Variation in ICU Care:  
Physician Practice Patterns

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No Conflicts to Report
Variation in Health Care

- There is a very extensive literature on this topic

- **LARGE** variation, *not* due to patient or illness characteristics, in every medical setting in which it has been assessed: outpatient, general inpatient, ICU

- Differences by: geographic region, hospital, payer system, physician specialty, individual physician, other factors

- Variation has been shown in clinical outcomes, treatments, resource use, end-of-life care

★ Strong evidence that suboptimal care is common -- we can’t all be doing it differently, & all be doing it equally well
Variation in ICU Structure/Organization

- Large differences by country in ICU beds/capita \((CCM\ 36:2787,2008)\)

- Variation in who does what in ICUs \((e.g.\ nurses:\ Audit\ Commission\ for\ Local\ Auth.\ &\ NHS\ in\ England\ &\ Wales,\ 1999)\)

- Many hospitals have MET teams, many don’t

- Large variation among U.S. ICUs in intensivist staffing \((weekdays,\ weekends,\ nights)\ \((CCM\ 34:1016,2006)\)

- Large variation among ICUs in the number and scope of practice guidelines

- “If you’ve seen one ICU, you’ve seen one ICU”
Variation in ICU Care and Outcomes

- **Variation in care**
  - odds ratio for use of PAC in 34 U.S. ICUs varied 220-480% by how the ICUs were organized and staffed (*JAMA* 283:2559, 2000)
  - dopamine for septic shock varied 15-fold (3-45%) between European countries (*CCM* 34:589, 2006)
  - % of MV pts with indwelling arterial catheters varied 30-72% (*Anesthesiology* 120:650, 2014)

  - regardless of risk-adjustment system used (*Chest* 133:1319, 2008)
Since medical decisions and outcomes ultimately come down to individual physicians caring for individual patients, the large-scale variation (between countries, regions, hospitals, ICUs, etc.) must be a reflection of an agglomeration of variation on the small-scale.

Segue ⇒ practice variation between individual physicians
ICU Variation Related to Individual Attendings

(AJRCCM 174:1206, 2006)

- Prospective study, 2002-2005, in Medical ICU of a 13 bed, public teaching hospital in Cleveland, Ohio

- 9 different intensivists doing 14 day blocks of coverage

- Multivariable models of daily discretionary ICU costs, LOS, mortality
  - intensivist identity included as fixed effects
  - adjusted for: age, race, gender, comorbidity, ICU admit source, DNR prior to ICU, type of acute illness, AP2APS, GCS, ±MV, ICU census & #admissions

★ Only patients with 1 intensivist for the entire ICU stay
ICU Variation Related to Individual Attendings

- Discretionary daily ICU costs
  - average = $1,084 ± 1,235
  - after adjusting, variation was 42% across the intensivists (p<.001)

- NS variation across intensivists of mortality or LOS (in ICU or hospital) ⇒ ↑ spending did not generate better outcomes

- Furthermore -- those who ordered more, tended to do so in all subcategories of discretionary costs
  - pharmacy, imaging, interventional radiology, laboratories, blood bank, echocardiography
  - these ordering/spending patterns appear to represent consistent individual styles of practice
Predictive Power of the Variables

<table>
<thead>
<tr>
<th>Omitted Variable(s)</th>
<th>Adjusted $R^2 \times 100$</th>
<th>(Adjusted $R^2$ of Full Model – Adjusted $R^2$) $\times 100$</th>
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</thead>
<tbody>
<tr>
<td>None (full model)</td>
<td>25.54</td>
<td>—</td>
</tr>
<tr>
<td>APS-N and GCS</td>
<td>18.63</td>
<td>6.91</td>
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<tr>
<td>Diagnostic grouping</td>
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<td>4.31</td>
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<tr>
<td>Intensivist identity</td>
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<td>2.22</td>
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<tr>
<td>Source of ICU admission</td>
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<tr>
<td>Number of comorbid conditions</td>
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<tr>
<td>Age, sex, and race</td>
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<td>0.75</td>
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<tr>
<td>Intubation status</td>
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<td>0.41</td>
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</table>
More Variation In Physician Practice

- 15-fold difference between individual intensivists, in that same MICU, in tendency to write orders in ICU to withhold or withdraw life support (J Palliative Med 10:1298,2007)

- Significant physician-level variation in use of Choosing Wisely non-recommended oncology practices (JAMA-IM 176:154,2016)

