氧飽和度儀對血氧飽和狀態的顯示比較:臨床醫生和非臨床醫師的實驗研究

Comparison of Standard and Enhanced Pulse Oximeter Auditory Displays of Oxygen Saturation: A Laboratory Study With Clinician and Nonclinician Participants

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Anesthesia & Analgesia: 2019 129 997-1004

背景：當從事需要高度注視的任務時，麻醉師依靠脈搏血氧飽和度儀（PO）的不同聲音提示患者的血氧飽和度（Sp02）資訊。目前的聽覺提示在提供 Sp02 資訊方面並不總是有效的。在本實驗室研究中，在執行干擾注意力的任務和背景雜訊存在的情況下，臨床醫生和非臨床醫生參與者使用標準聽覺顯示或具有額外的聲學特性的增強聽覺顯示識別 Sp02 參數。

方法：在平衡交叉設計中，專業麻醉醫師或實習麻醉醫師（n=25）和非臨床醫師（n=28）使用標準顯示器和增強型聽覺顯示器識別 Sp02 參數。參與者執行兩項干擾注意力的任務:（1）算術驗證和（2）關鍵字檢測。整個實驗過程中播放模擬手術室背景雜訊。主要結果是:（1）檢測到 Sp02 目標範圍的轉換和（2）識別 Sp02 範圍（目標值、降低或危急值）。次要結果包括參與者檢測目標轉換的延遲、確定絕對 Sp02 值的準確性、干擾注意力任務的準確性和延遲以及對任務的主觀判斷。

結果：與使用標準顯示相比，參與者使用增強顯示可以更準確地檢測到目標值的變化（57%對 87%；優勢比為 7.3[95%可信區間{CI}為 4.4-12.3]；p<0.001）；並更準確的區分出 Sp02 的 範圍（76%對 86%；優勢比，2.7[95%置信區間，1.6-4.6]；p<0.001）。次要結果分析表明，臨床醫生和非臨床醫生在目標值轉換的檢測準確度和時間延遲、Sp02 範圍識別準確度或 Sp02 絕對值識別方面的表現沒有差異。

結論：增強型聽覺顯示器為臨床醫生和非臨床醫生提供更精確的目標值轉換檢測和 Sp02 範圍識別。儘管他們以前有使用聽覺提示的經驗，但在這項實驗室研究中，臨床醫生在識別 Sp02 結果的準確度方面並不優於非臨床參與者。

（吳潔譯 李士通校）

BACKGROUND: When engaged in visually demanding tasks, anesthesiologists depend on the auditory display of the pulse oximeter (PO) to provide information about patients' oxygensaturation (Sp02). Current auditory displays are not always effective at providing Sp02 information. In this laboratory study, clinician and nonclinician participants identified Sp02 parameters using either a standard auditory display or an auditory display enhanced with additional acoustic properties while performing distractor tasks and in the presence of background noise.

METHODS: In a counter balanced crossover design, specialist or trainee anesthesiologists (n = 25) and nonclinician participants (n = 28) identified Sp02 parameters using standard and enhancedPO auditory displays. Participants performed

2 distractor tasks: (1) arithmetic verification and (2) keyword detection. Simulated background operating room noise played throughout the experiment. Primary outcomes were accuracies to (1) detect transitions to and from an SpO2 target range and (2) identify SpO2 range (target, low, or critical). Secondary outcomes included participants' latency to detect target transitions, accuracy to identify absolute SpO2 values, accuracy and latency of distractor tasks, and subjective judgments about tasks.

RESULTS: Participants were more accurate at detecting target transitions using the enhanceddisplay (87%) than the standard display (57%; odds ratio, 7.3 [95% confidence interval {CI}, 4.4-12.3]; P < .001). Participants were also more accurate at identifying SpO2 range using the enhanced display (86%) than the standard display (76%; odds ratio, 2.7 [95% CI, 1.6-4.6]; P < .001). Secondary outcome analyses indicated that there were no differences in performance between clinicians and nonclinicians for target transition detection accuracy and latency, SpO2 range identification accuracy, or absolute SpO2 value identification.

