#### **How Different is UK Critical Care?**

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## **Conflicts/Funding**

- No conflicts of interest
- Current funding from:
  - Canadian Institutes of Health Research
  - Heart & Stroke Foundation



## Potential admissions...

|   | Accepted | Refused |
|---|----------|---------|
| 56 yo M, liver transplant 1 week prior, small GI bleed<br>on the general ward, hypotensive, tachycardic |          |         |
|   |          |         |
|   |          |         |
|   |          |         |
|   |          |         |
|   |          |         |
|   |          |         |

## Why can (we) the US do this?

## Agenda

- Resources
- Case Mix
- Laws
- Culture

### **Differences in availability of beds...**



Murthy & Wunsch, Crit Care 2012

### Is There a Starling Curve for Intensive Care?

Hannah Wunsch, MD



Chest 2012

| Table 2 Data describing numbers of adult acute care, intermediate care and intensive care beds per European country |  |   |                                     |                                 |   |  |   |  |
|---|--|---|-------------------------------------|---------------------------------|---|--|---|--|
|   | Acute care beds <sup>a</sup>   | Acute<br>care beds/<br>100,000<br>population  | Intermediate<br>care (IMCU)<br>beds | Intensive<br>care (ICU)<br>beds | Critical<br>care<br>beds                            | ICU and<br>IMCU beds/<br>100,000<br>population | ICU beds<br>as % of<br>acute care<br>beds     | GDP<br>(\$million)/<br>ICU beds                            |
| Andorra<br>Austria<br>Belgium   | 188<br>48,446<br>50,156  | 224<br>635<br>456                             | 569                                 | 1,264                           | 6<br>1,833<br>1,755                                 | 7.1<br>21.8<br>15.9                            | 3.2<br>3.4<br>3.5                             | 482.2<br>205.9<br>266.5                                    |
| Bulgaria<br>Croatia<br>Cyprus   | 57,460<br>15,629<br>2,813  | 766<br>353<br>350                             | 9                                   | 83                              | 913<br>650<br>92                                    | 12.2<br>14.7<br>11.4                           | 1.6<br>4.2<br>3.3                             | 52.2<br>93.6<br>251.9                                      |
| Denmark   | 17,124   | 308   |                                     |                                 | 372   | 6.7  | 2.2   | 833.0  |
| Finland<br>France   | 3,096<br>12,442<br>232,821   | 231<br>358                                    | 28<br>3,471                         | 301<br>4,069                    | 329<br>7,540  | 6.1<br>11.6                                    | 3.8<br>2.6<br>3.2                             | 98.2<br>727.0<br>339.9                                     |
| Germany<br>Greece   | 469,791<br>44,411  | 575<br>392                                    | 30                                  | 650                             | 23,890<br>680                                       | 29.2<br>6.0                                    | 5.1<br>1.5                                    | 137.6<br>449.1   |
| Iceland<br>Ireland<br>Italy<br>Latvia<br>Lithuania  | 1,169<br>12,202<br>201,932<br>11,833<br>17,061                       | 367<br>272<br>333<br>531<br>526               | 88                                  | 201                             | 29<br>289<br>7,550<br>217<br>502                    | 9.1<br>6.5<br>12.5<br>9.7<br>15.5              | 2.5<br>2.4<br>3.7<br>1.8<br>2.9               | 434.3<br>716.2<br>272.2<br>110.7<br>72.5                   |
| The Netherlands   | 2,511<br>56,085  | 204<br>337<br>277                             | 27                                  | 100                             | 1,065   | 24.8<br>6.4                                    | 5.1<br>1.9                                    | 432.7<br>733.0   |
| Poland<br>Portugal<br>Romania<br>Slovakia<br>Slovenia<br>Spain<br>Sweden  | 156,662<br>31,722<br>108,611<br>32,560<br>7,656<br>124,194<br>26,131 | 410<br>298<br>507<br>599<br>373<br>269<br>278 | 2,574                               | 451<br>2,000                    | 2,635<br>451<br>4,574<br>500<br>131<br>4,479<br>550 | 6.9<br>4.2<br>21.4<br>9.2<br>6.4<br>9.7<br>5.8 | 1.7<br>1.4<br>4.2<br>1.5<br>1.7<br>3.6<br>2.1 | 178.1<br>508.1<br>35.3<br>174.9<br>364.4<br>314.8<br>834.0 |
| UK  | 147,809  | 237   | 1,737                               | 2,377                           | 4,114   | 6.6  | 2.8   | 547.0  |

## Definitions

## **UK & US ICU**

- UK: Level 3
  - 1:1 nurse to patient ratio, ability to provide mechanical ventilation
- US: Level 3
  - -?????
  - Mostly 1:2 nurse to patient ratio, ability to provide mechanical ventilation

