ROBOTICS IN ANESTHESIA & AIRWAY MANAGEMENT: **WHAT DOES THE FUTURE HOLD?**

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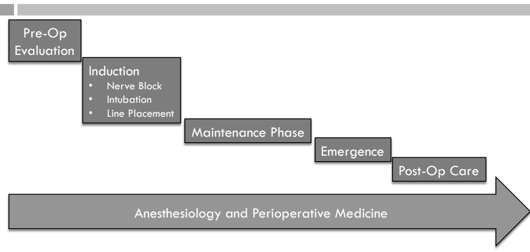
Objectives

- The History of Robotics in Anesthesia: An Elemental Approach
- The UF Simulation Experience
  - Fiberoptic Tracheal Intubation
  - Peripheral Nerve Catheter
  - Subclavian CVL Insertion
- Future Directions

An Elemental Approach



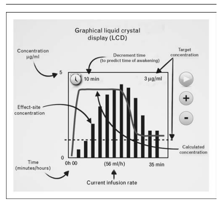
Preoperative Evaluation

- Northern Ontario Remote Telecommunication Health Network (1998)
- 2 cameras
- Digital stethoscope
- Multi-position exam of airway

Wong DT, Kamming D, Salenieks ME, Go K, Kohm C, Chung F. Preadmission anesthesia consultation using telemedicine technology: a pilot study. Anesthesiology. 2004 Jun.;100(6):1605–1607.

Maintenance of Anesthesia

- Target-Controlled Infusion (Schwilden, 1990)
  - Prevalence of 25% of TIVA in Europe
  - Automatically computes effect-site target concentration
    - 3-compartment model

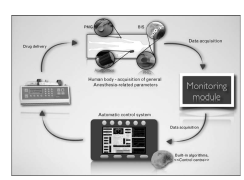


Note the estimated time of emergence if the infusion is stopped.

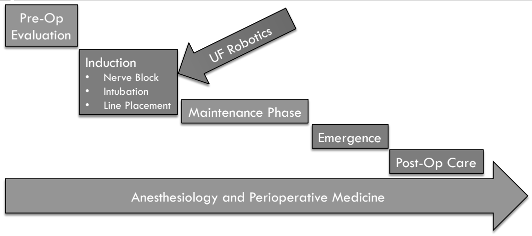
Schwilden H, Schüttler J. [The determination of an effective therapeutic infusion rate for intravenous anesthetics using feedback-controlled dosages]. Anaesthesist. 1990 Nov.;39(11):603–606.

Maintenance of Anesthesia

- Closed-Loop Anesthesia
  - Hemmerling *et al* from McGill University
  - Automated titration of propofol infusion using EEG-based Bispectral Index (BIS monitor)
  - **McSleepy**



Where are we now?



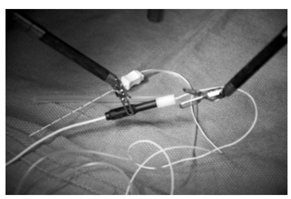
Robots and Nerve Blocks

Robot-Assisted Regional Anesthesia:
A Simulated Demonstration

Patrick J. Tighe, MD,* S. J. Badiyan, MD,* I. Luria, MS,* Andre P. Boezaart, MD, PhD,*†
and S. Parekattil, MD‡

Tighe PJ, Badiyan SJ, Luria I, Boezaart AP, Parekattil S. Technical communication: robot-assisted regional anesthesia: a simulated demonstration. Anesth Analg. 2010 Sep.;111(3):813–816.

Robots and Nerve Blocks



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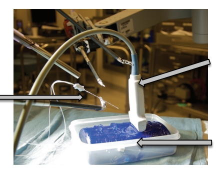
Robots and Nerve Blocks

Simulated Peripheral Nerve Block

Arrow StimQuick
21Ga. x 90mm



Sonosite S-Nerve +
C60x linear transducer

Blue Phantom Simulator

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Robots and Nerve Blocks

Dual-Video Input
Via
TilePro Video System

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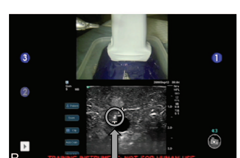
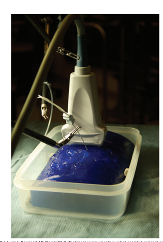
Robots and Nerve Blocks



T = Needle Tip



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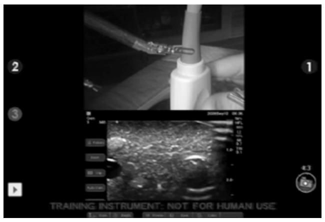
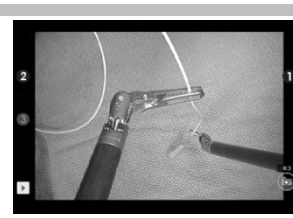
Robots and Nerve Blocks: Single-Shot



Robots and Nerve Blocks: Catheter



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Robots and Nerve Blocks: Conclusion

> “This simulation proved that robotic-assisted regional anesthesia is feasible using existing clinical equipment. The DVS easily adapted off-the-shelf equipment for US-guided placement of both single-injection and perineural catheter-based nerve blocks. Additionally, the DVS easily connected and adjusted nerve stimulation equipment, suggesting that similar techniques could be applied to a stimulating needle or catheter-based approach to robotically assisted nerve block. No permanent modifications to robotic or nerve block equipment were required for successful completion of this simulation.”