CONCLUSIONS: The enhanced auditory display supports more accurate detection of target transitions and identification of SpO2 range for both clinicians and nonclinicians. Despite their previous experience using PO auditory displays, clinicians in this laboratory study were no more accurate in any SpO2 outcomes than nonclinician participants.

兒童風險評估評分預測非心臟手術患兒圍手術期死亡率的前瞻性外部驗證 Prospective External Validation of the Pediatric Risk Assessment Score in Predicting Perioperative Mortality in Children Undergoing Noncardiac Surgery

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Anesthesia & Analgesia: 2019 129 1014-1020

背景：儘早確定高危兒童圍手術期死亡率可改善預後，但缺乏有效的風險預測工具。兒科風險評估（PRAm）評分是一種新的預測正在接受非心臟手術的兒科患者圍手術期死亡風險的模型。它來自美國外科學院（ACS）國家外科品質改進計畫（NSQIP）兒科資料庫。在這項研究中，我們的目的是從一個大型機構外部驗證 PRAm 評分。

方法： PRAm 評分由初級麻醉小組前瞻性地分配給 2017 年 7 月至 2018 年 7 月間在一所三級兒科醫院接受非心臟手術的 18 歲以下兒童。主要結果是 PRAm 評分預測 30 天死亡率的能力。受試者工作特性（ROC）曲線下的面積用於確定識別能力。考慮了不同截止點的敏感性和特異性。應用正確診斷指數和灰色地帶法（弱陽性法）確定預測 30 天死亡率的最佳 PRAm 臨界值。

結果:納入“外部驗證”佇列的13530例患者中，30天死亡率的發生率為0.21%(29/13530)。PRAm 評分預測 30 天死亡率，曲線下面積(AUC)為 0.956(95%可信區間[CI]為 0.938-0.974；p<0.001)。約登診斷指數確定最佳 PRAm 評分閾值≥5，敏感性為 86%，特異性為 91%。灰色地帶法確定了 6.93%（938/13530）的 PRAm 評分為 4 或 5（敏感性或特異性分別小於 90%）的患者的死亡風險，因此優化了最佳臨界點為 PRAm 評分≥6。 ASA 分級(ASA PS)≤3(0.06%，8/13530）的患者比 ASA PS≤3 同時 PRAm 評分≥6 的患兒死亡率增加了 8 倍。

結論：PRAm 評分是一種簡單、客觀的工具，它能很好地預測正在進行非心臟手術的患兒圍

手術期死亡風險，且易於臨床應用。PRAm 評分的應用可能對提高嬰兒和兒童的安全和護理品質以及兒童保健系統的資源利用產生重要影響。
（吳潔譯 李士通校）

BACKGROUND: Early identification of children at high risk for perioperative mortality could lead to improved outcomes; however, there is a lack of well-validated risk prediction tools. The PediatricRisk Assessment (PRAm) score is a new model to prognosticate perioperative risk of mortality in pediatric patients undergoing noncardiac surgery. It was derived from the American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP) Pediatric database. In this study, we aimed to externally validate the PRAm score at 1 large institution.

METHODS: A PRAm score was prospectively assigned by the primary anesthesia team to children≤18 years of age undergoing noncardiac surgery between July 2017 and July 2018 at a tertiary care pediatric hospital. The primary outcome was the PRAm score's ability to predict 30-day mortality. The area under the receiver operating characteristic (ROC) curve was utilized to determine discriminative ability. Sensitivity and specificity at varying cutoffs were considered. Youden J index and the gray zone approach were applied to determine the optimal PRAm cutoff for predicting 30-day mortality.

RESULTS: Among the 13,530 cases included in the external validation cohort, the incidence of 30-day mortality was 0.21% (29/13,530). The PRAm score was found to predict 30-day mortality with an area under the curve (AUC) of 0.956 (95% confidence interval [CI], 0.938-0.974; P < .001). Youden J index determined the optimal PRAm score threshold to be ≥5 with a sensitivity of 86% and a specificity of 91%. The gray zone identified an inconclusive risk of mortality in 6.93% (938/13,530) of patients who had PRAm scores of 4 or 5 (sensitivity or specificity <90%, respectively), therefore refining the optimal cutoff point to be a PRAm score of ≥6. The incidence of mortality for patients with an American Society of Anesthesiologists Physical Status (ASA PS) ≤3 (0.06%, 8/13,530) increased 8-fold for those with an ASA PS of ≤3 and a PRAm score of ≥6.

