

## How Innovations in Information Technology Will Change Anesthesiology

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## Disclosures

- Edwards Lifesciences - consulting

"Nothing in the world can take the place of Persistence. Talent will not; nothing is more common than unsuccessful men with talent. Genius will not; unrewarded genius is almost a proverb. Education will not; the world is full of educated derelicts. **Persistence and determination alone are omnipotent.** The slogan 'Press On' has solved and always will solve the problems of the human race." *Calvin Coolidge*

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## Objectives

At the end of this presentation the learner will be able to

- Distinguish near-term probable impacts of information technology on anesthesiology from longer term prospects
- Implement process controls for OR anesthesia (before payers do) and measure outcome improvements
- Use IT tools to track and manage the health-system impact of Perioperative Medicine initiatives
- Think a patient awake

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## Effectiveness Improvement Imperative

- Anesthesia is:
  - Commonly regarded as a safety leader
  - Only specialty built around administration of dangerous drugs
- Yet:
  - Safety taken for granted because failure is rare
  - Costs are very high
- We have a mandate to improve, but how can we figure out what to do?

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## A Proposition

- Excellent clinical skills, professionalism and medical knowledge (& the rest of the CCs) are *required* for a place at the table.
- To stay off the menu - need to offer something that can't be commoditized.
  - That wouldn't be 'caring', 'professionalism', 'ownership', 'vigilance' - the other guys have all that just as much!
- We need to leverage our current costs over more 'benefit' and transform our specialty to lock in the change.

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Some Things We WON'T be Doing Soon

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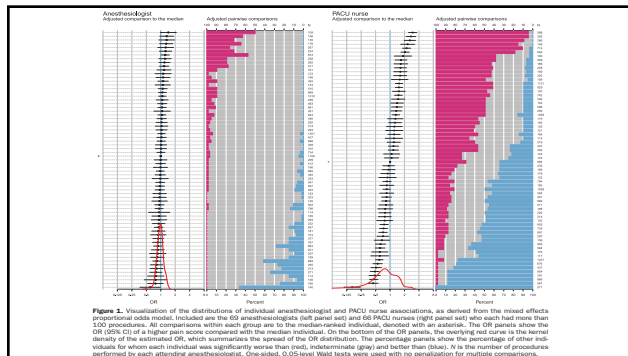
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## Things We WON'T be Doing Soon

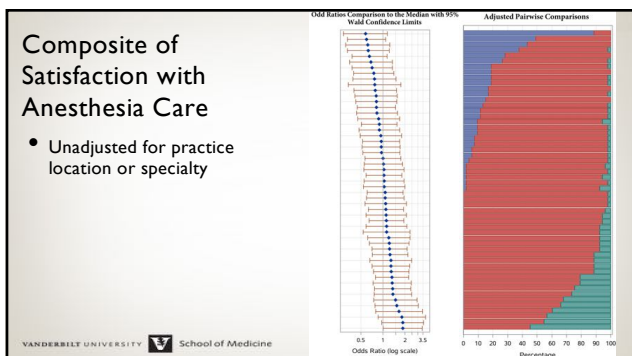
### Using Rating Systems to Score Anesthesiologists

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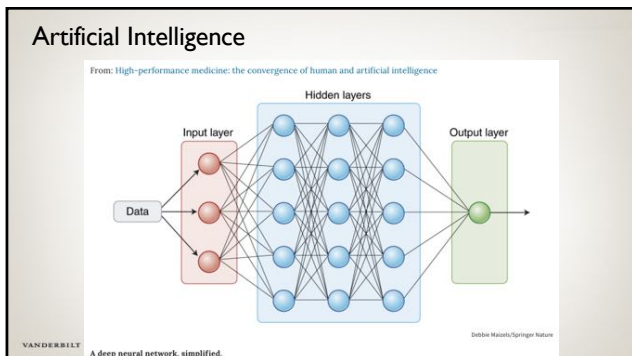
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## Things We WON'T be Doing Soon

### Using AI to Replace Anesthesiologists

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### Artificial Intelligence

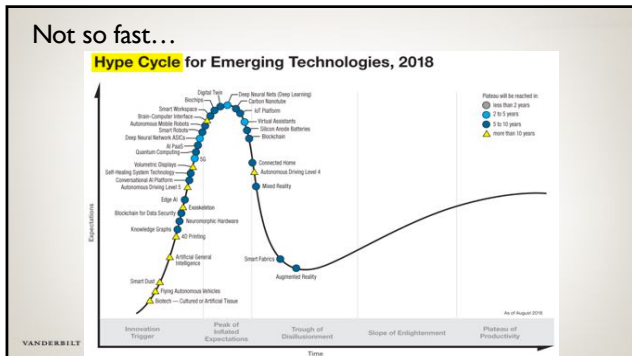
**PERIOPERATIVE MEDICINE**

**CLINICAL SCIENCE**

- Development and Validation of a Deep Neural Network Model for Prediction of Postoperative In-hospital Mortality  
C. K. Lee, I. Hiler, E. Gabler, P. Baird, and M. Carnesson 649
- Machine-learning Algorithm to Predict Hypotension Based on High-fidelity Arterial Pressure Waveform Analysis  
F. Habib, Z. Jhan, S. Burdick, C. Lee, J. Settels, K. Sibert, J. Rinshart, and M. Carnesson 663
- Supervised Machine-learning Predictive Analytics for Prediction of Postinduction Hypotension  
S. Kandale, F. Kulkarni, A. D. Rosenberg, and J. Wang 675

