Dexmedetomidine *versus* Propofol Sedation Reduces Delirium after Cardiac Surgery

A Randomized Controlled Trial

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ABSTRACT

Background: Postoperative delirium (POD) is a serious complication after cardiac surgery. Use of dexmedetomidine to prevent delirium is controversial. The authors hypothesized that dexmedetomidine sedation after cardiac surgery would reduce the incidence of POD.

Methods: After institutional ethics review board approval, and informed consent, a single-blinded, prospective, randomized controlled trial was conducted in patients 60 yr or older undergoing cardiac surgery. Patients with a history of serious mental illness, delirium, and severe dementia were excluded. Upon admission to intensive care unit (ICU), patients received either dexmedetomidine (0.4 μg/kg bolus followed by 0.2 to 0.7 μg kg^{-1} h^{-1} infusion) or propofol (25 to 50 μg kg^{-1} min^{-1} infusion) according to a computer-generated randomization code in blocks of four. Assessment of delirium was performed with confusion assessment method for ICU or confusion assessment method after discharge from ICU at 12-h intervals during the 5 postoperative days. Primary outcome was the incidence of POD.

Results: POD was present in 16 of 91 (17.5%) and 29 of 92 (31.5%) patients in dexmedetomidine and propofol groups, respectively (odds ratio, 0.46; 95% CI, 0.23 to 0.92; $P = 0.028$). Median onset of POD was on postoperative day 2 (1 to 4 days) *versus* 1 (1 to 4 days), $P = 0.027$, and duration of POD 2 days (1 to 4 days) *versus* 3 days (1 to 5 days), $P = 0.04$, in dexmedetomidine and propofol groups, respectively.

Conclusions: When compared with propofol, dexmedetomidine sedation reduced incidence, delayed onset, and shortened duration of POD in elderly patients after cardiac surgery. The absolute risk reduction for POD was 14%, with a number needed to treat of 7.1. **(Anesthesiology 2016; 124:362-8)**

DELIRIUM is an acute brain illness, which involves changes in consciousness, attention, cognition, and perception. The incidence of postoperative delirium (POD) in patients undergoing cardiac surgery has been reported in a range of 20 to 50%,[1–5] with elderly patients being at the greatest risk. POD is distressing to both the patients and their families, and it has also been associated with higher morbidity and mortality, prolonged hospital stay, and increased healthcare costs.[3,4,6]

Although the risk factors and consequences of POD are well recognized, perioperative therapies for the prevention of delirium are not well defined. There is evidence, however, that the type of sedation in critically ill patients is associated with an increased risk of delirium.[7] A recent meta-analysis of 14 prospective randomized clinical trials found that dexmedetomidine reduced delirium rates in critically ill patients when compared with sedation with midazolam.[8] Current pain, agitation, and delirium guidelines reflect these findings with respect to shorter mechanical ventilation time and reduced intensive care unit (ICU) length of stay and recommend minimizing or substituting benzodiazepines with either propofol or dexmedetomidine in this patient population.[9] A recent Cochrane review, however, found that

What We Already Know about This Topic

- The incidence of postoperative delirium in patients undergoing cardiac surgery has been reported in a range of 20 to 50%, with elderly patients being at the greatest risk
- This study is a prospective, randomized, controlled clinical trial comparing dexmedetomidine- and propofol-based postoperative sedation regimens in elderly patients undergoing cardiac surgery

What This Article Tells Us That Is New

- When compared with propofol, dexmedetomidine sedation reduced incidence, delayed onset, and shortened duration of postoperative delirium in elderly patients after cardiac surgery

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there was no evidence for a beneficial effect of dexmedetomidine on risk of delirium in critically ill patients due to the high heterogeneity of the studies, inadequate assessment of delirium, and lack of having delirium as a primary outcome measure.[10] This supports our contention that a prospective assessment of delirium using validated, reproducible tools at regular time intervals is paramount in determining the true rates of POD.[11] So far, only one small study used *a priori* hypothesis and validated tools for the assessment of delirium after cardiac surgery comparing dexmedetomidine- to midazolam- and propofol-based sedation regimens.[5] Consequently, level I evidence is still lacking in defining the specific pharmacological prevention strategies to reduce POD after cardiac surgery. The current study is a large prospective, randomized, controlled clinical trial comparing dexmedetomidine- and propofol-based postoperative sedation regimens in elderly patients undergoing cardiac surgery. We hypothesized that dexmedetomidine-based sedation strategy would reduce the incidence of POD.

