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輸注新鮮和儲存的紅細胞均可以導致亞臨床的肺部氣體交換功能缺陷，兩者沒有顯著差異
Fresh and Stored Red Blood Cell Transfusion Equivalently Induce Subclinical Pulmonary Gas Exchange Deficit in Normal Humans
BACKGROUND: Transfusion can cause severe acute lung injury, although most transfusions do not seem to induce complications. We tested the hypothesis that transfusion can cause mild pulmonary dysfunction that has not been noticed clinically and is not sufficiently severe to fit the definition of transfusion-related acute lung injury.

METHODS: We studied 35 healthy, normal volunteers who donated 1 U of blood 4 weeks and another 3 weeks before 2 study days separated by 1 week. On study days, 2 U of blood were withdrawn while maintaining isovolemia, followed by transfusion with either the volunteer's autologous fresh red blood cells (RBCs) removed 2 hours earlier or their autologous stored RBCs (random order). The following week, each volunteer was studied again, transfused with the RBCs of the other storage duration. The primary outcome variable was the change in alveolar to arterial difference in oxygen partial pressure (AaDo(2)) from before to 60 minutes after transfusion with fresh or older RBCs.

RESULTS: Fresh RBCs and RBCs stored for 24.5 days equally (P = 0.85) caused an increase of AaDo(2) (fresh: 2.8 mm Hg [95% confidence interval: 0.8-4.8; P = 0.007]; stored: 3.0 mm Hg [1.4-4.7; P = 0.0006]). Concentrations of all measured cytokines, except for interleukin-10 (P = 0.15), were less in stored leukoreduced (LR) than stored non-LR packed RBCs; however, vascular endothelial growth factor was the only measured in vivo cytokine that increased more after transfusion with LR than non-LR stored packed RBCs. Vascular endothelial growth factor was the only cytokine tested with in vivo concentrations that correlated with AaDo(2).
CONCLUSION: RBC transfusion causes subtle pulmonary dysfunction, as evidenced by impaired gas exchange for oxygen, supporting our hypothesis that lung impairment after transfusion includes a wide spectrum of physiologic derangements and may not require an existing state of altered physiology. These data do not support the hypothesis that transfusion of RBCs stored for >21 days is more injurious than that of fresh RBCs.

血管緊張素轉化酶抑制劑不與非心臟手術術後的呼吸道併發症和死亡率相關
Angiotensin Converting Enzyme Inhibitors Are Not Associated with Respiratory Complications or Mortality After Noncardiac Surgery
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背景：一般認為採用血管緊張素轉化酶抑制劑（ACEIs）與下呼吸道的併發症如咳嗽，血管神經源性水腫和支氣管痙攣相關；此外，術前使用與已增加的併發症和死亡率相關。這個研究的首要目標是評價在非心臟手術的成年病人中圍術期呼吸道併發症與 ACEI 治療的關係。我們的第二目標是評價在非心臟手術全身麻醉的成年病人中，圍術期使用 ACEI 和 30 天死亡率的關係，同時評價院內併發症和死亡率的一個綜合結果。

方法：我們評價了 2005 年到 2009 年間在 Cleveland 醫學中心就診的 79,228 名非心臟手術病人（9905 名使用 ACEI 的患者[13%]和 66,620[87%]不使用 ACEI 的患者）。傾向匹配成功地配對了 9028 名 ACEI 使用者（9905 名患者中的 91%）和 9028 名對照者。配對了術中 ACEI 使用者和非 ACEI 使用者在術中和術後的呼吸道併發症以及特有併發症，30 天死亡率，院內併發症和死亡率的綜合結果這些方面加以對照。

結果：使用 ACEI 和呼吸道併發症在術中（OR: 1.09 [95% CI: 0.91, 1.31], ACEI 相對非 ACEI; P = 0.28）和術後（OR: 0.97 [97.5% CI: 0.81, 1.16], ACEI 相對非 ACEI; P = 0.69）沒有明顯的統計學意義上的聯繫。在傾向匹配下，ACEI 的使用與 30 天死亡率(OR: 0.93 [95% CI: 0.73, 1.19], ACEI 相對非 ACEI; P = 0.56)和院內併發症和死亡率的綜合結果(OR: 1.06 [95% CI: 0.97, 1.15], ACEI 相對非 ACEI; P = 0.22)不相關。我們同時也觀察到，在多個時期內 ACEI 組和非 ACEI 組的術中血流動力學特徵，血管加壓素的使用，以及膠體和晶體的輸注是相似的（標準化差異<0.03）。

結論：我們沒有發現 ACEIs 的使用與術中或術後的下呼吸道併發症有任何聯繫。此外，ACEI 的使用與院內併發症及已增長的 30 天死亡率不相關。

（方昕譯 薛張綱校）

BACKGROUND: General use of angiotensin-converting enzyme inhibitors (ACEIs) is associated with upper-airway complications such as cough, angioedema, and bronchospasm; furthermore, preoperative use is associated with increased morbidity or mortality. Our primary goal in this study was thus to evaluate the association of ACEI therapy with perioperative respiratory morbidity in adult noncardiac surgical patients. Our secondary goals were to evaluate the association between preoperative use of ACEI and 30-day mortality, as well as to a composite outcome of in-hospital morbidity and mortality in adult noncardiac surgical patients having general anesthesia.
METHODS: We evaluated 79,228 patients (9905 ACEI users [13] and 66,620 [87%] non-ACEI users) who had noncardiac surgery at the Cleveland Clinic between 2005 and 2009. Propensity matching successfully paired 9028 ACEI users (91% of 9905 patients) with 9028 controls. Matched intraoperative ACEI users and non-ACEI users were compared on intraoperative and postoperative respiratory morbidity composites as well as individual complications, 30-day mortality, and a composite of in-hospital morbidity and mortality.

RESULTS: The association between ACEI use and respiratory morbidity composites was not statistically significant intraoperatively (OR: 1.09 [97.5% CI: 0.91, 1.31], ACEI versus non-ACEI; P = 0.28) or postoperatively (OR: 0.97 [97.5% CI: 0.81, 1.16], ACEI versus non-ACEI; P = 0.69). Within the propensity-matched subset, ACEI usage was not associated with either 30-day mortality (OR: 0.93 [95% CI: 0.73, 1.19], ACEI versus non-ACEI; P = 0.56) or the composite of in-hospital morbidity and mortality (OR: 1.06 [95% CI: 0.97, 1.15], ACEI versus non-ACEI; P = 0.22). We also observed that the ACEI and the non-ACEI groups were descriptively similar (standardized differences <0.03) on multiple time periods of intraoperative hemodynamic characteristics, vasopressor use, and colloid and crystalloid infusions.

