The William J. Sibbald Symposium

Critical Care Capacity
ICU bed capacity: does supply affect utilization?

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Disclosures

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• Speaking honoraria and travel from academic medical centers
• No industry relationships
Outline

• ICUs are overburdened, affecting quality
• One response to has been to build more ICU beds
• Increasing bed supply will solve some problems but may cause others
Demand for critical care is increasing

Angus JAMA 2002
Impact of delayed transfer of critically ill patients from the emergency department to the intensive care unit*

Donald B. Chalfin, MD, MS, FCCM; Stephen Trzesiak, MD, MPH; Antonios Likourezos, MA, MPH; Brigitte M.

Impact of delayed admission to intensive care units on mortality of critically ill patients: a cohort study

Refusal of Intensive Care Unit Admission Due to a Full Unit
Impact on Mortality

René Robert¹, Jean Reignier², Caroline Tournoux-Facon³, Thierry Boulain⁴, Olivier Lesieur⁵, Valérie Gissot⁶, Vincent Souday⁷, Mouldi Hamrouni⁸, Cécile Chapon⁹, and Jean-Paul Gouello¹⁰, for the Association des Réanimateurs du Centre Ouest Group*
Response: build more ICU beds

<table>
<thead>
<tr>
<th>Variable</th>
<th>2000</th>
<th>2005</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute care hospitals</td>
<td>4718</td>
<td>3747</td>
<td>-20.6%</td>
</tr>
<tr>
<td>Hospital beds</td>
<td>665,758</td>
<td>628,409</td>
<td>-4.2%</td>
</tr>
<tr>
<td>ICU beds</td>
<td>88,252</td>
<td>93,955</td>
<td>+6.5%</td>
</tr>
<tr>
<td>ICU bed days</td>
<td>21 M</td>
<td>23 M</td>
<td>+10.6%</td>
</tr>
<tr>
<td>ICU occupancy</td>
<td>65%</td>
<td>68%</td>
<td>+4.5%</td>
</tr>
</tbody>
</table>

Halpern CCM 2010
Could this strategy do more harm than good?

• Increasing supply will decrease wait times, but...
  – Costs: Increasing capacity by itself creates inefficiencies
  – Utilization: Increasing capacity can drive potentially harmful utilization
The problem of costs

<table>
<thead>
<tr>
<th>Cost Center</th>
<th>Total</th>
<th>Variable</th>
<th>% Fixed</th>
</tr>
</thead>
<tbody>
<tr>
<td>All ICU</td>
<td>$54.5 K</td>
<td>$10.5 K</td>
<td>81%</td>
</tr>
<tr>
<td>By cost-center</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blood bank</td>
<td>$2.7 K</td>
<td>$1.6 K</td>
<td>40%</td>
</tr>
<tr>
<td>Laboratory</td>
<td>$1.9 K</td>
<td>$0.3 K</td>
<td>83%</td>
</tr>
<tr>
<td>Pharmacy</td>
<td>$4.0 K</td>
<td>$1.9 K</td>
<td>52%</td>
</tr>
<tr>
<td>Radiology</td>
<td>$2.1 K</td>
<td>$0.2 K</td>
<td>90%</td>
</tr>
<tr>
<td>Respiratory</td>
<td>$3.0 K</td>
<td>$0.01 K</td>
<td>97%</td>
</tr>
</tbody>
</table>

Kahn, Med Care 2008
The problem of utilization

- Excess capacity can drive utilization
- "Supply induced demand"
- Depends on
  - Asymmetric information
  - No marginal societal gain
More doctors accused of putting unnecessary stents in patients

Lawyers file additional cases about procedures at St. Joseph Medical Center

October 16, 2012 | By Andrea K. Walker, TCTC

KICKBACKS FOUND! Unethical Methods Have Now Been Revealed
Auditors Assert Pregnancy Tests Should Not Have Been Performed
Take Jump

By EDWARD RANZAL

The introduction of Multislice Computed Tomography (MSCT) has changed the way urologists diagnose their patients. Today, CT has become the gold standard for many diagnostic examinations in urology.

Now Siemens Medical Solutions is making this fascinating imaging technology available to private practices like yours. Adding computed tomography can not only improve patient convenience — by combining diagnosis and care in one location — but it can also significantly improve the overall bottom line of your practice. Furthermore, in today’s competitive marketplace, adding this service can help distinguish and grow your practice successfully.

NEW: Quick Start Package
To get you started quickly, we will prepare your personal "CT Quick Start Package for Urology." Simply use the Quick Checks #1-4 and we will customize your personal information package with these features:
A model of demand elasticity in the ICU

<table>
<thead>
<tr>
<th></th>
<th>LIVES</th>
<th>DIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>SICK</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>NOT SICK</td>
<td></td>
<td>×</td>
</tr>
</tbody>
</table>
Increasing the supply of ICU beds will...
Decreasing the supply of ICU beds will...
Is there evidence of demand elasticity in the ICU?

• Not really
• Indirect evidence from
  – International comparisons
  – Variation within health systems
  – Natural experiments
More beds means less sick patients in the ICU

Wunsch CCM 2008
Lower mortality for low risk patients but higher mortality for high risk patients
More ICU beds means more care at the end of life

- More ICU beds
  - More ICU use at the end of life
  - Higher spending at the end of life

Carr JAMA 2010, Dartmouth Atlas
Also true at the hospital level:

Organizational Determinants of Hospital End-of-Life Treatment Intensity

Caroline Y. Lin, MD, * Max H. Farrell, * Judith R. Lave, PhD, *†‡ Derek C. Angus, MD, MPH, *†‡ and Amber E. Barnato, MD, MPH, MS*†‡

• Increasing beds size associated with increasing composite end-of-life utilization score (p=0.002)
On low bed availability days, MET activation leads to:

- Decreased odds of going to ICU
- Increased odds of comfort care on ward
- No change in odds of death

Stelfox Archives 2012
Conclusions

• Bad things happen under constrained supply
• Indirect evidence of demand elasticity
• Increasing bed supply solves one problem but causes others
  – Increased ICU costs at same utilization
  – New demand
A caveat

• Demand elasticity is not inherently bad
• Bed supply is a drug with benefits and side effects
• The “dose” will determine on:
  – How good are the benefits?
  – How bad are the side-effects?
  – How do we value these?
<table>
<thead>
<tr>
<th>The intended effects</th>
<th>The side effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decreased waiting times</td>
<td>Higher costs</td>
</tr>
<tr>
<td>Decreased boarding</td>
<td>Greater demand</td>
</tr>
<tr>
<td>Decreased ED crowding</td>
<td>Less patient-centered decision making</td>
</tr>
</tbody>
</table>
Future directions

• Let no bed supply go unevaluated
• Empirically determine what works best for the various stakeholders
• Make informed decisions
www.ccm.pitt.edu/crisma