Materials and Methods

Study Population

The current clinical trial was registered on June 20, 2011, at URL: www.clinicaltrials.gov, with the unique identifier: NCT01378741, and principal investigator: G.D. After the University Health Network, Toronto, Ontario, Canada, Research Ethics Board approval, and a written informed consent, we conducted a prospective, randomized, single-blinded, controlled clinical trial in patients older than 60 yr undergoing elective complex cardiac surgery and older than 70 yr undergoing either isolated coronary revascularization or single-valve repair/replacement surgery with the use of cardiopulmonary bypass (CPB) from August 2011 to July 2014. A complex cardiac surgery was defined as a combination of coronary revascularization with a valve repair/replacement, multiple valve repair/replacement, a redo-sternotomy, and the use of deep circulatory arrest. Patients with a history of serious mental illness, delirium, severe dementia, or undergoing emergency procedures were excluded. Patients were recruited through the preadmission clinic. This was a single-center study of the quaternary referral center in Toronto, Ontario, Canada.

Anesthesia and CPB Management

Anesthesia management was standardized to minimize any impact that anesthetic type would have on neurological outcomes. Premedication with 1 to 2 mg oral lorazepam was optional. The use of midazolam during the surgery was limited to a maximum of 0.05 mg/kg. Anesthesia was induced with 10 to 12 μg/kg fentanyl, 0.5 to 2 mg/kg propofol, and 0.15 mg/kg pancuronium and maintained with 0.5 to 2.0% isoflurane. The heart rate and blood pressure were maintained within 25% of the baseline values. Anticoagulation was achieved with heparin to maintain an activated clotting time above 480 s. The CPB circuit was primed with 1.8 l lactated of Ringer's solution and 50 ml of 20% mannitol. Management of CPB included systemic temperature drift to 34°C, alpha-stat pH management, targeted mean perfusion pressure between 60 and 80 mmHg, and pump flow rates of 2.0 to 2.4 l/min/m^2. Myocardial protection was achieved with intermittent antegrade and, occasionally, retrograde blood cardioplegia. A 32-μm filter (Avecor Affinity, USA) was used in the arterial perfusion line. Deep hypothermic circulatory arrest was achieved by cooling to 20°C with antegrade cerebral perfusion. Before separation from CPB, patients were rewarmed to 36° to 37°C. During rewarming, the maximal inflow temperature was limited to 37°C. After separation from CPB, heparin was neutralized with protamine sulfate, 1 mg/100 U heparin, to achieve an activated clotting time within 10% of baseline. All patients were transferred to ICU after surgery.

Study Drug Administration

The current study was a superiority study. We hypothesized that the administration of dexmedetomidine would result in lower delirium rates after cardiac surgery when compared with propofol sedation. Patients were randomly allocated to either dexmedetomidine or propofol (control) groups according to a computer-generated randomization code in blocks of four, aiming at subject allocation in a 1:1 ratio. Opaque sealed envelopes were generated according to the randomization schedule and opened by a study coordinator before surgery. Upon arrival to ICU, patients in the dexmedetomidine group received a bolus of 0.4 μg/kg dexmedetomidine (over a period of 10 to 20 min) followed by an infusion of 0.2 to 0.7 μg kg^{-1} h^{-1}. If patients were hemodynamically unstable, the bolus dose was omitted. The infusion of dexmedetomidine was continued for a maximum period of 24 h. Dexmedetomidine infusion was not discontinued before extubation. Patients in the propofol group received propofol infusion 25 to 50 μg kg^{-1} min^{-1} until readiness for tracheal extubation. If mechanical ventilation was required beyond the 24-h period, based on the institutional standard of practice, patients in the dexmedetomidine group were converted to propofol sedation. Sedation level was assessed by using the Sedation Agitation Scale (SAS).[12] Infusions of dexmedetomidine and propofol were titrated to achieve light sedation resulting in a calm and cooperative patient (SAS score of 4). SAS was performed every 4 h or more often if required (*e.g.*, patient's condition changed). Both groups received a combination of opioid analgesics and nonopioid adjuvants for postoperative pain management. Pain was assessed using a standard 10-cm visual analog scale (0, no pain; 10, worst and unbearable pain). Patients received 2 mg morphine or 0.2 to 0.4 mg hydromorphone intravenously or 2 to 4 mg orally if pain was 4 or more on the analog scale. An equivalent of morphine conversion analog to hydromorphone was calculated for all patients by a factor of 0.15. In addition, 50 to 100 mg indomethacin was used if there were

no contraindications and 325 to 650 mg acetaminophen as needed.

