Outcomes after Intensive care - how well are we doing?

Hans Flaatten
Dep. Of Anaesthesia & Intensive Care
Haukeland University Hospital, Bergen, Norway

What should we say to this young man?

On the day leaving the hospital

One week earlier
His major problems

• He was treated for six days for sepsis (source: peritonsillar abscess) with the loss > 10 kg bw

• He complained about fatigue, shortness of breath

• He was an athlete, prior to his illness, and wondered if he ever could train and compete again

• He had occasional nightmares

Is he a particular case?
Follow-up after intensive care: a single center study
Memory of ICU stay

- None
- A little
- Some
- A lot

<table>
<thead>
<tr>
<th></th>
<th>No IPPV</th>
<th>IPPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>A little</td>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>Some</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>A lot</td>
<td></td>
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</tbody>
</table>

Legend: No IPPV, IPPV
Weight loss
Work status: 6 months (n=136)
Our conclusions 15 years ago

• In our ICU survivors, the life after ICU up to 6 months had significantly impact, mostly negative, for their daily life!
Overview of my presentation

1. What are considered important outcomes after intensive care?
   1. Survival
   2. Physical function
   3. Mental function

2. Is it possible to influence outcomes after intensive care?
   1. During ICU stay or Hospital stay
   2. Post ICU follow-up
Survival
Easy to define, often difficult to follow

- ICU
- Hospital
- 30 day
- 6 months
- One year
- Beyond one year
Social security number

• A unique identifier given by birth for each individual in a given country
• Is the cornerstone in many countries (including all Nordic) for tracking individuals through life
  • Major events: Birth-Marriage-Divorce-Death
  • Contact with governmental bodies
    • Healthcare, school, military, social security etc
• (Relatively) easy to look up for those who need it
• Updated with regard to vital status after some days
  • Valuable in healthcare in particular (physicians)
  • Medical records automatically updated
12-year survival-ICU Haukeland hospital

Data from Flaatten & Kvåle, ICM 2001

Time of excess mortality
5 year survival according to severity of illness

Data from Niskanen et al CCM 1996
5 year survival according to diagnostic group

Data from Niskanen et al CCM 1996
Also pre-existing morbidity is important.
≈ 70% one year survival
Mortality: the very old (> 80 years)
Conclusions: survival

• There is a substantial excess in mortality in the years after ICU stay
• First year, approximately 2 x ICU mortality
• The excess mortality lasts for many years
  • Discussed for how long time
• Several factors important for long-term mortality
  • Pre-existing morbidity
  • Age at ICU-admission
  • Diagnostic group at admission
  • Severity of disease to a little extent after 6 months
Non-mortality outcomes
The most important?

• “It matters not how a man dies, but how he lives”
• “The act of dying is not of importance, it lasts so short a time”

• Samuel Johnson 1709-1784
Morbidity post ICU discharge

- Physical impairment
  - Pulmonary
  - Walking
  - Neurological
  - Cardiovascular

- Mixed physical and non-physical morbidity
  - Pain
  - Sexual dysfunction
  - Quality of life
  - HRQOL

- Non-physical morbidity
  - Mental function
    - Depression
    - Hallucinations
    - Anxiety
    - PTSD
    - Delirium

  - Cognitive function
QOL vs HRQOL

*After Heyland et al 1998
Health related quality of life

• One of the most frequently used assessments in patients and individuals
  • Chronic illness
  • Acute illness
  • After intensive care
  • In normal population: important for comparison!
How to assess HRQOL?