CONCLUSIONS: We did not find any association between use of ACEIs and intraoperative or postoperative upper-airway complications. Furthermore, ACEI use was not associated with in-hospital complications or increased 30-day mortality.

PT-SAFE:一款運行和顯示醫療音訊警報的軟體

PT-SAFE: Software Tool for Development and Annunciation of Medical Audible Alarms.
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背景：不久前麻醉患者安全基金會和聯合委員會的研究報告顯示醫療音訊警報的效果值得改進。最近的幾項研究探索了改進音訊警報的多種方式，這激發了筆者開發一款能比較這些警報的即時軟體的興趣。我們試著設計了一款軟體既能兼容不同設計的音訊警報，同時也能融入已有的手術室設備中。該軟體是用來作爲讓警報研究者們快速評估各項新穎警報系統設計的工具。

方法：該軟體用於製造並發出音訊警報，警報是由患者身上的監護儀發出的信號資料作爲信號源映射形成的。這些資料由這個運行時非常靈活且模組化的目標指向軟體轉化為磁片中的波形檔案，由使用者用 MATLAB 程式設計來自訂報警演算法。該軟體在一個類比的手術室中進行了試驗，測試了它的性能，並與現有報警設備比較報警延時證實了它發出警報的準確性。

結果：該軟體在一個類比手術室中進行，對一個模擬患者的監護儀及呼吸機信號作出反應發出警報，結果顯示它比現有的手術室警報設備平均快 6.2 秒發出警報，效果非常明顯。分析顯示該軟體在信號丟失前能在一個中等性能的筆記本上持續發出 15 聲音訊警報。

結論：這些結果顯示這款設計目的是評估各項報警設計的軟體在無論是實驗室還是模擬環境下都能提供快速多次報警，因此對於醫療音訊警報的標準化有非常大的價值。

(郭晨躍譯 薛張綱校)
BACKGROUND: Recent reports by The Joint Commission as well as the Anesthesia Patient Safety Foundation have indicated that medical audible alarm effectiveness needs to be improved. Several recent studies have explored various approaches to improving the audible alarms, motivating the authors to develop real-time software capable of comparing such alarms. We sought to devise software that would allow for the development of a variety of audible alarm designs that could also integrate into existing operating room equipment configurations. The software is meant to be used as a tool for alarm researchers to quickly evaluate novel alarm designs.

METHODS: A software tool was developed for the purpose of creating and annunciating audible alarms. The alarms consisted of annunciators that were mapped to vital sign data received from a patient monitor. An object-oriented approach to software design was used to create a tool that is flexible and modular at run-time, can announce wave-files from disk, and can be programmed with MATLAB by the user to create custom alarm algorithms. The software was tested in a simulated operating room to measure technical performance and to validate the time-to-annunciation against existing equipment alarms.

RESULTS: The software tool showed efficacy in a simulated operating room environment by providing alarm annunciation in response to physiologic and ventilator signals generated by a human patient simulator, on average 6.2 seconds faster than existing equipment alarms. Performance analysis showed that the software was capable of supporting up to 15 audible alarms on a mid-grade laptop computer before audio dropouts occurred.

CONCLUSIONS: These results suggest that this software tool provides a foundation for rapidly staging multiple audible alarm sets from the laboratory to a simulation environment for the purpose of evaluating novel alarm designs, thus producing valuable findings for medical audible alarm standardization.

圍術期失誤對麻醉醫生的影響：國家調查的結果

The Impact of Perioperative Catastrophes on Anesthesiologists: Results of a National Survey

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背景：多數麻醉醫生在他們的職業生涯中都至少經歷過一次圍術期失誤。非常少見，然而，要知道這種事件的情緒影響，他們的作用是立即出現的且會產生長久的影響。在這次研究中，我們調查了圍術期失誤的影響和這些影響對美國麻醉醫生產生的後果。方法：我們隨機地給 1200 位 ASA 成員寄出了問卷調查。提前寄給參與者一封信，共兩份調查，兩份人物明信片和一小筆薪酬。659 名醫生（56%）完成了這項調查。結果：84%的調查對象在他們的職業生涯中已經涉及到至少一例意外死亡或者嚴重損傷的圍術期病人。詢問這種最難忘的圍術期失誤情緒的影響，大於 70%的人感覺到愧疚，焦慮，消除這些影響有 88%的人是需要時間從中恢復，19%的人確認從沒有完全恢復。12%的人考慮轉行。67%的調查對象認爲他們在此事件的前 4 個小時內對病人的監護能力受到影響，僅有 7%不需要時間。
**CONCLUSION:** A perioperative catastrophe may have a profound and lasting emotional impact on the anesthesiologist involved and may affect his or her ability to provide patient care in the aftermath of such events.

放置中心靜脈導管前使用單純酒精消毒是否具有與外科消毒液等同的消毒效果
Is alcohol-based hand disinfection equivalent to surgical scrub before placing a central venous catheter?

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**背景**：手部清潔與消毒有下列方法可使用：無水抗菌外科消毒液（1%葡萄糖洗必泰和 61%乙醇，Avagard™; 3M 醫療保健，聖保羅，明尼蘇達），純酒精消毒液（62%乙醇）和傳統外科消毒液（用 4%洗必泰肥皂清洗並使用無菌刷子刷手 5 分鐘）。我們假設在置中心靜脈導管前手部消毒時使用純酒精消毒液和無水抗菌消毒液（Avagard）與傳統外科消毒有相當的消毒效果。

**方法**：按手部消毒方法共分 5 組，消毒後對手指主體進行 24 小時平板培養：方法 1：傳統外科消毒法（n=49，14 個主體的平板）；方法 2：傳統外科消毒（用 4%洗必泰肥皂刷手 5 分鐘並用水沖洗）後 15 分鐘使用純酒精消毒液（62%酒精）（n=49,14 感染主體的平板）；方法 3：單獨純酒精消毒液（n=49,14 個主體的平板）；方法 4：純酒精消毒液
BACKGROUND: Waterless antiseptic surgical hand scrub (1% chlorhexidine gluconate and 61% ethyl alcohol, Avagard™; 3M Health Care, St. Paul, MN), alcohol-only cleanser (62% ethyl alcohol), and traditional surgical scrub (5-minute scrub with 4% chlorhexidine soap using a sterile scrub brush with water) are techniques used for hand cleansing and disinfection. We hypothesized that alcohol-only cleanser and waterless antiseptic scrub (Avagard) would be as effective as a traditional surgical scrub for hand cleansing before placement of central venous catheters.