Study Endpoints

Assessment of delirium was performed preoperatively (baseline) and postoperatively at 12-h intervals or as needed according to the patient's condition using the confusion assessment method (CAM) for ICU.[13] When patients were discharged from ICU to the surgical floor, delirium was assessed using CAM. Patients were assessed for delirium during the 5 postoperative days. Patients were considered delirious until they were deemed CAM negative. The CAM-ICU was used for both ventilated and extubated patients. It included a four-step algorithm identifying the following: (1) an acute onset of changes or fluctuations in the course of mental status, (2) inattention, (3) disorganized thinking, and (4) an altered level of consciousness. Patients were considered delirious if both features (1) and (2) were present plus either feature (3) or (4). Patients were rendered either CAM positive (delirium present) or CAM negative (delirium absent). Diagnosis of delirium was confirmed by the psychiatry consult. The onset and duration of delirium were also recorded. The CAM-ICU and CAM testers were not aware of the study objectives. IV haloperidol was used as a first-line treatment in delirious patients, in the increments of 1 to 5 mg, repeated every 30 to 60 min as needed. If deemed necessary, other antipsychotic medications were administered as required.

Blood product transfusion rates, requirement for inotropic and/or vasoconstrictor support, permanent pacemaker insertion, major end-organ dysfunction, extubation times, and ICU and hospital length of stay were recorded. Cost calculations were conducted to reflect the delirium-related hours in ICU and on the surgical floor.

Sample Size and Statistical Analysis

On the basis of the previous report that identified the delirium rate of 3%[5] in patients receiving dexmedetomidine, and given the prevalence of delirium of 20%[1] in patients older than 60 yr, to see a reduction from 20 to 6% (doubling the reported rate of younger patients[5]), with $\alpha = 0.05$ and power $1\text{-}\beta = 0.8$, the group of 90 patients in each arm of the study was required for a total of 180 patients. Descriptive analysis was performed for all variables measured before and after surgery. A two-tailed Student's *t* test was used for two independent samples to analyze continuous normally distributed data. The Mann–Whitney U test was applied for nonparametric data. For the primary outcome of delirium, the two groups were compared with the chi-square test for differences in probabilities of a 2×2 contingency table. Odds ratio and CIs for proportions were calculated at 95%. A *P* value of less than 0.05 was considered statistically significant. All analyses were performed on an intent-to-treat basis. Statistical analysis was conducted with the use of MINITAB® statistical software (Minitab Inc., USA).

Results

A total of 950 subjects were screened for eligibility and 765 were excluded based on patients' refusal, not meeting the criteria, language barrier, or prior recruitment in other studies. A total of 185 patients were randomized and 183 analyzed. One patient died in the operating room, and one patient underwent off-pump coronary revascularization surgery based on the intraoperative decision and was excluded from the analysis. One patient who was randomized to dexmedetomidine group received propofol sedation due to scheduling changes that resulted in unavailability of dexmedetomidine upon arrival in ICU. On the basis of *a priori* "intent-to-treat" analysis, this patient remained in the dexmedetomidine group. As a result, there were a total 91 patients in the dexmedetomidine group and 92 patients in propofol group. Both groups were similar with respect to demographic data, preoperative medications, comorbidities, and surgical characteristics (table 1). POD was present in 16 of 91 (17.5%; 95% CI, 9.7 to 25.3%) and 29 of 92 (31.5%; 95% CI, 22.0 to 41.0%) patients in dexmedetomidine and propofol groups, respectively (odds ratio, 0.46; 95% CI, 0.23 to 0.92; $P = 0.028$).