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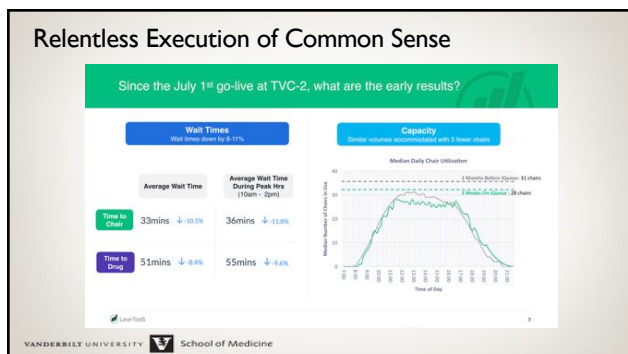
- ### Major Pitfalls
- Distributional shift:
    - The algorithm will learn from the training data
    - ...which may not represent the population
    - and then give output based on the training data
  - Black Box decision making
    - Level of confidence not always shown/known
    - Fail safe or unsafe?
    - Automation complacency
    - Adapt to changing practice?
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## But Anesthesiologists Can Use AI Productively

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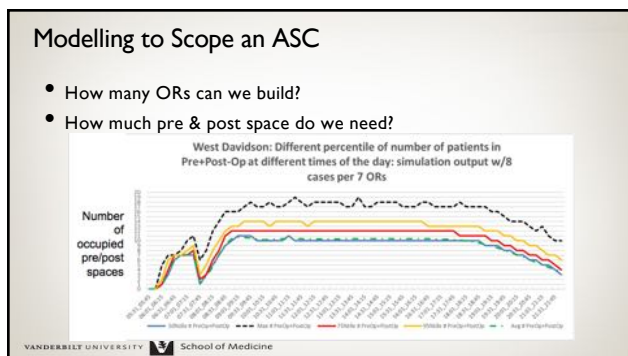
### Modelling to Scope an ASC

- How many ORs can we build?
- How much pre & post space do we need?

Answer: it depends on how many cases per OR, the case duration and how long the patients spend in pre- & post-op spaces

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### Disruption in Anesthesia?

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### Some Things We WILL Be Doing Soon

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### Things We WILL Be Doing Soon

#### Scoring and Incentivizing Clinicians on Process Performance

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### Glucose: A Modest Success Story

- Described solution happens **AUTOMATICALLY**
- Hit 'problem list' for any diagnosis of DM
- Hit 'VPIMS' for insulin administration
- Hit 'lab system' for [glucose]
- Run semi-continuously
  - Every 90' for diabetics
  - Every 60' for patients receiving insulin
- Remind providers when lab data are missing

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### [Glucose]: A Modest Success Story

Reduced the wound infection rate

Fig. 6. Interrupted time series showing surgical site infection (SSI) rates. Interrupted time series analysis of the average monthly SSI rate. A negative change in level indicates a statistically significant drop in the SSI rate across phases (P = 0.04 in the segmented regression analysis; P = 0.016 in the autoregressive integrated moving average model).

- Multiple strategies to 'eliminate' observed effect...

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### Glucose Monitoring

- Initially implemented in VPIMS
- Saved & re-implemented in Epic
- Improved glycemic control
- Demonstrated reduction in SSIs over 3.5 years

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Dhondt JM, Winkler JP, Teasdale M, Culman BS, Sandberg SD. A Participative Systems Change to Improve Intensive Glucose Monitoring is Associated with a Reduction in Surgical Site Infections in a Diabetic Patient Population. *Healthcare*. 2017 Mar;15(2):431-440.

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Things We WILL Be Doing Soon

Getting Control of Clinical Processes  
Up- and Downstream of the OR

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ERAS for Colorectal Surgery

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**ERAS+ for Colorectal Surgery**

- Development of decision-to-post discharge pathway for colorectal surgery patients
- Multidisciplinary initiative in collaboration with colorectal surgeons
- Target: One day off LOS (all pts; *more potential*)
- Full hospital: Every 4-5 patients across fixed floor bed cost base allows addition of a 5<sup>th</sup> or 6<sup>th</sup> case
- Falls straight to the bottom line

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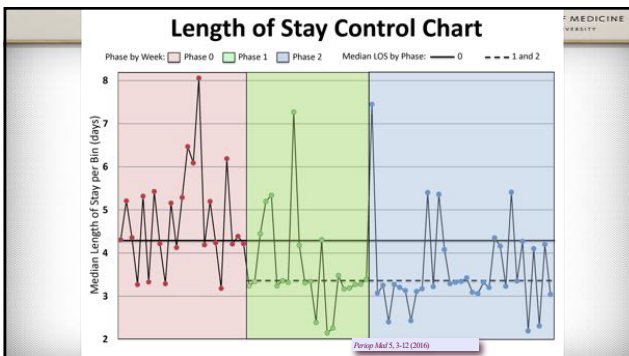
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**PCS Care Plan: Colorectal ERAS Components**

Preoperative Timeline

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**What About Medical Outcomes?**

- Difference in difference analysis: NSQIP complications

SSI	Respiratory	Transfusion	Renal
Organ/space SSI	On ventilator > 48 h	Transfusion intraop/post-op (72 h of surgery start time)	Progr. insult
Superficial incisional SSI	Unplanned intubation		Acute renal failure
Deep incisional SSI	Pneumonia		Sepsis
			Cardiac arrest requiring CPR
			Pulmonary embolism

SSI RATES  
— CCR Cohort — National NSQIP Matched Cohort  
PRE POST

VANDERBILT UNIVERSITY School of Medicine [Surp Endosc https://doi.org/10.1007/s00464-018-6596-2](https://doi.org/10.1007/s00464-018-6596-2)

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