METHODS: Fingers of subjects were plate-cultured for 24 hours after 5 methods of hand cleansing: method 1: traditional surgical scrub (n = 49 plates produced by 14 subjects); method 2: traditional surgical scrub (5-minute scrub with water, brush, and 4% chlorhexidine soap) followed by a 15-minute break, then alcohol-only cleanser (62% alcohol) (n = 49 plates produced by 14 subjects); method 3: alcohol-only cleanser alone (n = 49 plates produced by 14 subjects); method 4: alcohol-only cleanser (62% alcohol), followed by a 15-minute break, then traditional surgical scrub (5-minute scrub with brush, and 4% chlorhexidine soap with water) (n = 49 plates produced by 14 subjects); and method 5: waterless surgical scrub (Avagard) alone (n = 116 plates produced by 38 subjects). The 15-minute break was introduced to allow a short period of recontamination, and to test for residual effects from prior cleansing.

RESULTS: Alcohol-only cleanser alone (method 3) was significantly less effective than the traditional surgical scrub (method 1) (P < 0.001; 82% plate growth). Waterless surgical scrub (Avagard) (method 5) had a 0% observed difference (95% confidence interval [CI]: -14% to 11%) compared with the traditional 5-minute scrub (method 1) (P = 0.99; 16% plate growth). When a traditional surgical scrub was used first followed by a 15-minute period of recontamination, there was a 6% observed difference in method 2 from reference (method 1) (95% CI: -10% to 22%), and 0% observed difference in method 4 from reference (95% CI: -15% to 15%).

CONCLUSION: As the initial cleansing method, the alcohol-only cleanser (method 3) was significantly less effective than the traditional surgical scrub (method 1) (P < 0.001).
BACKGROUND: Epidural analgesia reduces pain and anxiety during childbirth. In this randomized controlled trial, we sought to determine whether partner presence during the initiation of epidural analgesia reduces stress of both the mother and her partner and their perception of maternal pain.

METHODS: Healthy, nulliparous women who were accompanied by their partners and requested neuraxial analgesia were enrolled into the study. The study took place in the Labor and Delivery Unit of a large tertiary hospital in Israel. Upon request for epidural analgesia, both partners were assessed for baseline anxiety (numerical rating scale, 0 to 10), systolic blood pressure, heart rate, estimated contraction pain of parturient (verbal rating scale for pain, 0 to 10), and salivary amylase. After measurements, couples were randomized into 1 of 2 groups: “partner in” and “partner out.” Immediately after epidural catheter insertion, anxiety, arterial blood pressure, heart rate, and salivary amylase were measured again in both partners. Both partners were asked to complete the State Anxiety Inventory questionnaire measuring current anxiety. The parturient was asked to rate the pain of epidural catheter insertion. The primary outcome measurement was parturient and partner anxiety as assessed by the numerical rating scale.

RESULTS: Eighty-four couples were randomized (partner in 41, partner out 42, protocol violation 1). At baseline there was no difference in self-reported anxiety of parturients between the partner-in and partner-out groups (median interquartile range 7.5 [6.0 to 9.0] versus 7.0 [3.5 to 8.5]; P = 0.26, difference in medians = -1.0; 95% confidence interval [CI] of difference -2.0 to 0.0). Epidural analgesia was successful in providing adequate pain relief in both groups. However, there was a significant difference in anxiety levels between the two groups at the end of the study (median interquartile range 8.0 [7.0 to 10.0] versus 7.0 [5.0 to 9.0]; P = 0.03, difference in medians = -1.0; 95% CI range -2.0 to 0.0). Epidural analgesia decreased anxiety levels in both groups, but the decrease was more pronounced in the partner-in group (median interquartile range 7.0 [4.0 to 8.0] versus 4.0 [3.0 to 6.0]; P = 0.004, difference in medians = -2.0; 95% CI range -3.0 to -1.0).

Conclusions: Epidural analgesia decreased anxiety levels in both groups, but the decrease was more pronounced in the partner-in group. Therefore, partner presence during epidural analgesia may have a beneficial effect on anxiety levels in the laboring mother.
After epidural catheter insertion, parturients in the partner-in group had a higher level of anxiety than those in the partner-out group (8.0 [7.0 to 10.0] versus 7.0 [5.0 to 9.0]; P = 0.03, difference in medians-1.0; 95% CI of difference-2.0 to 0.0). Pain scores during epidural catheter placement were higher in partner-in than in partner-out groups (7.0 [4.0 to 8.0] versus 4.0 [3.0 to 6.0]; P= 0.004, difference in medians-2.0; 95% CI of difference -3.0 to -1.0).

**CONCLUSION**: Partner presence during epidural catheter insertion for labor analgesia did not decrease anxiety levels. To the contrary, anxiety and pain of epidural catheter placement were greater if the partner remained in the room.

**The analgesic activity of intrathecal tianeptine, an atypical antidepressant, in a rat model of inflammatory pain.**

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**BACKGROUND**: Tianeptine is an atypical antidepressant that exhibits structural similarities to the tricyclic antidepressants but has distinct neurochemical properties. We evaluated the antinociceptive activity of tianeptine and its mechanism of action regarding serotonergic and adrenergic transmission at the spinal level.

**METHODS**: The effects of intrathecally administered tianeptine and DUP-697 (a cyclooxygenase-2 inhibitor) were examined on flinching behavior evoked by intraplantar formalin injection, and their interaction was characterized using isobolographic analysis. Dihydroergocristine, prazosin, or yohimbine—which are serotonergic, α-1, and α-2 adrenergic receptor antagonists, respectively—were intrathecally administered 10 minutes before tianeptine to investigate its mechanism of action.

**結論**: 鞘內注射非典型抗抑鬱藥噻奈普汀對炎性疼痛大鼠模型的鎮痛活性

**背景**: 噻奈普汀是一個非典型抗抑鬱藥，它與三環類抗抑鬱藥有相似的結構，但卻有著不同的神經化學特性。我們評估噻奈普汀的鎮痛活性及其在脊髓水準上與5-羥色胺能和腎上腺素能神經遞質系統相關的作用機制。

**方法**: 通過研究大鼠腳掌內注射福馬林後誘發出的退縮反應，從而判斷鞘內注射噻奈普汀和DUP-697（一種COX-2抑制劑）的療效，並使用等輻射分析瞭解兩者之間的相互作用。5-羥色胺能、α-1和α-2腎上腺素能受體拮抗劑，通過在使用噻奈普汀前10分鐘鞘內注射這三種藥物來探索其作用機制。

**結果**: 在第一和第二階段中，在鞘內注射噻奈普汀和DUP-697能夠減少由注射福馬林後誘發的退縮反應。在福馬林試驗的兩個階段中，呱唑嗪和育亨賓減輕由鞘內注射噻奈普汀而產生的鎮痛效果。5-羥色胺能和α-2腎上腺素能神經遞質系統參與噻奈普汀對疼痛易化和急性疼痛的鎮痛作用。合用應用噻奈普汀和COX-2抑制劑對控制炎性疼痛有較好的益處。

（周玲譯 薛張綱校）
**RESULTS:** Intrathecally administered tianeptine and DUP-697 reduced the flinching response evoked by formalin injection during phases 1 and 2 in an additive fashion. Prazosin and yohimbine attenuated the antinociceptive effect of intrathecal tianeptine during both phases of the formalin test. Dihydroergocristine reversed the antinociception of tianeptine during phase 2, but not during phase 1.