In patients treated with dexmedetomidine, the median onset of delirium was delayed and the duration of delirium reduced when compared with controls (table 2). There were three patients in the dexmedetomidine group and six patients in the propofol group who required mechanical ventilation and sedation beyond the 24-h period. None of these patients in dexmedetomidine group developed delirium, whereas three patients in the propofol group were delirious. The overall incidence of major adverse outcomes, requirements for inotropic/vasoconstrictor support, and the length of stay were similar between the two groups (table 3). The sedation and pain scores as well as the requirements for analgesics and antipsychotics are reflected in table 4.

Patients who developed delirium were significantly older, had longer surgery, and increased length of stay when compared with patients without delirium (table 5). A total of 11 and 25 patients in the dexmedetomidine and propofol groups developed delirium in ICU. The remaining five and four patients in their respective groups developed delirium on the surgical floor after ICU discharge. Constant care on the surgical floor was required in 12 and 17 patients in dexmedetomidine and propofol groups, respectively. Constant care provides a personal support worker who is trained in assisting the management of patients with delirium. Delirium-related hours were calculated as 450 and 1,200 in the ICU and 532 and 888 on the surgical floor in the dexmedetomidine and control groups, respectively. An average cost of ICU day was estimated at $2,200.00 Canadian dollars (CAD), and an average cost of a constant care was $18.95 CAD per hour. A total cost of ICU stay in propofol and dexmedetomidine groups were $728,200 CAD and $541,200 CAD, respectively (table 6). The estimated cost of delirium-related hours in ICU was $41,250.00 CAD in the dexmedetomidine group and $110,000.00 in the propofol group. Similarly, the estimated constant-linked

Table 1. Baseline Demographics and Surgical Characteristics of Study Population

	Dexmedetomidine Group (n = 91)	Propofol Group (n = 92)
Age, yr, mean (SD)	72.7 (6.4)	72.4 (6.2)
Male sex, n (%)	68 (74.7)	70 (76.0)
Weight, kg, mean (SD)	82.0 (15.3)	79.6 (16.9)
Comorbidities, n (%)		
Coronary artery disease	55 (60.4)	60 (65.2)
Hypertension	70 (76.9)	68 (73.9)
Myocardial infarction	14 (15.4)	16 (17.4)
Atrial fibrillation	20 (21.9)	17 (18.5)
Congestive heart failure	13 (14.3)	15 (16.3)
Stroke/transient ischemic attack	10 (10.9)	11 (11.9)
Diabetes mellitus	18 (19.7)	22 (23.9)
Peripheral vascular disease	8 (8.8)	11 (11.9)
Thyroid disease	16 (17.5)	14 (15.2)
COPD	8 (8.8)	11 (11.9)
Left ventricular grade, median (range)	2 (1–4)	2 (1–4)
Preoperative medications, n (%)		
β-Blockers	48 (52.7)	49 (53.2)
Calcium channel blockers	21 (23.1)	22 (23.9)
ACE inhibitors	39 (42.4)	34 (36.9)
Statins	62 (68.1)	64 (69.5)
Aspirin	55 (60.4)	60 (65.2)
Antidepressants	14 (15.4)	10 (10.9)
Benzodiazepines	15 (16.5)	11 (11.9)
Lorazepam premedication	43 (47.2)	45 (48.9)
Alcohol intake (units per week)	9 (0–40)	8 (0–56)
Smoking	39 (42.8)	32 (34.8)
Hemoglobin, g/l, mean (SD)	139.6 (17.4)	137.6 (15.0)
Creatinine, μM, mean (SD)	89.1 (21.6)	89.2 (21.8)
Type of surgery, n (%)		
Coronary bypass grafting	48 (52.7)	53 (57.6)
Number of distal anastomoses, median (range)	3 (1–5)	3 (1–5)
Mitral valve	13 (14.3)	19 (20.6)
Aortic valve	42 (46.1)	43 (46.7)
Tricuspid valve	4 (4.4)	3 (3.3)
Replacement ascending aorta	15 (16.5)	13 (14.1)
Redo-sternotomy	11 (12.1)	13 (14.1)
Hypothermic circulatory arrest	8 (8.8)	7 (7.6)
Cardiopulmonary bypass time, min, median (IQR)	100 (71–127)	98 (77.5–133)
Cross-clamp time, min, median (IQR)	78 (55–105)	77 (58–103)

Data are expressed as mean (SD), n (%), or median (IQR). Left ventricular grading: 1 (ejection fraction >60%), 2 (ejection fraction 40–59%), 3 (ejection fraction 20–39%), and 4 (ejection fraction <20%).