#### Comparison of Medical Admissions to Intensive Care Units in the United States and United Kingdom

Hannah Wunsch<sup>1,2</sup>, Derek C. Angus<sup>3</sup>, David A. Harrison<sup>4</sup>, Walter T. Linde-Zwirble<sup>5</sup>, and Kathryn M. Rowan<sup>4</sup>

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#### Severity of illness of medical patients in the ICU



Wunsch et al, AJRCCM 2011

## **Use of mechanical ventilation**

#### Figure 2.



Wunsch et al AJRCCM, 2011

## **American VA System**



53.2% of patients admitted to the ICU from the ER had a predicted mortality of <2%



Chen et al Arch Int Med 2012

## For a single diagnosis - DKA



Gershengorn et al, CCM 2012

## **Occupancy across 97 US ICUs**



Wunsch et al, CCM 2013



# London Ambulance Service MHS Trust

- Providing advice on the availability of intensive care beds
- We contact intensive care units several times a day to determine their capacity. Using this information we can direct hospital-based clinicians to the nearest available intensive care bed for their patient.

## What about outcomes?

## **Hospital mortality**



### Experience of caring for "critically ill" patients is different

## **'Risk' adjusted hospital mortality for ICU patients**



Wunsch et al AJRCCM 2011

#### Hospital mortality by severity of illness



Wunsch et al AJRCCM, 2011

#### **Hospital Length of Stay**



Wunsch et al AJRCCM 2011

## Other options for care...

## Rehab, SNFs and LTACs

- SNF
  - Skilled Nursing Facility
- LTAC
  - -Long-term Acute Care Facility

# Shift in location of care for critically ill patients in the US

100% 90% 80% 70% 60% □ SCF/Rehab 50% Home Died 40% 30% 20% 10% 0% 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006

US ICU patients with MV

Kahn et al JAMA 2010

## **Mechanically ventilated**



Wunsch et al JAMA 2010

# Long-term acute care (LTAC) patients (>65 years old)



Kahn et al, JAMA 2010

#### Research

#### **Original Investigation**

#### Increased Hospital-Based Physical Rehabilitation and Information Provision After Intensive Care Unit Discharge The RECOVER Randomized Clinical Trial

Timothy S. Walsh, MD; Lisa G. Salisbury, PhD; Judith L. Merriweather, PhD; Julia A. Boyd, PhD; David M. Griffith, MD; Guro Huby, PhD; Susanne Kean, PhD; Simon J. Mackenzie, MBChB; Ashma Krishan, MSc; Stephanie C. Lewis, PhD; Gordon D. Murray, PhD; John F. Forbes, PhD; Joel Smith, PhD; Janice E. Rattray, PhD; Alastair M. Hull, MD; Pamela Ramsay, PhD; for the RECOVER Investigators

| Outcome (No. of Patients With Evaluable Data | Treatment Group |              |  |  |
|--|-----------------|--------------|--|--|
| in Usual Care/Intervention Groups)           | Usual Care      | Intervention |  |  |
| Destination, % (116/118) <sup>g</sup>        |                 |              |  |  |
| Own residence                                | 72              | 76           |  |  |
| Rehabilitation hospital/facility             | 13              | 13           |  |  |
| Other acute care nonstudy hospital           | 7               | 6            |  |  |
| Other  | 6               | 3            |  |  |
| Died   | 2               | 2            |  |  |

JAMA Int Med 2015



#### A Randomized Trial of an Intensive Physical Therapy Program for Acute Respiratory Failure Patients



## What about culture & laws?



### **Preferences?**

"Kingsley [Amis] has 'the old man's friend': pneumonia. He is on morphine and antibiotics. When pneumonia recurs, which it will, the morphine will remain but the antibiotics will go. This is the English way..."

- Martin Amis



| Research          |  |
|-------------------|--|
| original Invest   | <sup>tigation</sup>  |
| Compa             | rison of Site of Death, Health Care Utilization,   |
| and Ho            | spital Expenditures for Patients Dying With Cancer   |
| in 7 Dev          | veloped Countries  |
| Justin E. Bekelma | in, MD; Scott D. Halpern, MD, PhD; Carl Rudolf Blankart, PhD; Julie P. Bynum, MD, MPH;     |
| Joachim Cohen, N  | MSc, PhD; Robert Fowler, MDCM, MS(Epi); Stein Kaasa, MD, PhD; Lukas Kwietniewski, MSc;     |
| Hans Olav Melber  | rg, PhD; Bregje Onwuteaka-Philipsen, PhD; Mariska Oosterveld-Vlug, PhD; Andrew Pring, MSc; |
| Jonas Schrevögg   | PhD; Connie M. Ulrich, PhD, RN; Julia Verne, MBBS, PhD; Hannah Wunsch, MD, MSc;            |