**CONCLUSIONS:** Intrathecally administered tianeptine effectively relieved inflammatory pain in rats. The serotonergic system is related to the activity of tianeptine for facilitated pain at the spinal level. Adrenergic transmission is also involved in tianeptine-induced analgesia for both facilitated and acute pain. The combination of tianeptine and cyclooxygenase-2 inhibitor may provide additional benefits for the management of inflammatory pain.

**Predicting the Limits of Cerebral Autoregulation During Cardiopulmonary Bypass**

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**背景** 體外迴圈（CPB）期間對平均動脈壓（MAP）的控制目標往往憑經驗確定。已經證明近紅外光譜（NIRS）可用於臨床監測腦血流的自動調節。本研究假設體外迴圈期間使用基於近紅外光譜的方法即時監測腦血流的自動調節，較根據年齡、術前病史、術前血壓的經驗性判斷，能更為準確地判定腦自動調節下限（LLA）時的平均動脈壓值。

**方法** 對 232 名接受體外迴圈下冠狀動脈搭橋和/或瓣膜手術患者進行經顱的大腦中動脈多普勒監測及 NIRS 監測。持續動態地計算 MAP 和大腦血流速度以及 MAP 和 NIRS 之間的皮爾遜相關係數，得出平均流速指數和腦血氧飽和度指數。大腦能夠自動調節時，腦血流量和 MAP 之間不存在相關性（即平均流速指數和大腦血氧飽和指數接近 0）；當 MAP 低於 LLA 水準時，平均流速指數和大腦血氧飽和指數接近 1。LLA 是指在 MAP 下降同時平均流速指數增加 0.4 時的 MAP 水準。作者還分別將術前收縮壓、 MAP、MAP 比基線降低 10%的值和平均大腦血氧飽和指數與 LLA 時的 MAP 進行了線性回歸分析。

**結果** 在 225 名患者中觀察到腦血流自動調節下限的 MAP 值是 66mmHg（95%的可信區間為 43 到 90mmHg）。在處理了年齡、性別、中風史和高血壓造成的偏倚後，得出術前 MAP 與 LLA 之間無相關性（P = 0.829）；而大腦血氧飽和指數高於 0.5 時與 LLA 相關（p=0.022）。在 219 名患者（94.4%）中，可以根據大腦血氧飽和指數確定 LLA。平均流速指數與大腦血氧飽和指數得到的 LLA 進行對比，平均相差 0.2 ± 10.2 mm Hg (95% 可信區間是 -1.5 to 1.2 mm Hg)。在收縮壓≤160 mm Hg 的患者中，術前收縮壓水準與 LLA 升高相關。
BACKGROUND: Mean arterial blood pressure (MAP) targets are empirically chosen during cardiopulmonary bypass (CPB). We have previously shown that near-infrared spectroscopy (NIRS) can be used clinically for monitoring cerebral blood flow autoregulation. The hypothesis of this study was that real-time autoregulation monitoring using NIRS-based methods is more accurate for delineating the MAP at the lower limit of autoregulation (LLA) during CPB than empiric determinations based on age, preoperative history, and preoperative blood pressure.

METHODS: Two hundred thirty-two patients undergoing coronary artery bypass graft and/or valve surgery with CPB underwent transcranial Doppler monitoring of the middle cerebral arteries and NIRS monitoring. A continuous, moving Pearson correlation coefficient was calculated between MAP and cerebral blood flow velocity and between MAP and NIRS data to generate mean velocity index and cerebral oximetry index. When autoregulated, there is no correlation between cerebral blood flow and MAP (i.e., mean velocity and cerebral oximetry indices approach 0); when MAP is below the LLA, mean velocity and cerebral oximetry indices approach 1. The LLA was defined as the MAP at which mean velocity index increased with declining MAP to ≥0.4. Linear regression was performed to assess the relation between preoperative systolic blood pressure, MAP, MAP in 10% decrements from baseline, and average cerebral oximetry index with MAP at the LLA.

RESULTS: The MAP at the LLA was 66 mm Hg (95% prediction interval, 43 to 90 mm Hg) for the 225 patients in which this limit was observed. There was no relationship between preoperative MAP and the LLA (P = 0.829) after adjusting for age, gender, prior stroke, diabetes, and hypertension, but a cerebral oximetry index value of >0.5 was associated with the LLA (P = 0.022). The LLA could be identified with cerebral oximetry index in 219 (94.4%) patients. The mean difference in the LLA for mean velocity index versus cerebral oximetry index was −0.2 ± 10.2 mm Hg (95% CI, −1.5 to 1.2 mm Hg). Preoperative systolic blood pressure was associated with a higher LLA (P = 0.046) but only for those with systolic blood pressure ≤160 mm Hg.

CONCLUSIONS: There is a wide range of MAP at the LLA in patients during CPB, making estimation of this target difficult. Real-time monitoring of autoregulation with cerebral oximetry index may provide a more rational means for individualizing MAP during CPB.
Cardiac surgery presents particular challenges for the anesthesiologist. In addition to standard and advanced monitors typically used during cardiac surgery, anesthesiologists may consider monitoring the brain with raw or processed electroencephalography (EEG). There is strong evidence that a protocol incorporating the processed EEG bispectral index (BIS) decreases the incidence intraoperative awareness in comparison with standard practice. However, there is conflicting evidence that incorporating the BIS into cardiac anesthesia practice improves “fast-tracking,” decreases anesthetic drug use, or detects cerebral ischemia. Recent research, including many cardiac surgical patients, shows that a protocol based on BIS monitoring is not superior to a protocol based on end-tidal anesthetic concentration monitoring in preventing awareness. There has been a resurgence of interest in the anesthesia literature in limited montage EEG monitoring, including nonproprietary processed indices. This has been accompanied by research showing that with structured training, anesthesiologists can glean useful information from the raw EEG trace.

In this review, we discuss both the hypothesized benefits and limitations of BIS and frontal channel EEG monitoring in the cardiac surgical population. 