ACE = angiotensin-converting enzyme; COPD = chronic obstructive pulmonary disease; IQR = interquartile range.

accrued cost on the surgical floor was $10,081.40 CAD and $16,827.60 in the dexmedetomidine and propofol groups, respectively.

Discussion

The current study is the largest prospective randomized clinical trial confirming that, compared with propofol, dexmedetomidine-based postoperative sedation reduces delirium in elderly patients after cardiac surgery. Dexmedetomidine-based sedation regimen resulted in reduced incidence, delayed onset, and shortened duration of POD. The absolute risk reduction for POD was 14%, with a number needed to treat of 7.1, suggesting that dexmedetomidine-based sedation strategy prevents one case of delirium for every eight patients. Furthermore, this approach resulted in considerable cost savings, primarily due to reduced incidence and shortened duration of POD. In patients who experienced delirium, the median difference in ICU and hospital length of stay was 8.7 h and 2.5 days favoring dexmedetomidine group. At our institution, the University Health Network, last year's delirium-related extra length of hospital stay was estimated at 9,000 days resulting in a financial annual cost of $17 million. A recent study by Thoma *et al.*[14] reported that the estimated net financial benefit of choosing dexmedetomidine *versus* propofol in patients after cardiac surgery was $2,613 US per patient. In the era of limited resources and cost containment, these findings are important in aiding optimal budget management.

Postoperative sedation practices have undergone an evolution process by targeting a more balanced regimen of hypnotic- and analgesia-based sedation. A small proportion of patients should not require any sedation after cardiac surgery, and an immediate extubation could be carried out safely either in the operating room or upon arrival in ICU. However, patients with multiple comorbidities undergoing high-risk cardiac surgery might still require postoperative mechanical ventilation and sedation. Although postoperative sedation with propofol after cardiac surgery has been a standard of practice for over a decade, dexmedetomidine presents an attractive alternative. Unlike other sedatives that are commonly used in the critically ill patients, dexmedetomidine has a unique mechanism of action exhibiting sedative, anxiolytic, and analgesic effects without causing respiratory depression.[15] Furthermore, dexmedetomidine improves the quality of sleep in critically ill patients,[16] primarily resembling a nonrapid eye movement sleep pattern.[17] As an α2-adrenergic receptor agonist, it has also been shown to have significant opioid-sparing effect.[18] In addition, dexmedetomidine is lacking clinically significant anticholinergic effects[15] and has been shown to attenuate the inflammatory response of CPB.[19] A combination of all of these unique properties of dexmedetomidine may have contributed to the reduced incidence and duration of POD. Consequently, it is not surprising that administration of dexmedetomidine during the perioperative period has also been associated with reduced mortality after cardiac surgery.[20]

Table 2. Onset and Duration of Delirium and the Length of Stay in Patients with Delirium

	Dexmedetomidine Group (n = 16)	Propofol Group (n = 29)	*P* Value
Onset of delirium, d, median (range)	2 (1–4)	1 (1–4)	0.027
Duration of delirium, d, median (range)	2 (1–4)	3 (1–5)	0.04
Extubation time, h, median (range)	5.5 (3.5–14.2)	7.6 (3.8–202.2)	0.0007
Intensive care unit length of stay, h, median (range)	67.8 (20–214)	76.5 (17.8–956.5)	0.38
Hospital length of stay, d, median (range)	7.5 (5–32)	10 (6–74)	0.054

Table 3. Postoperative Outcomes and Length of Stay in the Study Population

	Dexmedetomidine Group (n = 91)	Propofol Group (n = 92)
No. patients, (%)		
Single inotrope/vasoconstrictor	83 (91)	85 (92)
Two or more inotropes/vasoconstrictors	47 (52)	53 (58)
Reexploration for bleeding	7 (7.7)	6 (6.5)
Permanent pacemaker insertion	6 (6.6)	5 (5.4)
Atrial fibrillation	53 (58.2)	48 (52.2)
Stroke/transient ischemic attack	4 (4.4)	3 (3.2)
Any blood product transfusion	35 (38)	34 (37.4)
Dialysis	0 (0)	2 (2.2)
Intraaortic balloon pump	4 (4.4)	5 (5.4)
Death	1 (1.1)	0 (0)
Extubation time, h, median (range)	5.4 (2–142)	5.9 (1–202)
Intensive care unit length of stay, h, median (range)	43 (18–315)	29.4 (17–957)
Hospital length of stay, d, median (range)	7 (4–35)	7 (4–74)

Length of stay reflects the actual discharge times and not the readiness for discharge.