• HRQOL instruments specifically designed for adult ICU patients
  • Perceived QOL
    • Patrick 1988
  • QOL (Italian)
    • Capuzzo 1996
  • QOL (Spanish)*
    • Rivera Fernandez 1991
  • QOL questionnaire for MV patients
    • Pandian, CCM 2015

• Generic (not disease specific) HRQOL instruments used in adult ICU patients
  • EQ-5D
    • Brooks 1996
  • Sickness Impact Profile
  • Short Form 36 (SF-36)
  • Nottingham Health Profile
  • Spitzer’s QOL index
SF-36

- 36 questions
- 8 domains
  - Physical functioning (PF)
  - Role-physical (RP)
  - Bodily pain (BP)
  - General health (GH)
  - Vitality (VI)
  - Social functioning (SF)
  - Role-emotional (RE)
  - Mental health (MH)

- The eight domains further aggregated into
- Physical health
  - PF, RP, BP and GH
- Mental health
  - VI, SF, RE, MH
Short Form 36

SF-36 scores in the average Norwegian Population 1996 (Loge % Kaasa 1998)
EQ-5D

• A more simple questionnaire
  • 1 part: Descriptive, five areas
    • Mobility
    • Personal care
    • Usual activities
    • Pain/discomfort
    • Anxiety/depression
  • 2 part: VAS scale (general health state)
Outcome after intensive care

- Results from a systematic review in 1998
  - Heyland D et al 1998
- 1073 published papers relevant to the practice of intensive care was investigated
  - Only 1.7% included QOL measures
  - Of the few including QOL after intensive care, comparison between studies were limited because of the wide variety of instruments used
Increasing scientific interest: Pub Med Search
Outcome Measurement in ICU Survivorship Research From 1970 to 2013: A Scoping Review of 425 Publications*

Alison E. Turnbull, DVM, MPH, PhD1-3; Anahita Rabiee, MD1,2; Wesley E. Davis, BA1,2; Mohamed Farhan Nasser, MBBS1; Venkat Reddy Venna, MBBS1; Rohini Lolitha, MBBS1; Ramona O. Hopkins, PhD4-6; O. Joseph Bienvenu, MD, PhD1,7; Karen A. Robinson, MSc, PhD3,8,9; Dale M. Needham, FCPA, MD, PhD1,2,10

<table>
<thead>
<tr>
<th>Methodological Characteristics</th>
<th>Cross-Sectional Studies</th>
<th>Cohort Studies With One Follow-Up Assessment</th>
<th>Cohort Studies With More Than One Follow-Up Assessment</th>
<th>Randomized Controlled Trials</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 116 (27%)</td>
<td>n = 168 (39%)</td>
<td>n = 110 (26%)</td>
<td>n = 31 (7%)</td>
</tr>
<tr>
<td>Months from discharge to last assessment, median (IQR)</td>
<td>31 (18–52)</td>
<td>6 (6–12)</td>
<td>12 (12–12)</td>
<td>12 (5–12)</td>
</tr>
<tr>
<td>No. of follow-up assessments, median (IQR)</td>
<td>2 (2–3)</td>
<td></td>
<td>1 (1–2)</td>
<td></td>
</tr>
<tr>
<td>No. of participants assessed at last follow-up time, median (IQR)</td>
<td>65 (37–125)</td>
<td>107 (53–255)</td>
<td>80 (46–146)</td>
<td>87 (32–199)</td>
</tr>
<tr>
<td>Loss to follow-up reported (%)</td>
<td>80 (69)</td>
<td>129 (77)</td>
<td>40 (36)</td>
<td>20 (65)</td>
</tr>
<tr>
<td>Loss to follow-up, median (IQR) (%)</td>
<td>22 (11–38)</td>
<td>22 (7–37)</td>
<td>14 (2–25)</td>
<td>13 (6–25)</td>
</tr>
</tbody>
</table>
Number of publications

1970-2013

Physical Impairment
Cognitive activity
Mental health
Activity of daily life
HRQOL
Outcome - more than survival!

Cognitive function

HRQOL = health related quality of life
PTSD = post traumatic stress disorders

Hong Kong 2011
Cognitive dysfunctions (CD)

• A heterogenic group of dysfunctions
• From unconscious patients to mild impairment only observed by close relatives
• The former is easy to diagnose without much investigation, the latter is more difficult without proper testing
How to recognise CD?