### Systemic Lidocaine Does Not Attenuate Hepatic Dysfunction After Liver Surgery in Rats

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#### 背景：可能由於對炎症反應和凋亡信號傳導通路的調節,利多卡因已證明能減輕心、肺和腦的缺血再灌注(I/R)損傷。由於肝臟手術後的肝缺血/再灌注損傷對術後肝功能不全或甚至衰竭仍構成重大風險，本文實驗調查全身性應用利多卡因是否將對肝細胞損傷和肝功能的肝缺血/再灌注損傷產生積極的影響。此外,對潛在的作用機制進行了研究。

#### 方法：一個 70% I/R 損傷的標準化大鼠模型被用於評估全身性應用利多卡因對缺血 60 分鐘並再灌注情況下肝細胞損傷的影響。為了更好地類比臨床情況,本實驗在對第二個模型處理中將缺血 45 分鐘與肝部分切除相結合。從缺血開始前 30 分鐘至再灌注後 20 分鐘全身性持續應用利多卡因。使用代表肝纖合成、細胞完整性和代謝的不同參數來估評肝功能。監測白細胞流入和通過 TUNEL 染色和 Caspase - 3 檢測的細胞凋亡情況來評價炎症反應。
結果：兩個模型顯示，在對照組和利多卡因治療動物組中同時發現了 I/R 造成的生化和組織學上的肝細胞損傷。術後發生了繼發於缺血的肝功能明顯受損，但對照組和利多卡因組沒有觀察到顯著性差異。同樣作為炎症反應的一項標誌，在 I/R 損傷導致的白細胞流入方面，對照組和利多卡因治療組之間也沒有顯著差異。

結論：全身性應用利多卡因的治療濃度並不減少肝缺血/再灌注損傷後肝細胞損傷也不改善術後肝功能。

技術交流：開普勒插管系統

Technical Communication: The Kepler Intubation System
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此項實驗目標是開發一個機器人插管系統，並進行一項關於使用機器人插管系統實施氣管插管的可行性試驗性研究。開普勒插管系統的開發包括一個通過機械臂與標準的可視喉鏡相連的遠程控制中心（操縱杆和插管駕駛艙）。一個操作者獨立使用開普勒插管系統在人體氣管插管訓練模型上完成 90 例插管操作。第一組 30 例氣管插管是在直視下完成的（直視組）。第二組 30 例氣管插管是在無法看到人體模型的視野下完成的（間接視野組）。30 例半自動插管是在機器人系統重複之前的人體模型插管記錄時完成的（半自動組）。記錄氣管插管的首次嘗試成功率和插管時間。採用線性回歸分析趨勢。資料以平均
Our goal in this study was to develop a robotic intubation system and to conduct a feasibility pilot study on the use of a robotic intubation system for endotracheal intubations. The Kepler Intubation System was developed, consisting of a remote control center (joystick and intubation cockpit) linked to a standard videolaryngoscope via a robotic arm. Ninety intubations were performed by the Kepler Intubation System on an airway trainer mannequin by a single operator. The first group of 30 intubations was performed with the operator in direct view of the mannequin (direct view group). The second group of 30 intubations was performed with the operator unable to see the mannequin (indirect view group). Thirty semiautomated intubations were also performed during which the robotic system replayed a trace of a previously recorded intubation maneuver (semiautomated group). First-attempt success rates and intubation times for each trial were recorded. Trends were analyzed using linear regression. Data are presented as mean (SD). All intubations were successful at first attempt. The mean intubation times were 46 (18) seconds, 51 (19) seconds, and 41 (1) seconds for the direct view, indirect view, and semiautomated group, respectively. Both the direct and indirect view groups had a negative slope, denoting that each successive trial required less time. The semiautomated group had a slope of 0 and a low SD of 1 second, illustrating the high reproducibility of automated intubations. We concluded that a robotic intubation system has been developed that can allow remote intubations within 40 to 60 seconds.
The disclosure of unanticipated outcomes to patients, including medical errors, has received considerable attention of late. The discipline of anesthesiology is a leader in patient safety, and as the doctrine of full disclosure gains momentum, anesthesiologists must become acquainted with these philosophies and practices. Effective disclosure can improve doctor–patient relations, facilitate better understanding of systems, and potentially decrease medical malpractice costs. However, many physicians remain wary of discussing errors with patients due to concern about litigation, the communication challenges of disclosure, and loss of self-esteem. As a result, harmful errors are often not disclosed to patients. Disclosure poses special challenges for anesthesiologists. There is often very limited time before the anesthetic in which to build the patient–physician relationship, and anesthesiologists usually function within complex health care teams. Other team members such as the surgeon may have different perspectives on what the patient should be told about operating room errors. The anesthesiologist may still be physically caring for the patient while the surgeon has the initial discussion with the family about the event. As a result the anesthesiologist may be excluded from the planning or conduct of the important initial disclosure conversations. New disclosure strategies are needed to engage anesthesiologists as active participants in the disclosure of unanticipated outcomes. Anesthesiologists should be aware of the emerging best practices surrounding disclosure, as well as the training opportunities and disclosure support resources that are increasingly available. Innovative models should be developed that promote collaboration between all perioperative team members in the disclosure process. There are important opportunities for anesthesiologists to play a leading role in defining specialty-specific disclosure practices and to more effectively meet patients’ needs for disclosure after unanticipated outcomes and medical errors.

Perioperative Fluid Management Strategies in Major Surgery: A Stratified Meta-Analysis

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背景: 大量液體治療（LVR）以及目標定向性液體治療（GD）這兩項策略其共同點都在術中應用大量液體，但其後的結果卻截然不同。本研究目的，即確定這兩項策略孰優孰劣。

方法: 從 MEDLINE, EMBASE, PubMed 和 Cochrane 無語言限制登記在冊的試驗 (1951 至 2011 年 4 月)中選擇應用于成人外科手術中目標定向性液體治療或限制液體治療與大量液體治療之間的隨機對照試驗 (RCTs)。進行了 GD 和 LVR 的分層間接比較。
BACKGROUND: Both “liberal” and “goal-directed” (GD) therapy use a large amount of perioperative fluid, but they appear to have very different effects on perioperative outcomes. We sought to determine whether one fluid management strategy was superior to the others.

METHODS: We selected randomized controlled trials (RCTs) on the use of GD or restrictive versus liberal fluid therapy (LVR) in major adult surgery from MEDLINE, EMBASE, PubMed (1951 to April 2011), and Cochrane controlled trials register without language restrictions.