Jonas Schreyögg, PhD; Connie M. Ulrich, PhD, RN; Julia Verne, MBBS, PhD; Hannah Wunsch, MD, MSc; Ezekiel J. Emanuel, MD, PhD; for the International Consortium for End-of-Life Research (ICELR) Figure. Hospital Expenditures in the Last 180 Days of Life for Patients Older Than 65 Years Dying With Cancer in Acute Care Hospitals in 7 Developed Nations 60 Canada <sub>⊢●</sub>⊣ Belgium 👝 **50** Death in Acute Care Hospital, % <sup>+● |</sup> Norway England 40 Germany Hel 30-• The Netherlands United States 📕 20



JAMA 2016

#### Use of Intensive Care Services during Terminal Hospitalizations in England and the United States

Hannah Wunsch<sup>1</sup>, Walter T. Linde-Zwirble<sup>2</sup>, David A. Harrison<sup>3</sup>, Amber E. Barnato<sup>4,5</sup>, Kathryn M. Rowan<sup>3</sup>, and Derek C. Angus<sup>5</sup>



Wunsch et al AJRCCM 2009

| ORIGINAL ARTI   |  |  |  |   |  |  |  |
|---|--|--|--|---|--|--|--|
| Noninvasive Ventilati<br>Cardiogenic Pulmor   | RCT d  | ata  |  |   |  |  |  |
| Alasdair Gray, M.D., Steve Goodacre, Ph.D., David E. Newby, M.D.,<br>Moyra Masson, M.Sc., Fiona Sampson, M.Sc., and Jon Nicholl, M.Sc.,<br>for the 3CPO Trialists*  |  |  |  |   |  |  |  |
|   | 0% of deaths o   | occurred   |  |   |  |  |  |
| Table 3. Primary and Secondary End Points for     Noninvasive Ventilation (CPAP or NIPPV).*   | or Patients Receiving  | Standard   | without intuba<br>nechanical ven   | tion &<br>tilation                                    |  |  |  |
| Table 3. Primary and Secondary End Points for   Noninvasive Ventilation (CPAP or NIPPV).*   Variable  | or Patients Receiving<br>Standard Oxygen<br>Treatment<br>(N = 367)                                       | Standard<br>CPAP or NIPPV<br>(N=702)                                       | without intuba<br>nechanical ven   | tion &<br>tilation                                    |  |  |  |
| Table 3. Primary and Secondary End Points fo<br>Noninvasive Ventilation (CPAP or NIPPV).*<br>Variable<br>Death within 7 days (% of patients)  | or Patients Receiving<br>Standard Oxygen<br>Treatment<br>(N = 367)<br>9.8                                | Standard<br>CPAP or NIPPV<br>(N=702)<br>9.5                                | without intuba<br>nechanical ven<br>' Or' ratio<br>5% CI)<br>/ (0.63 to 1.48)  | tion &<br>tilation<br>P Value<br>0.87                 |  |  |  |
| Table 3. Primary and Secondary End Points for<br>Noninvasive Ventilation (CPAP or NIPPV).*VariableDeath within 7 days (% of patients)Death within 30 days (% of patients)   | or Patients Receiving<br>Standard Oxygen<br>Treatment<br>(N=367)<br>9.8<br>16.4                          | Standard<br>CPAP or NIPPV<br>(N=702)<br>9.5<br>15.2                        | without intuba<br>nechanical ven<br>/ Or katio<br>5% Cl)<br>/ (0.63 to 1.48)<br>0.92 (0.64 to 1.31)  | tion &<br>tilation<br>P Value<br>0.87<br>0.64         |  |  |  |
| Table 3. Primary and Secondary End Points for<br>Noninvasive Ventilation (CPAP or NIPPV).*VariableDeath within 7 days (% of patients)Death within 30 days (% of patients)Intubation within 7 days (% of patients)   | or Patients Receiving<br>Standard Oxygen<br>Treatment<br>(N = 367)<br>9.8<br>16.4<br>2.8                 | Standard<br>CPAP or NIPPV<br>(N = 702)<br>9.5<br>15.2<br>2.9               | without intuba<br>nechanical ven<br>/ Orl katio<br>.% Cl)<br>/ (0.63 to 1.48)<br>0.92 (0.64 to 1.31)<br>1.05 (0.49 to 2.27)  | tion &<br>tilation<br>P Value<br>0.87<br>0.64<br>0.90 |  |  |  |
| Table 3. Primary and Secondary End Points for<br>Noninvasive Ventilation (CPAP or NIPPV).*VariableDeath within 7 days (% of patients)Death within 30 days (% of patients)Intubation within 7 days (% of patients)Admission to critical care unit (% of patients)  | or Patients Receiving<br>Standard Oxygen<br>Treatment<br>(N = 367)<br>9.8<br>16.4<br>2.8<br>40.5         | Standard<br>CPAP or NIPPV<br>(N=702)<br>9.5<br>15.2<br>2.9<br>45.2         | without intuba<br>nechanical ven<br>"Or" katio<br>"% CI)<br>/ (0.63 to 1.48)<br>0.92 (0.64 to 1.31)<br>1.05 (0.49 to 2.27)<br>1.21 (0.93 to 1.57)                          | tion &<br>tilation                                    |  |  |  |
| Table 3. Primary and Secondary End Points for<br>Noninvasive Ventilation (CPAP or NIPPV).*VariableDeath within 7 days (% of patients)Death within 30 days (% of patients)Intubation within 7 days (% of patients)Admission to critical care unit (% of patients)Myocardial infarction (% of patients)                               | or Patients Receiving<br>Standard Oxygen<br>Treatment<br>(N = 367)<br>9.8<br>16.4<br>2.8<br>40.5         | Standard<br>CPAP or NIPPV<br>(N = 702)<br>9.5<br>15.2<br>2.9<br>45.2       | without intuba<br>nechanical ven<br>"Or" katio<br>"% CI)<br>"/ (0.63 to 1.48)<br>0.92 (0.64 to 1.31)<br>1.05 (0.49 to 2.27)<br>1.21 (0.93 to 1.57)                         | tion &<br>tilation                                    |  |  |  |
| Table 3. Primary and Secondary End Points for Noninvasive Ventilation (CPAP or NIPPV).*   Variable   Death within 7 days (% of patients)   Death within 30 days (% of patients)   Intubation within 7 days (% of patients)   Admission to critical care unit (% of patients)   Myocardial infarction (% of patients)   WHO criteria | or Patients Receiving<br>Standard Oxygen<br>Treatment<br>(N = 367)<br>9.8<br>16.4<br>2.8<br>40.5<br>24.9 | Standard<br>CPAP or NIPPV<br>(N=702)<br>9.5<br>15.2<br>2.9<br>45.2<br>27.0 | without intuba<br>nechanical ven<br>"Or" katio<br>"% CI)<br>"/ (0.63 to 1.48)<br>0.92 (0.64 to 1.31)<br>1.05 (0.49 to 2.27)<br>1.21 (0.93 to 1.57)<br>"1.12 (0.84 to 1.49) | tion &<br>tilation                                    |  |  |  |