- Clinical examination
- Mini mental state evaluation (MMSE)
- Neuropsychological testing
- Computer based testing
Mini Mental State Examination

• Simple test survey
  • Orientation
  • Registration
  • Attention and calculation
  • Recall
  • Language

• Maximum score 30
• “Normal score” ≥ 24
  • <9 severe
  • 10-20 moderate

Folstein et al: 1975
Neuropsychological testing

• Neuropsychological testing provides diagnostic clarification and grading of clinical severity for patients with subtle or obvious cognitive disorders

• Requires the use of a trained neuropsychologist
Alternative cognitive testing

• **CANTAB®**
  - Semi automated method for cognitive testing
    - Cambridge cognition
  - The tests are simple, computerised, non-linguistic and culturally blind
  - Can be administered by a technician
  - Easy interpretation

Screenshot: Delayed matching

http://www.cantab.com
Minimal cognitive impairment (MCI)

• Could be defined as the “hidden” cognitive dysfunction in patients seemingly “normal” and with a MMSE > 24

• We have found a high proportion of these patients to have cognitive impairment immediately post-ICU discharge, but with considerable improvement within 3 months
Development of MCI

# Long term consequences

<table>
<thead>
<tr>
<th>Cerebral function at ICU discharge</th>
<th>Death HR</th>
<th>Institution or Death 3 months (OR)</th>
<th>Institution or Death 12 months (OR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMSA &gt; 24; No MCI</td>
<td>1 (Ref)</td>
<td>1 (Ref)</td>
<td>1 (Ref)</td>
</tr>
<tr>
<td>MMSA ≥ 24; MCI</td>
<td>0.53</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MMSA &gt; 24</td>
<td>1 (Ref)</td>
<td>1 (Ref)</td>
<td>1 (Ref)</td>
</tr>
<tr>
<td>MMSA &lt; 24 no delirium</td>
<td>4.43</td>
<td>7.5</td>
<td>3.27</td>
</tr>
<tr>
<td>MMSA &lt; 24, delirium</td>
<td>6.69</td>
<td>12.0</td>
<td>4.67</td>
</tr>
</tbody>
</table>

ARDS results in significant neurocognitive and emotional morbidity and decreased quality of life that persists at least 2 years after hospital discharge.

62 ARDS survivors were investigated after hospital discharge and at 1 and 2 years post ICU discharge.

"ARDS results in significant neurocognitive and emotional morbidity and decreased quality of life that persists at least 2 years after hospital discharge"
30 non-delirious patients were tested in the ICU and after 2 months.

Difficulties with problem solving and poor memory remained a significant issue for 2 months after ICU discharge.
"Of the 97 patients identified, 58 were evaluated, in person between 12 to 24 months after hospital discharge, with a comprehensive battery of cognitive, emotional, and functional instruments”

"The majority of trauma survivors without intracranial hemorrhage display persistent cognitive impairment”

"This cognitive impairment was associated with functional defects, poor quality of life, and an inability to return to work”. 
Cognitive dysfunction: Delirium

• Delirium
  • Is an acute cognitive dysfunction most often to appear during the ICU stay
    • Delirium is an acute confusional state characterised by fluctuating mental status, inattention, and either disorganized thinking or altered level of consciousness
  • Is the most common neuropsychological condition in the hospital
    • Reported in up to 80% of ICU patients
    • www.icudelirium.org http://www.icudelirium.co.uk/
Long term consequences of ICU-delirium

• Van Rompay et al*
  • In a series of 105 consecutive ICU patients they found increased overall mortality both in the ICU (OR 3.03) and at 3 months follow-up (OR 4.31)

• Torgersen et al (2011)
  • Found delirium in 11/80 patients at discharge from the ICU
  • Increased OR (compared with non-delirious patients) to be
    • Dead
    • Institution at 12 months

J Clin Nurs 2009
Conclusions

• Cognitive dysfunction have been reported in a high proportion of survivors after ICU, in particular associated with ARDS and severe trauma