RESULTS: A total of 3861 patients from 23 GD RCTs (median sample size = 90, interquartile range [IQR] 57 to 109) and 1160 patients from 12 LVR RCTs (median sample size = 80, IQR 36 to 151) were considered. Both liberal and GD therapy used more fluid compared to their respective comparative arm, but their effects on outcomes were very different. Patients in the liberal group of the LVR stratum had a higher risk of pneumonia (risk ratio [RR] 2.2, 95% confidence interval [CI] 1.0 to 4.5), pulmonary edema (RR 3.8, 95% CI 1.1 to 13), and a longer hospital stay than those in the restrictive group (mean difference [MD] 2 days, 95% CI 0.5 to 3.4). Using GD therapy also resulted in a lower risk of pneumonia (RR 0.7, 95% CI 0.6 to 0.9) and renal complications (0.7, 95% CI 0.5 to 0.9), and a shorter length of hospital stay (MD 2 days, 95% CI 1 to 3) compared to not using GD therapy. Liberal fluid therapy was associated with an increased length of hospital stay (4 days, 95% CI 3.4 to 4.4), time to first bowel movement (2 days, 95% CI 1.3 to 2.3), and risk of pneumonia (RR ratio 3, 95% CI 1.8 to 4.8) compared to GD therapy.

CONCLUSION: Perioperative outcomes favored a GD therapy rather than liberal fluid therapy without hemodynamic goals. Whether GD therapy is superior to a restrictive fluid strategy remains uncertain.

Dorsal Root Ganglion Application of Muscimol Prevents Hyperalgesia and Stimulates Myelin Protein Expression After Sciatic Nerve Injury in Rats
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背景：外周神經損傷可產生慢性疼痛，後者對傳統治療不敏感。外周神經損傷會引起神經病理性疼痛，部分原因是由於損傷部位或脊根神經節(DRG)的異位放電導致中樞傳入增強和中樞系統興奮過度。不同家族的γ氨基丁酸(GABA)通道對於穩定神經元的興奮性至關重要。近期活體研究發現於背根神經節處調節GABA神經元後，可以改變外周神經元損傷後神經病理性疼痛發展過程。似乎在同側背根神經節應用有效的GABA拮抗劑-蠅蕈醇，可防止坐骨神經損傷的大鼠發生痛覺過敏。除了可以減少興奮過度的發生，氨基丁酸興奮後還可上調髓磷脂蛋白22(PMP22)的表達，PMP22是基膜的一個主要成分，它與外周髓磷脂的形成和神經再生有關。

方法：由於PMP22對髓磷脂的形成和穩定密切相關，而刺激氨基丁酸後可調節PMP22表達，故本試驗主要觀察坐骨神經損傷後，直接在背根神經節應用蠅蕈醇是否可恢復PMP22蛋白的表達和神經纖維完整性。

結果：使用成年雌性大鼠的坐骨神經損傷模型作為研究物件發現同側背根神經節處的氨基丁酸的調節可恢復坐骨神經遠端的PMP22蛋白的表達，同時能穩定神經纖維基膜，因而從形態學上可減少神經損傷或加快神經纖維再生。增加PMP22蛋白的表達和神經原形態學上的改變與熱超敏及機械性超敏的消除是一致的。

結論：對於外周神經損傷後的神經再生以及疼痛緩解，背根神經節可能是個有前景的治療靶點。

（張婷譯陳傑校）

BACKGROUND: Peripheral nerve injuries may result in debilitating pain that is poorly responsive to conventional treatment. Neuropathic pain induced by peripheral nerve injury is caused, in part, by ectopic discharges from the injury site or the dorsal root ganglia (DRG) resulting in enhanced central input and central hyperexcitability. A heterogeneous family of γ-amino butyric acid (GABA) channels is important in quieting neuronal excitability. We have recently reported that in vivo modulation of GABAergic neurons in DRG can alter the course of neuropathic pain development after peripheral nerve injury. It seems that direct application of a potent GABA_2 agonist, muscimol, to the ipsilateral DRG prevents the development of hyperalgesia in rats subjected to a sciatic nerve crush injury. In addition to potentially curtailing hyperexcitability, GABAergic stimulation upregulated expression of peripheral myelin protein 22 (PMP22), a key component of the basal lamina. PMP22 expression correlates with peripheral myelin formation and nerve regeneration.

METHODS: Because of the importance of PMP22 for the formation and stability of myelin, and the fact that PMP22 expression could be GABAergically modulated, we examined whether direct DRG application of muscimol can restore PMP22 protein expression and the integrity of nerve fibers after crush injury of a sciatic nerve.

RESULTS: Using adult female rats and a crush injury model, we found that GABAergic modulation in the ipsilateral DRG restores PMP22 protein expression in the distal segment of the sciatic nerve and improves myelin stability in the basal membrane of nerve fibers, thus giving the morphological appearance of lessened nerve injury or faster nerve fiber regeneration. Both the
enhanced PMP22 protein expression and morphological improvements coincide with the abolishment of thermal and mechanical hypersensitivity.

CONCLUSIONS: The DRG could be a promising therapeutic target in nerve regeneration and pain alleviation after crush injury of a myelinated peripheral nerve.

The Bainbridge and the “Reverse” Bainbridge Reflexes: History, Physiology, and Clinical Relevance
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Francis A. Bainbridge demonstrated in 1915 that an infusion of saline or blood into the jugular vein of the anesthetized dog produced tachycardia. His findings after transection of the cardiac autonomic nerve supply and injection of the cholinergic blocking drug atropine demonstrated that the tachycardia was reflex in origin, with the vagus nerves constituting the afferent limb and a withdrawal of vagal tone the primary efferent limb. Subsequent investigators demonstrated that the increase in venous return was detected by stretch receptors in the right and left atria. In the 1980s, it was shown convincingly that the Bainbridge reflex was present in primates, including humans, but that the reflex was much less prominent than in the dog. This difference may be due to a more dominant arterial baroreceptor reflex in humans. A “reverse” Bainbridge reflex has been proposed to explain the decreases in heart rate observed under conditions in which venous return is reduced, such as during spinal and epidural anesthesia, controlled hypotension, and severe hemorrhage. The Bainbridge reflex is invoked throughout the anesthesia literature to describe the effect of changes in venous return on heart rate in patients in the surgical and critical care settings, but a critical analysis of the experimental and clinical evidence is lacking. Our main objectives in this review are to summarize the history of the Bainbridge reflex, to describe its anatomy and physiology, and to discuss the evidence for and against it having an influence on heart rate changes observed clinically. The interaction of the Bainbridge reflex with the arterial baroreceptor and Bezold–Jarisch reflexes is discussed.
Minimum Alveolar Concentration of Sevoflurane in Rabbits with Liver Fibrosis
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BACKGROUND: Sevoflurane is widely used in patients undergoing surgical procedures, which could affect both the liver function and hepatic blood flow. However, the effects of liver fibrosis on minimum alveolar concentration (MAC) of sevoflurane are still unclear. Therefore, we designed this study to determine the MAC of sevoflurane in rabbits with liver fibrosis.