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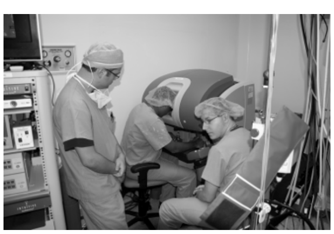
Robotic-Assisted Fiberoptic Intubation

Robot-Assisted Airway Support: A Simulated Case

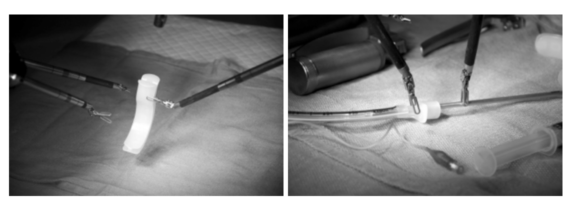
Patrick J. Tighe, MD, S. J. Badiyan, MD, I. Luria, BS, MS, S. Lampotang, PhD, and S. Parekattil, MD

Tighe PJ, Badiyan SJ, Luria I, Lampotang S, Parekattil S. Robot-assisted airway support: a simulated case. Anesth Analg. 2010 Oct.;111(4):929–931.

Robotic-Assisted Fiberoptic Intubation



Robotic-Assisted Fiberoptic Intubation

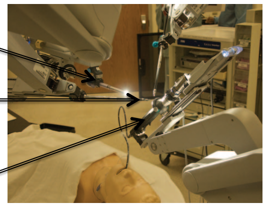


Robotic-Assisted Fiberoptic Intubation

DaVinci Camera

DaVinci Graspers

Fiberoptic Bronchoscope With Camera



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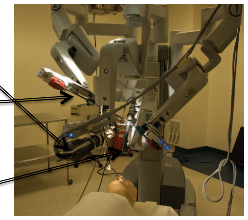

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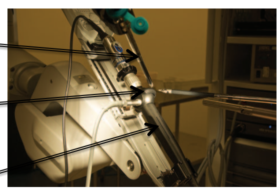
Robotic-Assisted Fiberoptic Intubation

DaVinci Graspers

Bronchoscope Lever

Fiberoptic Bronchoscope With Camera



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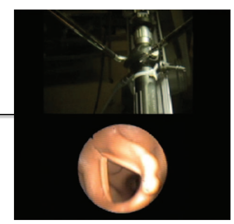
Robotic-Assisted Fiberoptic Intubation

DaVinci Camera View

Fiberoptic Bronchoscope View



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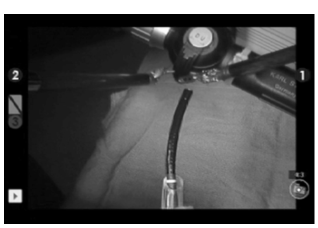

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In Progress: Central Venous Line Insertion

- Site of Placement: Subclavian
- Components to Simulate
  - *Needle positioning*
  - *Catheter placement*

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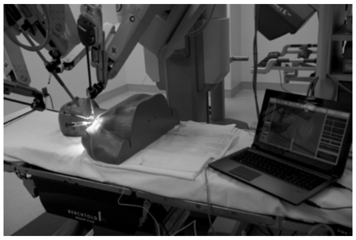

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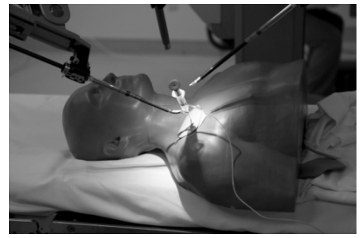

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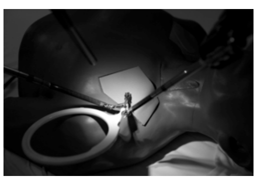
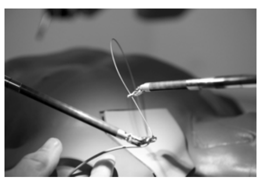
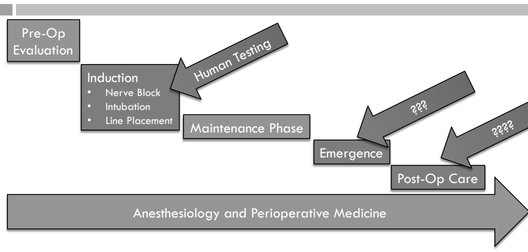




In Progress: Central Venous Line Insertion

Where to Next?



Summary of Objectives

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Perioperative Robotics!

http://medgadget.com/2010/11/first_allrobotic_surgery_mcsleepy_meets_davinci.html