• Minimal cognitive dysfunction, defined as MMSE > 24 is very frequent at hospital discharge, improves considerably within he next 3 months, and seems to have little influence to predict death or being in an institution at 3 or 12 month.
The elderly respondents lived mostly at home (289 of 299; 97%); 53% (n=152) of them needed no assistance, and 32% (n=92) lived alone.
Outcomes after severe Trauma
Sexual function in ICU survivors more than 3 years after major trauma

Atle Uvik
Reidar Kvåle
Tore Wentzel-Larsen
Hans Flaatten

DOI 10.1007/s00134-007-0936-0

Submitted: 10 Aug 2007  Accepted: 4 Sep 2007  Published: 4 Sep 2007
Fig. 1. Seven-year survival curve (with confidence bands) of 325 trauma patients admitted to the intensive care unit (ICU) compared with a sex- and age-adjusted sample of the general population.
Mortality is related to development of organ dysfunction.
### Table 2

Number of EuroQol-5D dimensions with any reported problems before and 2–7 years after trauma.

<table>
<thead>
<tr>
<th>Number of EuroQol-5D dimensions with any reported problem</th>
<th>Before trauma</th>
<th>2–7 years after trauma</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>185 (88)</td>
<td>43 (20)</td>
</tr>
<tr>
<td>1</td>
<td>22 (10)</td>
<td>56 (27)</td>
</tr>
<tr>
<td>2</td>
<td>2 (1)</td>
<td>38 (18)</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>36 (17)</td>
</tr>
<tr>
<td>4</td>
<td>1 (1)</td>
<td>19 (9)</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>18 (9)</td>
</tr>
</tbody>
</table>

### Table 3

Health-related quality of life before trauma and at follow-up among 210 trauma patients treated in the intensive care unit.

<table>
<thead>
<tr>
<th>EuroQol-5D dimension</th>
<th>Before trauma, number of patients (%)</th>
<th>2–7 years after trauma, number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No problem</td>
<td>Moderate problems</td>
</tr>
<tr>
<td>Mobility</td>
<td>206 (98)</td>
<td>4 (2)</td>
</tr>
<tr>
<td>Self-care</td>
<td>208 (99)</td>
<td>2 (1)</td>
</tr>
<tr>
<td>Usual activities</td>
<td>207 (99)</td>
<td>3 (1)</td>
</tr>
<tr>
<td>Pain/discomfort</td>
<td>205 (98)</td>
<td>5 (2)</td>
</tr>
<tr>
<td>Anxiety/depression</td>
<td>194 (92)</td>
<td>14 (7)</td>
</tr>
</tbody>
</table>

There was deterioration in health-related quality of life after the trauma in all the five EuroQol-5D dimensions, \( P < 0.001 \), marginal homogeneity test.
Follow up consultations after intensive care
The continuum of care

Hospital

ICU

After

Recovery phase

Home

3 months? One year?

Hong Kong 2011
Some publications
We know there is problems – is there a cure?

• In order to offer ICU survivors council and care after intensive care, an outpatient clinic has been created

• Different forms and shapes
  • Telephone contact
  • Invitation back to the ICU
  • Dedicated outpatient clinic
  • Internet based follow-up
  • Training programs- dietary advice

• Some are run by nurses, some by physicians
A national survey of intensive care follow-up clinics

J. A. Griffiths, V. S. Barber, B. H. Cuthbertson and J. D. Young

1 Honorary Research Fellow, 4 Consultant, Nuffield Department of Anaesthetics, 2 Research Coordinator, Intensive Care Society Trials Group, John Radcliffe Hospital, Oxford, UK
3 Clinical Senior Lecturer, Health Services Research Unit, Institute of Applied Health Sciences, University of Aberdeen, Foresterhill, Aberdeen AB25 2ZD, UK
This review will focus on the most common long-term outcomes post-ICU admission, and will emphasize the importance of developing ICU clinics to provide comprehensive care to ICU survivors.
Recommendations for intensive care follow-up clinics; report from a survey and conference of Dutch intensive cares

M. VAN DER SCHAAF 1, F. BAKHSHI-RAIEZ 2,3, M. VAN DER STEEN 4,5
D. A. DONGELMANS 3,5,6, N. F. DE KEIZER 2,3
Follow-up - does it matter?