METHODS: Thirty male New Zealand white rabbits weighing approximately 2.5 kg were divided randomly into 2 groups: fibrosis (n = 20) and normal control group (n = 10). The rabbits in the fibrosis group were treated with 50% carbon tetrachloride for 12 weeks to induce liver fibrosis. The serum concentration of total protein, albumin, globulin, total bile acids, alanine aminotransferase, aspartate aminotransferase, alkaline phosphatase, γ-glutamyl transpeptidase, total bilirubin, direct bilirubin, and indirect bilirubin were measured before anesthesia. The anesthesia for animals that survived in both groups was induced and maintained with sevoflurane. A standard tail-clamp technique was used to determine the MAC of sevoflurane in spontaneously breathing rabbits. After anesthesia, animals were killed for liver pathologic examination.

RESULTS: Twelve weeks after 50% carbon tetrachloride administration, 14 of 20 rabbits survived in the fibrosis group, and 9 of 10 survived in the control group. All surviving animals in the fibrosis group had developed moderate to severe liver fibrosis. Three rabbits that survived after the fibrosis challenge were excluded for other diseases or no response to pain stimulation. The levels of globulin, aspartate aminotransferase, and γ-glutamyl transpeptidase significantly
increased in fibrosis animals compared with controls. However, the albumin and alkaline phosphatase levels were significantly lower in the fibrosis group than in the control group. Mean arterial blood pressure, heart rate, end-tidal CO₂, and temperature were stable in both groups during sevoflurane anesthesia. The MAC of sevoflurane was significantly less in the fibrosis group than in the control group (3.52% vs 4.10%, \( P = 0.018 \)).

**CONCLUSION:** The MAC of sevoflurane decreased significantly in rabbits with liver fibrosis.

University of Queensland Vital Signs Dataset: Development of an Accessible Repository of Anesthesia Patient Monitoring Data for Research

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BACKGROUND: Data recorded from the devices used to monitor a patient's vital signs are often used in the development of displays, alarms, and information systems, but high-resolution, multiple-parameter datasets of anesthesia monitoring data from patients during anesthesia are often difficult to obtain. Existing databases have typically been collected from patients in intensive care units. However, the physical state of intensive care patients is dissimilar to those undergoing surgery, more frequent and marked changes to cardiovascular and respiratory variables are seen in operating room patients, and additional and highly relevant information to anesthesia (e.g., end-tidal agent monitoring, etc.) is omitted from these intensive care databases. We collected a set of high-quality, high-resolution, multiple-parameter monitoring data suitable for anesthesia monitoring research.

METHODS: Vital signs data were recorded from patients undergoing anesthesia at the Royal Adelaide Hospital. Software was developed to capture, time synchronize, and interpolate vital signs data from Philips IntelliVue MP70 and MP30 patient monitors and Datex-Ohmeda Aestiva/5 anesthesia machines into 10 millisecond resolution samples. The recorded data were saved in a variety of accessible file formats.

RESULTS: Monitoring data were recorded from 32 cases (25 general anesthetics, 3 spinal anesthetics, 4 sedations) ranging in duration from 13 minutes to 5 hours (median 105 min). Most cases included data from the electrocardiograph, pulse oximeter, capnograph, noninvasive arterial blood pressure monitor, airway flow, and pressure monitor and, in a few cases, the Y-piece spirometer, electroencephalogram monitor, and arterial blood pressure monitor. Recorded data were processed and saved into 4 file formats: (1) comma-separated values text files with full numerical and waveform data, (2) numerical parameters recorded in comma-separated values files at 1-second intervals, (3) graphical plots of all waveform data in a range of resolutions as Portable Network Graphics image files, and (4) graphical overview plots of numerical data for entire cases as Portable Network Graphics and Scalable Vector Graphics files. The complete dataset is freely available online via doi:10.2100.100/6914 and has been listed in the Australian National Data Service Collections Registry.

DISCUSSION: The present dataset provides clinical anesthesia monitoring data from entire surgical cases where patients underwent anesthesia, includes a wide range of vital signs variables that are commonly monitored during surgery, and is published in accessible, user-friendly file formats. The text and image file formats let researchers without engineering or computer science backgrounds easily access the data using standard spreadsheet and image browsing software. In future work, monitoring data should be collected from a wider range and larger number of cases, and software tools are needed to support searching and navigating the database.
BACKGROUND: Although anesthesiologists are leaders in patient safety, there has been little research on factors affecting their reporting of adverse events and errors. First, we explored the attitudinal/emotional factors influencing reporting of an unspecified adverse event caused by error. Second, we used a between-groups study design to ask whether there are different perceived barriers to reporting a case of anaphylaxis caused by an error compared with anaphylaxis not caused by error. Finally, we examined strategies that anesthesiologists believe would facilitate reporting. Where possible, we contrasted our results with published findings from other physician groups.

METHODS: An anonymous, self-administered, mailed survey was conducted of 629 consultant anesthesiologists and 263 anesthesiology residents on the mailing list of the Australian and New Zealand College of Anaesthetists in Victoria, Australia. Participants were randomized into “Error” versus “No Error” groups for the specified anaphylaxis adverse event section of the survey. Data were analyzed using nonparametric descriptive and inferential tests.

RESULTS: There were 433 usable returned surveys, a usable response rate of 49%. First, there was only 1 of 13 statements on attitudinal/emotional factors that influenced reporting of an unspecified adverse event caused by error with which more anesthesiologists agreed/strongly agreed than disagreed/strongly disagreed: “Doctors who make errors are blamed by their colleagues.” Second, when an error rather than no error had caused anaphylaxis, participants were more likely to agree/strongly agree that 6 statements about litigation, getting into trouble, disciplinary action, being blamed, unsupportive colleagues, and not wanting the case discussed in meetings, were perceived as reporting barriers. Finally, the most favoredassistive strategies
for reporting were generalized deidentified feedback about adverse event and error reports, role
models such as senior colleagues who openly encourage reporting, and legislated protection of
reports from legal discoverability.
CONCLUSION: The majority of anesthesiologists in our study did not agree that the
attitudinal/emotional barriers surveyed would influence reporting of an unspecified adverse event
caused by error, with the exception of the barrier of being concerned about blame by colleagues.
The probable influence of 6 perceived barriers to reporting a specified adverse event of
anaphylaxis differed with the presence or absence of error. Anesthesiologists in our study
supported assistive reporting strategies. There seem to be some differences between our results
and previously published research for other physician groups.