Table 4. Delirium, Sedation, and Pain Scores and Requirements for Analgesia and Antipsychotics in Dexmedetomidine and Propofol Groups

	Dexmedetomidine Group (n = 91)	Propofol Group (n = 92)	*P* Value
Delirium frequency, n (%)	16 (17.5)	29 (31.5)	0.028
Haloperidol, n (%)	12 (13)	24 (26)	0.04
Quetiapine, n (%)	3 (3.3)	5 (5.4)	0.72
Sedation Agitation Scale scores, 24 h	4 (1–7)	4 (1–7)	0.13
Pain scores			
12 h	3.0 (0–8)	2.5 (0–8)	0.87
24 h	2.0 (0–7)	2.0 (0–9)	0.14
48 h	4.0 (0–8)	5.0 (0–9)	0.17
Opioid use, mg			
12 h	1.2 (0.2–4)	1.58 (0.35–8)	0.018
24 h	4 (0.2–16.4)	5.8 (0.2–12)	0.045
48 h	3.0 (0.6–8)	2.8 (0.6–8)	0.50
Ketorolac, n (%)	14 (15.4)	12 (13)	0.67
Acetaminophen, n (%)	91 (100)	92 (100)	1.0

Data are expressed as number of patients (%) and median (range).

Table 5. Comparison of Patients with and without Delirium

	Patients with Delirium (n = 45)	Patients without Delirium (n = 138)	*P* Value
Age, yr, mean (SD)	76 (6)	72 (6)	0.0001
Male sex, n (%)	36 (80)	102 (74)	0.41
Cardiopulmonary bypass time, min, mean (SD)	123 (54)	101 (36)	0.002
Extubation time, h, median (range)	6 (3.5–202)	5 (1–104)	0.0037
Intensive care unit length of stay, h, median (range)	70 (18–957)	26 (12–162)	0.0001
Hospital length of stay, d, median (range)	9 (5–74)	7 (4–21)	0.0001

Table 6. Intensive Care Unit Costs Comparison between the Propofol and Dexmedetomidine Groups

	Propofol Group (n = 92)		Dexmedetomidine Group (n = 91)	
ICU-LOS, h	No. Patients	Dollar Amount (Canadian dollars)	No. Patients	Dollar Amount (Canadian dollars)
≤ 24	26	57,200	21	46,200
24–48	29	127,600	31	136,400
48–72	14	92,400	19	125,400
72–96	5	44,000	10	88,000
> 96	18	407,000	10	145,200

ICU-LOS = intensive care unit length of stay.

The primary limitation of our study was lack of blinding of the dexmedetomidine and propofol infusions. However, the testers of CAM-ICU and CAM were not aware of the study objectives. Furthermore, the applications of both CAM and CAM-ICU are objective and well-validated tools that have been a standard of practice for the assessment of delirium in critically ill patients for many years. The secondary limitation was attributed to the duration of infusion of dexmedetomidine that was limited to the maximum of 24 h according to the regulatory guidelines at the time of the inception of the study. If patients required postoperative sedation beyond 24 h, then dexmedetomidine was replaced with a propofol infusion. This practice likely resulted in a decrease in the magnitude of the effect size for dexmedetomidine. However, it may also explain the delayed onset of delirium in dexmedetomidine group and strengthening its therapeutic value.

In conclusion, postoperative administration of dexmedetomidine-based sedation regimen resulted in the reduced incidence, delayed onset, and shortened duration of POD when compared with propofol-based sedation in elderly patients after cardiac surgery.

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Competing Interests

The authors declare no competing interests.

Reproducible Science

Full protocol available from Dr. Djaiani: george.djaiani@uhn.ca. Raw data available from Dr. Djaiani: george.djaiani@uhn.ca.