CONCLUSIONS: The PRAm score is a simple and objective tool that has excellent ability to predict perioperative risk of mortality in pediatric patients undergoing noncardiac surgery and can be easily used by clinicians. The application of the PRAm score could have important implications on the safety and quality of care delivered to infants and children and on the resource utilization in the pediatric health care system.

麻醉類型與下肢外傷性骨折術後併發症無關

Anesthesia Type Is Not Associated With Postoperative Complications in the Care of Patients With Lower Extremity Traumatic Fractures

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Anesthesia & Analgesia: 2019 129 1034-1042

背景：軍事麻醉受獨特的後勤、技術、戰術和人員限制，迄今為止，在軍事活動期間戰傷手術麻醉管理方面公佈的資料有限。
目標：這項研究旨在描述和分析法國在一個已部署的軍事環境中的麻醉活動。
方法：2015 年 10 月至 2018 年 2 月間，所有由聖安妮軍隊醫院（Sainte Anne Military Hospital）指派任務的麻醉醫師所管理的患者全部包括在內。對同一麻醉團隊在法國施行相同手術（疝氣修補、下肢和上肢手術）的麻醉管理進行了描述和比較。人口統計學，手術類型和手術活動也被描述。主要終點是描述前方手術團隊（FST）執行任務期間的麻醉管理。次要終點是比較 FST 執行任務期間的麻醉方式與通常在軍隊教學醫院使用的麻醉方式。
結果：在研究期間，11 名麻醉師在 20 次任務中實施了 1547 例麻醉，總共在 9 個不同的據點部署了 1237 天。多數為局部麻醉，單純局部麻醉（43.5%）或聯合全身麻醉（21%）。與法國國內相比,在疝修補術、下肢和上肢手術中使用區域阻滯麻醉的情況在統計學上顯著增加。作為對地方醫療支持的一部分，大多數病人是平民。
結論：在嚴峻的醫療環境下，應該盡可能使用區域麻醉技術。這些結果表明，軍隊麻醉醫師的培訓必須是完整的，包括麻醉、重症監護、兒科和區域阻滯麻醉。
（吳潔譯 李士通校）

BACKGROUND: Military anesthesia meets unique logistical, technical, tactical, and human constraints, but to date limited data have been published on anesthesia management during military operations.
OBJECTIVE: This study aimed to describe and analyze French anesthetic activity in a deployed military setting.
METHODS: Between October 2015 and February 2018, all patients managed by Sainte-Anne Military Hospital anesthesiologists deployed in mission were included. Anesthesia management was described and compared with the same surgical procedures in France performed by the same anesthesia team (hernia repair, lower and upper limb surgeries). Demographics, type of surgical procedure, and surgical activity were also described. The primary endpoint was to describe anesthesia management during the deployment of forward surgical teams (FST). The secondary endpoint was to compare anesthesia modalities during FST deployment with those usually used in a military teaching hospital.
RESULTS: During the study period, 1547 instances of anesthesia were performed by 11 anesthesiologists during 20 missions, totaling 1237 days of deployment in nine different theaters. The majority consisted of regional anesthesia, alone (43.5%) or associated with general anesthesia (21%). Compared with France, there was a statistically significant increase in the use of regional anesthesia in hernia repair, lower and upper limb surgeries during deployment. The majority of patients were civilians as part of medical support to populations.
CONCLUSION: In the context of an austere environment, the use of regional anesthesiatechniques predominated when possible. These results show that the training of military anesthetists must be complete, including anesthesia, intensive care, pediatrics, and regional anesthesia.