超聲引導下中心靜脈無菌穿刺技術教學：比較單獨教學訓練與複合模擬的教學訓練的隨
機試驗
Teaching Aseptic Technique for Central Venous Access Under Ultrasound Guidance: A
Randomized Trial Comparing Didactic Training Alone to Didactic Plus Simulation-Based
Training
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背景：我們的目的是評定超聲（US）引導中心靜脈（CVC）置管過程中，複合模擬的教
學訓練與單獨教學訓練相比，是否能提高初學者無菌操作水準。我們假設，接受複合模擬
教學訓練的初學者，在模擬器上進行 US 引導 CVC 置入操作時，能夠獲得同富有經驗的
住院醫生類似的無菌操作評分、知識的掌握度以及舒適度的感覺。
方法：72 位受試者參加隨機、對照的教學訓練實驗。54 位初學者隨機納入教學組和複合
模擬教學組。每組受試者均接受教學訓練，但複合模擬教學組同時接受基於模擬的 CVC
置入訓練。兩組均在模擬器上進行超聲引導下 CVC 置入操作的示範測試。不知道受試者
隨機分組的評定者對 8 步無菌操作技術分別按“是/否”和利克特七分量表（七分為“優
秀操作”）進行評分。初次測試後，教學組接受基於模擬的訓練並進行再測試。每組受試
者均在訓練前後進行知識測驗，並採用利克特五分量表評定他們訓練前後使用超聲和
CVC 置入的舒適度。18 位熟練的住院醫生隨後也參加知識測驗，評定他們的舒適度，並
在模擬器上進行超聲引導下無菌 CVC 置入時對他們進行評分。
結果：相比初學者教學組，複合模擬方法的教學組“是/否”評分和利克特量表評分分別
增加 167% (95% 可信區間 [CI] 133%–167%) 和 115% (CI 112%–127%)。與富有經驗的住院
醫生相比，複合模擬方法的教學訓練出的初學者無菌操作的“是/否”評分和利克特量表
評分分別增加 33.3% (CI 16.7%–50%) 和 20% (CI 13.3%–40%)，同時其知識測驗分數高出
2.5 倍。對於所有初學者，接受複合模擬訓練的教學後，其知識測試分數增加 3 倍，舒適
度增加 2 倍。
BACKGROUND: Our goal was to determine whether simulation combined with didactic training improves sterile technique during ultrasound (US)-guided central venous catheter (CVC) insertion compared with didactic training alone among novices. We hypothesized that novices who receive combined didactic and simulation-based training would perform similarly to experienced residents in aseptic technique, knowledge, and perception of comfort during US-guided CVC insertion on a simulator.

METHODS: Seventy-two subjects were enrolled in a randomized, controlled trial of an educational intervention. Fifty-four novices were randomized into either the didactic group or the simulation combined with didactic group. Both groups received didactic training but the simulation combined with didactic group also received simulation-based CVC insertion training. Both groups were tested by demonstrating US-guided CVC insertion on a simulator. Aseptic technique was scored on 8 steps as “yes/no” and also using a 7-point Likert scale with 7 being “excellent technique” by a rater blinded to subject randomization. After initial testing, the didactic group was offered simulation-based training and retesting. Both groups also took a pre- and posttraining test of knowledge and rated their comfort with US and CVC insertion pre- and posttraining on a 5-point Likert scale. Subsequently, 18 experienced residents also took the test of knowledge, rated their comfort level, and were scored while performing aseptic US-guided CVC insertion using a simulator.

RESULTS: The simulation combined with didactic group achieved a 167% (95% confidence interval [CI] 133%–167%) incremental increase in yes/no scores and 115% (CI 112%–127%) incremental increase in Likert scale ratings on aseptic technique compared with novices in the didactic group. Compared with experienced residents, simulation combined with didactic trained novices achieved an increase in aseptic scores with a 33.3% (CI 16.7%–50%) increase in yes/no ratings and a 20% (CI 13.3%–40%) increase in Likert scaled ratings, and scored 2.5-fold higher on the test of knowledge. There was a 3-fold increase in knowledge and 2-fold increase in comfort level among all novices (P < 0.001) after combined didactic and simulation-based training.

CONCLUSION: Simulation combined with didactic training is superior to didactic training alone for acquisition of clinical skills such as US-guided CVC insertion. After combined didactic and simulation-based training, novices can outperform experienced residents in aseptic technique as well as in measurements of knowledge.

Propofol and Etomidate Depress Cortical, Thalamic, and Reticular Formation Neurons During Anesthetic-Induced Unconsciousness
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BACKGROUND: The sites where anesthetics produce unconsciousness are not well understood. Likely sites include the cerebral cortex, thalamus, and reticular formation. We examined the effects of propofol and etomidate on neuronal function in the cortex, thalamus, and reticular formation in intact animals.

METHODS: Five cats had a recording well and electroencephalogram screws placed under anesthesia. After a 5-day recovery period, the cats were repeatedly studied 3 to 4 times per week. Neuronal (single-unit) activity in the cerebral cortex (areas 7, 18 and 19), thalamus (ventral posterolateral and ventral posteromedial nuclei and medial geniculate body), and reticular formation (mesencephalic reticular nucleus and central tegmental field) was recorded before, during, and after infusion of either propofol or etomidate. Cortical neuronal action potentials were analyzed separately as either regular spiking neurons or fast spiking neurons.

RESULTS: Propofol and etomidate decreased the spontaneous firing rate of cortical neurons by 37% to 41%; fast spiking neurons and regular spiking neurons were similarly affected by the anesthetics. The neuronal firing rate in the thalamus and reticular formation decreased 30% to 49% by propofol and etomidate. The electroencephalogram shifted from a low-amplitude, high-frequency pattern to a high-amplitude, low-frequency pattern during drug infusion suggesting an anesthetic effect; peak power occurred at 12 to 13 Hz during propofol infusion. There were 2 major peaks during etomidate anesthesia: one at 12 to 14 Hz and another at 7 to 8 Hz. The cats were heavily sedated, with depressed corneal and whisker reflexes; withdrawal to noxious stimulation remained intact.

CONCLUSION: These data show that neurons in the cortex, thalamus, and reticular formation are similarly depressed by propofol and etomidate. Although anesthetic depression of neuronal activity likely contributes to anesthetic-induced unconsciousness, further work is needed to determine how anesthetic effects at these sites interact to produce unconsciousness.
Intrathecal Catheterization Influences Tolerance to Chronic Morphine in Rats

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We evaluated the antinociceptive effects of acute and chronic morphine administered spinally via lumbar puncture in intrathecally catheterized and sham-surgery rats. The effects of acute morphine did not differ between groups. Catheterized rats developed tolerance to chronic morphine more rapidly, compared with sham and naive rats. Therefore, catheter presence facilitated development of opioid antinociceptive tolerance. Spinal astrogliosis, determined by measurement of 3-dimensional cell volumes, was observed in catheterized rats as indicated by significantly larger cell volumes compared with surgery-naive controls. Gliosis induced by chronic intrathecal morphine administered to surgery-naive animals was comparable to that observed in saline-treated catheterized rats.