N Engl J Med 2008;359:142-51.

## What about laws?

|                | Table 1—Health-care System Characteristics of Seven Industrialized Countries |                              |   |  |                              |   |
|----------------|--|------------------------------|---|--|------------------------------|---|
|                | % GDP in 200911  | PCE in 2009, \$ <sup>3</sup> | Life Expectancy<br>in 2009, y <sup>15</sup> | Withholding ICU<br>Admission WC <sup>a</sup> | Withholding<br>Treatments WC | Withdrawing Life-<br>Sustaining Care WC |
| United Kingdom | 9.3  | 3,285 (2,747)                | 80  | Yes (but not recommended)                    | Yes (but not recommended)    | Yes (but not<br>recommended)            |
| Italy          | 9.5  | 3,328 (2,573)                | 82  | Yes  | Depends                      | No                                      |
| Spain          | 9.7  | 3,075 (2,218)                | 82  | Yes  | No                           | No                                      |
| France         | 11.7   | 4,798 (3,674)                | 81  | Yes  | No                           | No                                      |
| Argentina      | 9.5  | 730 (485)                    | 75  | Yes  | Depends                      | No                                      |
| Canada         | 10.9   | 4.380 (3.009)                | 81  | Depends                                      | Depends                      | Depends                                 |
| United States  | 16.2   | 7,410 (3,602)                | 79  | Depends                                      | Depends                      | $Depends^{b}$                           |

% GDP = percentage of gross domestic product spent on health care; PCE = per capita expenditure, where the first number is the total and the number in parentheses is government spending per capita (both in US dollars); WC = without consent.

<sup>a</sup>Those answering that admission could be withheld stressed that the decision to withhold admission could be made based on clinicians' assessment of physiologic need and potential benefit.

 $^{b}$ Some states (eg, Texas) have instituted a formal process whereby futile life-sustaining therapies can be legally withdrawn without consent of surrogates.

## NY State Memo...

#### Conclusion

We conclude that where a patient is incapacitated and did not consent to the entry of a do-not-resuscitate order prior to becoming incapacitated, the Public Health Law requires the physician to obtain the consent of the patient's health care agent or surrogate before entering a do-not-resuscitate order, even if the physician concludes that administration of cardiopulmonary resuscitation would be "medically futile."

Very truly yours,

ELIOT SPITZER Attorney General

## Conclusions



# **Conclusions (2)**

- Pressures/triage
- Case mix
- Outcomes
  - Difficulty in comparison
  - -? Benefit for low-risk patients
- Studies affected by differences

## Thank you!

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