衝突管理策略在兒科手術室的應用

Applying Conflict Management Strategies to the Pediatric Operating Room

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Anesthesia & Analgesia: 2019 129p 1109-1117

在當今的醫療環境下，有效的溝通是必不可少的，溝通不良會導致醫療服務提供者之間的衝突。文化和信仰的差異會進一步激發醫療團隊成員、家庭和患者之間的“衝突”。 因為患者、父母/監護人和臨床醫生共同承擔決策責任，使“兒科”患者護理具有更高的發生“衝突”可能性。因為每種衝突情況都需要不同的方法來優化管理，因此瞭解衝突的階段和類型非常重要。同樣重要的是理解個人處理衝突風格的不同。thomas kilmann 衝突模式工具和衝突處理荷蘭測試問卷是評估衝突管理風格的兩個有效工具。不同的風格包括競爭/強迫、合作/解決問題、妥協、回避和讓步/遷就。一個成功的醫生應該能夠識別衝突的不同階段和類型，以便使用最適合的特定衝突管理方法。在兒科手術室有幾種管理衝突的技術。在衝突中承認和管理自己的情緒是避免向擴散局勢邁出的關鍵的第一步。積極傾聽是提高團隊活力的重要溝通技巧。協調衝突各方的利益將有利於合作解決問題。文化勝任力（有效應對多文化情境的能力）培訓可以提高溝通和衝突管理技能。通過對所有圍手術期團隊成員的正式教育，有效的衝突管理可以改善溝通與團隊合作，改善患者的預後。

（吳潔譯 李士通校）

Effective communication is essential in today's health care environment, and poor communication can lead to conflict among health care providers. Differences in cultures and beliefs can further incite conflict among health care team members, families, and patients. Pediatric patient care has a higher potential for conflict because decision-making responsibilities are shared among patients, parents/guardians, and clinicians. It is important to understand the phases and types of conflictbecause each conflict situation requires a different approach to optimize management. Equally important is an understanding of styles used by individuals to manage conflict. The Thomas-Kilmann Conflict Mode Instrument and the Dutch Test for Conflict Handling are 2 validated tools used to assess conflict management styles. The different styles include competing/forcing, collaborating/problem solving, compromising, avoiding, and yielding/accommodating. A successful physician should be able to identify the phases and types of conflict to use the conflictmanagement approach most suitable for the given conflict.There are several techniques for managing conflict in the pediatric operating room. Acknowledging and managing one's own emotions during conflict is a pivotal first step toward diffusing the situation. Active listening is an important communication skill that improves team dynamics. Aligning the interests of the parties involved in conflict will encourage collaborative problem solving. Cultural competency training can improve communication and conflict management skills. Effective conflict management through formal education of all perioperative team members can lead to improved communication and teamwork and better patient outcomes.

兒童複雜顱穹窿重建術圍術期結局及手術病例量:來自兒童顱面協作組織的多中心觀察研究

Perioperative Outcomes and Surgical Case Volume in Pediatric Complex Cranial Vault

Reconstruction: A Multicenter Observational Study From the Pediatric Craniofacial Collaborative Group

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Anesthesia & Analgesia: 2019 129 1069-1078

背景：用於治療顱縫早閉或顱縫骨化症的複雜顱底重建手術（CCVR）常伴隨大量的失血、輸血和圍術期性併發症。本研究的目的是檢驗 CCVR 外科病例量對圍術期後果的影響。我們假定外科病例數量與圍術期結果的差異無關。本項研究的主要結果是整個圍術期獻血者的總暴露量。次要結果包括圍術期總輸血量、嚴重併發症、以及在重症監護室和醫院停留時長。

方法：查詢了 2012 年 6 月至 2016 年 9 月期間，在多中心小兒外科手術圍術期登記進行了 CCVR 手術的兒童和少年。依據每個月平均手術例數，醫療機構被分類為低、中、高量手術病例組。對這些群體的主要結果和次要結果進行了分析。

結果：查詢結果顯示，共有來自 33 所醫療機構的 1814 例 CCVR 病例，三個研究組的人口統計學特徵相似。觀察到外科病例數量與整個圍術期獻血者的總暴露量的逆向關係(<p.001>)。低病例數量組具有高圍術期輸血量（與中等病例數量組相比 P=0.02；與大量病例數量組相比 P=0.01）。手術病例數量與嚴重術後併發症發生率或住院時長沒有顯著關係。

結論：在本研究中，低手術病例組與增加的整個圍術期獻血者的總暴露量和圍術期輸血量相關。住院時長在三組中是均勻的，表明觀察到的輸血結果差異的總體臨床影響有限。

（吳潔譯 李士通校）

BACKGROUND: Complex cranial vault reconstruction (CCVR) performed to treat craniosynostosis can be associated with significant blood loss, transfusion, and perioperative complications. The aim of this study was to examine the effect of CCVR surgical case volume on perioperative outcomes. We hypothesized that surgical case volume is not associated with differences

in perioperative outcomes. The study primary outcome was total perioperative blood donor exposures. Secondary outcomes included the total perioperative transfusion volume, major complications, and intensive care unit and hospital length of stay.