- All these findings imply that physicians have ingrained practice styles (behavioral practice patterns)

  - “Further research is required to explore determinants of provider behavior to better identify modifiable and nonmodifiable effect modifiers”
Addressing Undesirable Variation in Care

- The modern paradigm (QI, OI, TQM) is process- and system-based approach -- but as far into the future as we’re realistically able to see, individual practitioners will continue to play a large role (*Chest* 127:2151 & 2165, 2005)

- Changing physician practice is very hard to do
  - “Changing Physicians’ Practices” *NEJM* 329:1271, 1993
  - “Changing Physician Behavior Is Harder Than We Thought” *JAMA* 316:21, 2016
  - pay-for-performance also has a mixed track record (*Hlth Policy*, epub, 2016; *Hlth Policy* 110:115, 2013)
  - all this indicates that practice styles are more “hard-wired” than just education and money can influence
Hypothesis#1: Physicians’ personality traits and training are important determinants of their practice patterns

Clinical practice patterns are behaviors -- influence of personality traits would explain why it’s so difficult to change these patterns

Training has been shown to play a role, but that influence wanes with time from graduation (JAMA 312:2385,2014)

Hypothesis#2: One influential personality trait is Tolerance of Uncertainty

1st discussed in medicine by sociologist Renee Fox (1957) -- observed that physicians cope with uncertainty by strategies that include magical thinking, repeatedly telling stories of success as myths of enterprise, and trying out new things on a hunch
Tolerance of Uncertainty in Medicine

- Relatively little work has been done on it.
- Several survey instruments have been developed to measure it -- including 2 that are physician specific (*Motiv Emot* 19:175, 1995; *JGIM* 10:557, 1995).
  - varied by specialty: highest in surgery, anesthesia, radiology; lowest in internal medicine, family medicine, psychiatry
  - higher in those who had greater reliance on high-tech medicine.
Tolerance of Uncertainty in Medicine

- In his 1984 book *The Silent World of Doctor and Patient*, Katz argued that doctors commonly respond to medical uncertainty by ordering more tests.


- Primary care docs with lower risk tolerance more often refer to subspecialists, prescribe antibiotics, and generate higher care costs (Med Decis Making 18:320,1998; Br J Gen Practice 40:134,1990).
Other Personality Trait Differences

- Common construct in psychology of basic personality traits is represented by “The Big Five Inventory”: Neuroticism, Extraversion, Openness, Agreeableness, Conscientiousness.

- Surgeons, c/w internists, have (J Surg Res 196:60,2015)
  - significantly higher Conscientiousness and Extraversion
  - significantly lower Agreeableness

- Some correlations were found, in German GPs, between the Big Five traits and Tolerance of Uncertainty (PLoS ONE 9(7):e102780,2014)
Study Underway

- ICUs in 9 centers in US and Canada
- Surveys of intensivists -- demographics, training, instruments to assess Tolerance of Uncertainty and The Big Five Inventory
- Measure of clinical practice style = # of diagnostic radiology and laboratory tests performed (from ICU databases)
- Analysis: multivariable, mixed effects Poisson model
  - ICU LOS as offset variable
  - adjusted for patient and illness characteristics, ICU characteristics
  - clustering of patients within intensivists within ICUs -- variance component of intensivist-level effect indicates magnitude of inter-individual differences in practice style
Potential Implications

- If physicians’ practice patterns result (at least in part) from personality traits $\Rightarrow$ altering these behaviors may be amenable to strategies based on behavior modification.

- 2x2x2 factorial study of 3 approaches to reducing non-indicated use of Abx in hospital practice (JAMA 315:562,2016)
  - EMR reminders did not work, 2 behavior mod. approaches did
  - Accountable justification = justification text required in the EMR, where others could see it, and if omitted, listed as “none given”
  - Peer comparison, with (limited) quarterly announcement of results
Summary

- Medical practice, including in ICU, suffers from substantial, ubiquitous, undesirable variation not explained by patient or illness characteristics.

- Differences in practice patterns of individual physicians contributes substantially to this variation.

- Physician practice patterns are behaviors -- which are very difficult to change, possibly because they are related to personality traits.

- Given the (at most) modest success with current approaches to changing physicians’ behavior, other, psychology-driven, approaches may be helpful, and require more study.
"You will make the same foolish mistakes you have made before, not only once but many, many times again."