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Should we agree to disagree on who may benefit from ICU admission?

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The identification of practice pattern variation is a cornerstone of health services research. However, finding practice variation requires subsequent consideration of the underlying causes of different practice patterns among similar patients. In early health services research papers, JE Wennberg stated that, “Variations in utilization indicate that there is considerable uncertainty about the effectiveness of...specific kinds of health services.”¹ In addition to variation in practice that is driven by uncertainty in evidence, Wennberg also described “unwarranted variation” that can be seen in clinical areas where: (1) effectiveness has been demonstrated but variation represents poor adherence to best practices; (2) patient preferences for two or more medically acceptable options may vary, but is unduly swayed by local medical opinion; and (3) deployment of care is “supply-sensitive.”² Thus, identifying practice variation may either signify areas where more research is needed to fill a poor evidence base, or areas to target improvement in healthcare delivery or quality.

In the ICU setting, multiple studies have observed wide variation in ICU admission rates between hospitals³ for similar patients.^{4–6} For example, median ICU admission rates for patients with pulmonary embolus ranged from 2.9% to 79.9% across 263 hospitals⁵, and for patients with diabetic ketoacidosis ranged from 2.1% to 87.7% across 159 hospitals.⁴ However, patients admitted to hospitals with high ICU admissions rates did not generally receive more organ supportive therapy and (with the possible exception of pneumonia⁷) did not have better patient outcomes. Instead, hospitals with high ICU rates produced greater healthcare costs.³

What could be driving the large, unexplained variation in ICU use? While studies have explored the role of patient factors (e.g., differences in disease severity,³ or differences in patient preferences for invasive interventions)⁸ and structural factors (e.g., ICU bed availability⁹; hospital technical capabilities),³ as drivers of variation in ICU use, studies have not explored physician opinions on what constitutes beneficial ICU care.

In this issue of *Critical Care Medicine*, Valley and colleagues performed a randomized study to explore variation in physician beliefs about the likelihood of benefit from an ICU admission.¹⁰ Using an online survey approach, Valley and colleagues administered eight identical vignettes of hypothetical patients, each with one of eight factors randomized— four factors related to severity of illness (respiratory rate, oxygen requirement, blood pressure, mental status) and four factors unrelated to severity of illness (number of available ICU beds, presence of family, patient age, patient race/ethnicity). Respondents were asked to grade on a four-point Likert-type scale: (1) if a given patient would benefit most from admission to the general ward or ICU, and (2) the difficulty of their decision. Authors assessed both the level of agreement among US critical care physicians with regards to estimated benefit from ICU admission via an intraclass correlation coefficient (ICC) model as well as whether factors beyond severity of illness played a role in their decisions. The authors found overall poor consensus among US physician estimates of a patient's likelihood of benefitting from an ICU admission (mean ICC 0.06, range 0–0.18; ICC values <0.5 indicate poor agreement). Whereas increasing severity of illness was correlated with estimated benefit of ICU care, factors that also affected estimates of ICU benefit included ICU bed availability and/or family presence, as well as patient age. A remarkable result of Valley and colleagues' work is that variable ICU admission rates arise not only because of differences in how sick patients are, or what patients want, but also because ICU physicians *do not agree* on who will benefit from ICU care.

The authors' findings should be taken in the context of some strengths and limitations. Randomization reduces confounding from unmeasured case mix variation that affects many studies of practice variation, allowing causal inferences on the impact that specific patient characteristics on estimates of ICU benefit. However, generalizability of study results may be reduced by a low survey response rate of 14%, especially given that respondent characteristics differed from the underlying population of Society of Critical Care Medicine from which they were drawn. We speculate that the similarities that led some physicians to respond to the survey may bias the responses towards agreement – thus, it is possible that agreement on who may benefit from an ICU may be even less than identified by Valley et al.

We propose 3 major reasons why ICU physicians cannot agree on who benefits from ICU admission.

1. **Although respondents were asked to estimate benefit from ICU admission based on clinical characteristics, clinicians projected their own set of health-system circumstances on the vignettes.** For example, a respondent may have thought “if this patient was admitted to an institution like mine, where we have limited ICU beds, but high nurse staffing on the wards and a robust rapid response team, then maintaining continuity of care with the ward teams would be

beneficial". In this case, variation in local ward capabilities may drive variation in perceived ICU benefit and ICU use.