METHODS: The multicenter Pediatric Surgery Perioperative Registry was queried for infants and children undergoing CCVR between June 2012 and September 2016. Institutions were categorized into low, middle, or high surgical case volume groups based on tertiles of the average number of cases performed per month. Primary and secondary outcomes were analyzed with respect to these groupings.

RESULTS: The query yielded 1814 CCVR cases from 33 institutions. Demographics were similar among the 3 study groups. An inverse relationship between surgical case volume and total perioperative blood donor exposures was observed (P < .001). The low-volume group had higher perioperative transfusion volumes (P = .02 versus middle; P = .01 versus high). There was no significant relationship between surgical case volume and the incidence of major postoperative complications or hospital length of stay.

CONCLUSIONS: In this study, low surgical case volumes were associated with increased total blood donor exposures and increased perioperative transfusion volumes. Hospital length of stay was homogeneous in the 3 groups, suggesting a limited overall clinical impact of the observed transfusion outcome differences.

右美托咪定對全麻患兒血糖和血鉀水準的影響：隨機對照試驗中安全性指標的二次分析

Effects of Dexmedetomidine on Blood Glucose and Serum Potassium Levels in Children Undergoing General Anesthesia: A Secondary Analysis of Safety Endpoints During a Randomized Controlled Trial

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Anesthesia & Analgesia: 2019 129 1093-1099

背景：右美托咪啶是一種高選擇性α2腎上腺素能激動劑，在小兒麻醉和重症監護中的應用日益廣泛。尚未對兒童的潛在不良影響進行嚴格評估的，包括其對血糖和血清鉀濃度的影響，這與兩個參數的紊亂和不期望的結果有關。我們在一項隨機對照試驗中，研究了 3 種不同劑量的右美托咪啶（dexmedetomidine）對兒童擇期手術結果的影響。

方法：64 名 ASA I-II 級兒童麻醉誘導後隨機接受 0.25μg/kg、0.5μg/kg、0.75μg/kg 或 0μg/kg（對照）右美托咪啶大於 60 秒靜脈推注。在給藥前、給藥後 15 分鐘和 30 分鐘，測量靜脈血中血漿葡萄糖和血清鉀濃度的變化。記錄組內和組間資料，並使用有限定的縱向資料方法進行分析。

結果：共有 49 名兒童完成了這項研究。給藥後 15 分鐘和 30 分鐘的平均血糖水準分別從基線水準 0.37 mmol/L(95%CI 為 0.29-0.45 mmol/L)和 0.05 mmol/L(95%CI 為 0.00-0.10 mmol/L)升高。在 15 分鐘時，存在線性劑量-反應關係（1.07 mmol/L/μg/kg[95%可信區間為 0.57-1.58 mmol/L/μg/kg]），但在 30 分鐘時（0.15 mmol/L/μg/kg[95%可信區間為 -0.40-0.70 mmol/L/μg/kg]）沒有明顯的影響。血鉀水準相對于基線水準有所下降，均差在 15 分鐘時為-0.20 mEq/L（95%置信區間為-0.28 至-0.12 mEq/L），在 30 分鐘時為-0.12

mEq/L（95%置信區間為-0.15 至-0.08 mEq/L），但在兩個時點右美托咪啶對血鉀均無明顯影響。

結論：麻醉誘導後，觀察到兒童血糖輕度升高，血鉀降低。給藥 15 分鐘時血糖升高取決於右美托咪啶的給藥劑量。這些初步資料有待進一步研究。

（吳潔譯 李士通校）

BACKGROUND: Dexmedetomidine is a highly selective α2-adrenergic agonist, which is increasingly used in pediatric anesthesia and intensive care. Potential adverse effects that have not been rigorously evaluated in children include its effects on blood glucose and serumpotassium concentrations, which are relevant due to the associations of derangements of both parameters with undesired outcomes. We investigated the effects of 3 different doses of dexmedetomidine on these outcomes in a randomized controlled trial in children undergoing elective surgery.