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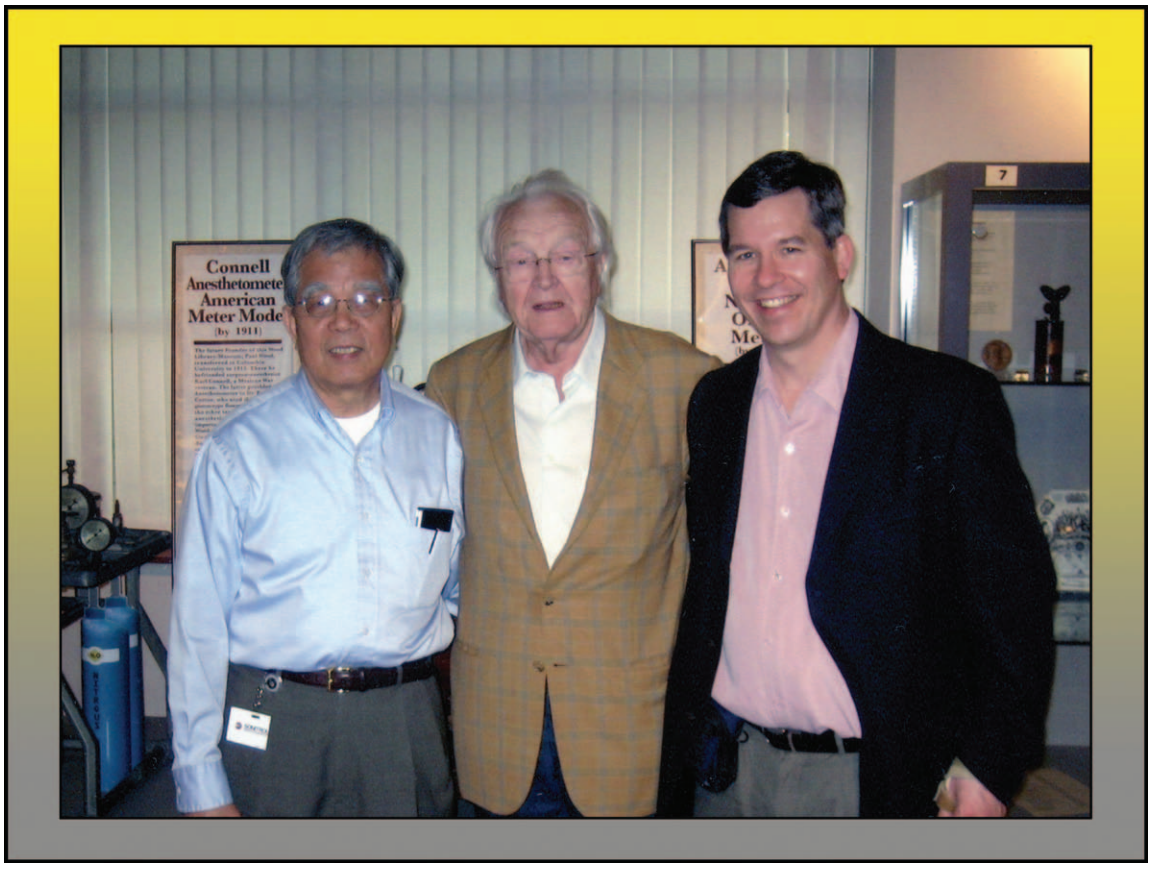
ANESTHESIOLOGY REFLECTIONS FROM THE WOOD LIBRARY-MUSEUM

Sim and Bause Flanking Stoeckel, "Germany's Paul Wood"



Now in Schaumburg, Illinois, the Wood Library-Museum of Anesthesiology was founded formally in 1933 in New York by Paul Meyer Wood, M.D. (1894 to 1963). The late Paul M. Wood Distinguished Librarian Emeritus, Patrick Sim, M.L.S. (1939 to 2010; *left*), enjoyed referring to Prof. Dr. Dr. Horst Stoeckel (*center*) as "Germany's Paul Wood." Soon after this trio was photographed in 2008 at the WLM's former Park Ridge Gallery, Prof. Stoeckel reminded the author (*right*) that the Stoeckel surname meant "little stick" in German. So the WLM's Sim and Bause spent the rest of the day musing about the "little stick in the Wood" (Library-Museum). Prof. Stoeckel may have had the last laugh, however, as he now curates one of the world's finest anesthesia museums. His namesake library and museum complex opened in 2000 in Venusberg, a southern suburb of Bonn, Germany. (Copyright © the American Society of Anesthesiologists, Inc.)

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