2. **When judging the utility of a limited resource, physicians partially judged benefit in relative terms.** Respondents were more likely to perceive a benefit to ICU care if they were told one ICU bed was available than if ICU bed availability was not mentioned. This suggests that respondents judged an individual's potential benefit from the ICU to be relative to the potential benefit to a future patient.
3. **Physicians disagree on what constitutes a "benefit from ICU care".** Two providers could anticipate the *same clinical course* (e.g. the same prognostication that a patient has a very high likelihood of death) and arrive at different conclusions of whether the patient may benefit from the ICU. Were the more favorable nursing ratios, experience with end-of-life care, and closer monitoring beneficial? Or were the greater number of invasive procedures prior to before death harmful? Perhaps the variability in our estimate of patient benefits (and subsequent variation in ICU admission) primarily reflects variation in our own internal biases and values with regards to invasive/futile vs life-sustaining care.

One path to move toward shared mental models of ICU benefit would be to better understand the situations in which physicians most agree and disagree on ICU benefit. Are there certain physician "archetypes" with common sets of beliefs about the potential benefits of ICU care? For example, do some physicians see greater benefits of ICU admission as of illness severity increases, while others perceive less benefit among patients with highest risks of death (Figure 1)? Further characterization of physician patterns of belief on ICU benefits and evidence regarding ICU admission decisions that deliver "value" to patients and hospitals/health systems is needed.

Wennberg cautioned against a system where "local medical opinion and local supply of resources are more important than science in determining how medical care is delivered."² Valley and colleagues show that idiosyncratic physician opinion and local supply of ICU beds at least partially determine how medical care is delivered in selecting patients for ICU admission. Yet Wennberg also reminds us that where variations exists, there are valuable learning opportunities. With continued robust examination of the systems already in place, we may have a chance to move forward.

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REFERENCES

1. Wennberg J, Gittelsohn. Small area variations in health care delivery. Science. 1973;182(4117): 1102–1108. [PubMed: 4750608]
2. Wennberg JE. Unwarranted variations in healthcare delivery: implications for academic medical centres. BMJ. 2002;325(7370):961–964. [PubMed: 12399352]

3. Seymour CW, Iwashyna TJ, Ehlenbach WJ, Wunsch H, Cooke CR. Hospital-level variation in the use of intensive care. *Health Serv Res.* 2012;47(5):2060–2080. [PubMed: 22985033]
4. Gershengorn HB, Iwashyna TJ, Cooke CR, Scales DC, Kahn JM, Wunsch H. Variation in use of intensive care for adults with diabetic ketoacidosis*. *Crit Care Med.* 2012;40(7):2009–2015. [PubMed: 22564962]
5. Admon AJ, Seymour CW, Gershengorn HB, Wunsch H, Cooke CR. Hospital-level variation in ICU admission and critical care procedures for patients hospitalized for pulmonary embolism. *Chest.* 2014;146(6):1452–1461. [PubMed: 24992579]
6. Valley TS, Sjoding MW, Ryan AM, Iwashyna TJ, Cooke CR. Intensive Care Unit Admission and Survival among Older Patients with Chronic Obstructive Pulmonary Disease, Heart Failure, or Myocardial Infarction. *Ann Am Thorac Soc.* 2017;14(6):943–951. [PubMed: 28208030]
7. Valley TS, Sjoding MW, Ryan AM, Iwashyna TJ, Cooke CR. Association of Intensive Care Unit Admission With Mortality Among Older Patients With Pneumonia. *JAMA.* 2015;314(12):1272–1279. [PubMed: 26393850]
8. Walkey AJ, Weinberg J, Wiener RS, Cooke CR, Lindenauer PK. Hospital Variation in Utilization of Life-Sustaining Treatments among Patients with Do Not Resuscitate Orders. *Health Serv Res.* 2018;53(3):1644–1661. [PubMed: 28097649]
9. Wunsch H Is there a Starling curve for intensive care? *Chest.* 2012;141(6):1393–1399. [PubMed: 22670019]
10. Valley TS, Admon AJ, Zahuranec DB, et al.: Estimating ICU benefit: a randomized study of physicians. *Crit Care Med* 2018; in press.

FIGURE 1.

We present three theoretical patterns of belief regarding benefits of ICU admission. Future characterization of patterns of perceived benefit of ICU admission as a function of illness severity may reveal patterns that provide greatest value to patients and healthcare systems, and further inform guidelines on ICU admission criteria.