METHODS: Sixty-four American Society of Anesthesiologists I-II children were randomized to receive either dexmedetomidine 0.25 μg/kg, dexmedetomidine 0.5 μg/kg, dexmedetomidine 0.75 μg/kg, or 0 μg/kg (control), as a bolus administered over 60 seconds after induction of anesthesia. Changes in plasma glucose and serum potassium concentrations were measured in venous bloodsampled before and at 15 and 30 minutes after study drug administration. Data were plotted within and between groups and analyzed using a constrained longitudinal data approach.

RESULTS: Forty-nine children completed the study. Mean glucose levels at 15 and 30 minutes were elevated with estimated changes from baseline of 0.37 mmol/L (95% CI, 0.29-0.45 mmol/L) and 0.05 mmol/L (95% CI, 0.00-0.10 mmol/L), respectively. At 15 minutes, there was a linear dose-response relationship (1.07 mmol/L/μg/kg [95% CI, 0.57-1.58 mmol/L/ μ g/kg]), but there was no appreciable effect of dexmedetomidine at 30 minutes (0.15 mmol/L/μg/kg [95% CI, -0.40 to 0.70 mmol/L/μg/kg]). Potassium levels were depressed relative to baseline, with a mean difference at 15 minutes of -0.20 mEq/L (95% CI, -0.28 to -0.12 mEq/L) and at 30 minutes of -0.12 mEq/L (95% CI, -0.15 to -0.08 mEq/L), but there was no appreciable effect of dexmedetomidine at either time.

CONCLUSIONS: Small elevations in glucose and decreases in potassium were observed after induction of anesthesia in children. The elevation in glucose at 15 minutes depended on the dose of dexmedetomidine administered. These preliminary data warrant further investigation.

布瑞亭和新斯的明逆轉小兒神經肌肉阻滯的安全性和有效性回顧性分析 Retrospective Analysis of the Safety and Efficacy of Sugammadex Versus Neostigmine for the Reversal of Neuromuscular Blockade in Children

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Anesthesia & Analgesia: 2019 129 1124-1129

背景：舒更葡糖鈉是新型包裹性、非競爭性結合的氨基甾類神經肌肉阻斷劑（羅庫溴銨和維

庫溴銨)，可能對於殘餘神經肌肉阻滯耐受性較差的兒童患者優勢明顯。現今描述其在兒科人群中的應用資料有限，沒有大規模的研究可用於評估各個年齡段不良事件的發生。我們試圖通過調查不良事件的發生率，評估這些事件的嚴重性和臨床意義，與成人人群和各個年齡段兒童中使用新斯的明相比較，並量化舒更葡糖鈉的替代療效。

方法：從 2016 年 9 月開始，通過資料收集，我們從我們的資料倉庫中確定，從出生到青春期，按病例類型和年齡組進行回顧性配對，再到歷史上接受新斯的明治療的對照組，所有患者均使用舒更葡糖鈉拮抗神經肌肉阻滯劑作用。在隨後的圖表回顧中，我們量化了不良事件的發生率和治療不良事件的藥物使用。在最初確定的佇列中，如果在病例匹配後沒有捕捉到罕見的事件，則在給予舒更葡糖鈉後用腎上腺素治療的所有病例都要進行圖表審查以找出原因。“結束間隔時間”是指從使用逆轉劑到離開手術室的時間，作為療效的間接評估。“結束間隔時間”指從使用肌松拮抗劑到離開手術室的時間，作為療效的間接評價。

結果：在整個佇列中，與新斯的明組（p<0.001）和年齡較大的兒童（p<0.001）及青少年（p<0.001）亞組相比，舒更葡糖鈉組的發生心動過緩病例較少。結束間隔時間，即從給予神經肌肉阻滯(NMB)逆轉劑到離開手術室的時間，舒更葡糖鈉組在整個佇列中(均差為 2.8；95%CI 為 1.85-3.77；P<0.001）和除新生兒（31 天到 12 個月）以外的所有年齡組均顯著縮短。這一觀察結果在新生兒亞組中最為明顯(均差為 11.94 分鐘;95%可信區間為 4.79-19.1；p<0.001)。未發現治療組之間的其他不良事件存在差異。

結論:這項研究為舒更葡糖鈉在各個年齡段兒科患者人群中安全有效地用於拮抗神經肌肉阻滯提供了資料支援。在年齡組內，與新斯的明相比，舒更葡糖鈉顯示出手術完成速度更快，尤其在新生兒人群中觀察到最大的差異。

（吳潔譯 李士通校）

BACKGROUND: Sugammadex, with its novel mechanism of action of encapsulation and noncompetitive binding of aminosteroid neuromuscular-blocking agents (rocuronium and vecuronium), may offer distinct advantage to pediatric patients where residual neuromuscularblockade may be poorly tolerated. Data describing its use in the pediatric population are limited, and no large-scale studies are available evaluating the occurrence of adverse event across the full spectrum of ages. We sought to measure the occurrence of adverse events, assess the severity and clinical significance of the events, and quantify a surrogate measure of efficacy of sugammadex compared to neostigmine in a large population and in the full age range of children.

METHODS: Beginning in September 2016 through initiation of data collection, we identified from our data warehouse that all patients were treated with sugammadex for reversal of neuromuscularblockade, from birth through adolescence, and retrospectively matched, by case type and age group, to historical neostigmine-treated controls. From subsequent chart review, we quantified occurrence of adverse events and administration of medications to treat adverse events. All cases in the originally identified cohort treated with epinephrine after administration of sugammadex underwent chart review to elicit the cause, in the event that an infrequently occurring event was not captured after the case-matching process. "End-Interval Time," the time from administration of reversal agent to time out of the procedure room, was measured as an indirect assessment of efficacy.

RESULTS: Fewer cases of bradycardia were observed in the sugammadex group

compared to the neostigmine group in the overall cohort (P < .001) and in the subgroups of older children (P < .001) and adolescents (P < .001). End-interval time, the time measured from administration of neuromuscular blockade (NMB) reversal agent to time out of the operating room, was significantly shorter in sugammadex-treated groups in the overall cohort (mean difference, 2.8; 95% CI, 1.85-3.77; P < .001) and all age groups except for first year (31 days through 12 months). This observation was most pronounced in the neonatal subgroup (mean difference, 11.94 minutes; 95% CI, 4.79-19.1; P < .001). No other adverse events measured were found to be different between treatment groups.
CONCLUSIONS: This study provides data supporting the safe and effective use of sugammadexfor reversal of neuromuscular blockade throughout the entire range of ages in the pediatric population. Within age groups, sugammadex demonstrates faster completion of operation compared with neostigmine, with the greatest difference observed in the neonatal population.

靜脈自控鎮痛的阿片類藥物等效鎮痛劑量副作用發生率的系統評價及網路薈萃分析
Side Effect Rates of Opioids in Equianalgesic Doses via Intravenous Patient-Controlled Analgesia: A Systematic Review and Network Meta-analysis
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Anesthesia & Analgesia: 2019 129 1153-1162

背景：用於治療急性疼痛的阿片類藥物的副作用常常限制其鎮痛品質。許多研究都比較了阿片類藥物在病人自控鎮痛（PCA）中的副作用，但仍不清楚在為病人選擇阿片類藥物時是否存在可利用的特定副作用。在這篇綜述中，我們想確定在使用等效鎮痛劑量的不同阿片類藥物進行靜脈 PCA 時最常見的副作用的風險比（RRS），並對這些藥物進行相應的排序。
方法：通過對 medline、embase、cochrane 圖書館（中心）和科學網的檢索，確定了 63 個隨機對照試驗，比較了在同等鎮痛條件下的阿片類藥物。納入標準為兩組間可比較的疼痛刺激、同等的鎮痛治療和可比較的疼痛評分。使用 Cochrane 偏倚風險評估工具共 6 項對研究品質進行評估。以嗎啡為對照，進行頻率網路薈萃分析。這種方法不僅總結了來自不同干預的直接比較的所有估計效果，而且還允許通過共同比較器連結的干預措施之間的間接比較，在這種情況下，間接證據可以用來提高直接比較的精度。本研究的主要終點是噁心嘔吐、瘙癢和鎮靜事件的風險比，以及鎮靜評分的平均差異。計算呼吸抑制事件發生。次要終點是患者滿意度（平均差異）。研究方案在 PROSPERO 註冊（CRD42017062355）。
結果：在最大網路中比較了 16 種阿片類藥物干預（噁心嘔吐發生）和在最小網路中比較了 7 種阿片類藥物干預（鎮靜事件發生）的效果。大多數干預措施在主要結果（副作用）上與嗎啡沒有區別，但有些例外。丁丙諾啡的噁心和嘔吐發生率顯著高於芬太尼，而芬太尼的噁心和嘔吐發生率較低。納布芬、布托啡諾、美沙酮和呱替啶等等發生瘙癢的風險較低。呼吸抑制很少見（2452 例中有 22 例）。呱替啶、芬太尼和氧嗎啡酮可使鎮靜評分顯著降低。曲馬多的滿意度得分明顯較低，而羥考酮、芬太尼、瑞芬太尼、芬太尼和呱替啶的滿意度得分明顯較高。

結論：選擇用於治療的阿片類藥物最有可能對瘙癢和噁心嘔吐的發生幾乎沒有影響，儘管在所提出的排名中，不同阿片類藥物的優劣越來越大。不同藥物在鎮靜和患者滿意度方面存在較大差異，選擇適當的阿片類藥物可能有助於改善這方面的 PCA 效果。
（吳潔譯 李士通校）

BACKGROUND: Side effects of opioids used for the treatment of acute pain frequently limit their analgesic quality. Many studies have compared opioid side effects in patient-controlled analgesia(PCA), but it remains unclear whether there are specific side effect profiles that can be exploited when choosing an opioid for a patient. In this review, we wanted to determine the risk ratios (RRs) for the most common side effects when using different opioids for intravenous PCA in equianalgesic doses and rank the substances accordingly.

METHODS: A search of MEDLINE, EMBASE, the Cochrane Library (CENTRAL), and Web of Science identified 63 randomized controlled trials comparing opioids under equianalgesic conditions. Inclusion criteria were comparable pain stimulus between groups, equal coanalgesic treatment, and comparable resulting pain scores. Quality of studies was assessed using the Cochrane risk of bias tool with 6 items. Frequentistic network meta-analysis was conducted with morphine as the comparator. This method not only summarizes all estimated effects from direct comparisons of different interventions but also allows for indirect comparisons between interventions that can be linked via the common comparator, in which case the indirect evidence can be used to enhance the precision of the direct comparisons. Primary end points of this study were RRs for nausea and vomiting, pruritus, and events of sedation, as well as mean differences for scores of sedation. Events of respiratory depression were counted. Secondary end point was patient satisfaction (mean difference). The study protocol was registered at PROSPERO (CRD42017062355).

RESULTS: Sixteen opioid interventions were compared in the largest network (nausea and vomiting outcome) and 7 opioid interventions in the smallest network (sedation events outcome). Most interventions did not differ from morphine on the primary outcomes (side effects), with some exceptions. Buprenorphine had a significantly higher RR of nausea and vomiting, whereas fentanyl had a lower RR of nausea and vomiting. Nalbuphine, butorphanol, methadone, and pethidine/meperidine had a lower risk of pruritus. Respiratory depression was rare (22 of 2452 patients). Pethidine/meperidine, fentanyl, and oxymorphone caused significantly lower sedation scores. Tramadol caused significantly lower satisfaction scores, whereas oxycodone, alfentanil, remifentanil, fentanyl, and pethidine/meperidine caused significantly higher satisfaction scores.

CONCLUSIONS: The opiate chosen for treatment most likely has little effect on the incidence of pruritus and nausea/vomiting, although considerable differences exist in terms of better and worse opioids in the presented rankings. Larger differences between drugs were observed with regard to sedation and patient satisfaction, and choosing the appropriate opioid may help to improve PCA in this regard.