Impact of follow-up consultations for ICU survivors on post-ICU syndrome: a systematic review and meta-analysis
<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Experimental</th>
<th>Control</th>
<th>Mean Difference</th>
<th>Mean Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Total</td>
<td>Mean</td>
</tr>
<tr>
<td>1.1.1 Anxiety at 2-3 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Holmes 2007</td>
<td>4.7</td>
<td>5</td>
<td>27</td>
<td>4.1</td>
</tr>
<tr>
<td>Knowles 2009</td>
<td>4.72</td>
<td>2.99</td>
<td>18</td>
<td>6.59</td>
</tr>
<tr>
<td>Subtotal</td>
<td>45</td>
<td></td>
<td></td>
<td>49</td>
</tr>
<tr>
<td>Heterogeneity: $\chi^2 = 2.01$, df = 1 ($P = 0.16$); $I^2 = 50%$</td>
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<tr>
<td>Test for overall effect: $Z = 0.63$ ($P = 0.53$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1.2 Anxiety at 6 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cuthbertson 2009</td>
<td>6</td>
<td>4.5</td>
<td>105</td>
<td>7</td>
</tr>
<tr>
<td>Holmes 2007</td>
<td>6.9</td>
<td>5.2</td>
<td>27</td>
<td>6.9</td>
</tr>
<tr>
<td>Subtotal (95% CI)</td>
<td>132</td>
<td></td>
<td></td>
<td>146</td>
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<tr>
<td>Heterogeneity: $\chi^2 = 0.44$, df = 1 ($P = 0.51$); $I^2 = 0%$</td>
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<tr>
<td>Test for overall effect: $Z = 1.49$ ($P = 0.14$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1.1.3 Depression at 6 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cuthbertson 2009</td>
<td>5.3</td>
<td>4.3</td>
<td>105</td>
<td>5.3</td>
</tr>
<tr>
<td>Holmes 2007</td>
<td>8.9</td>
<td>6.8</td>
<td>27</td>
<td>8.2</td>
</tr>
<tr>
<td>Subtotal (95% CI)</td>
<td>132</td>
<td></td>
<td></td>
<td>146</td>
</tr>
<tr>
<td>Heterogeneity: $\chi^2 = 0.15$, df = 1 ($P = 0.70$); $I^2 = 0%$</td>
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<td>Test for overall effect: $Z = 0.12$ ($P = 0.90$)</td>
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</table>

Fig. 3 Forest plot comparing the effect of follow-up consultations versus standard care on anxiety and depression at 2–3 and 6 months measured with HADS-A and HADS-D
### 1.2.1 Depression at 2-3 month

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Experimental Mean</th>
<th>SD</th>
<th>Total</th>
<th>Control Mean</th>
<th>SD</th>
<th>Total</th>
<th>Weight</th>
<th>Mean Difference</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holmes 2007</td>
<td>5.6</td>
<td>5.1</td>
<td>27</td>
<td>4.3</td>
<td>3.9</td>
<td>31</td>
<td></td>
<td>1.30</td>
<td>[1.06, 3.66]</td>
</tr>
<tr>
<td>Knowles 2009</td>
<td>4.17</td>
<td>2.98</td>
<td>18</td>
<td>8.29</td>
<td>5.13</td>
<td>18</td>
<td></td>
<td>-4.12</td>
<td>[-6.86, -1.38]</td>
</tr>
</tbody>
</table>

**Fig. 4** Forest plot comparing the effect of follow-up consultations versus standard care on depression at 2–3 months measured with HADS-D.
<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Experimental</th>
<th>Control</th>
<th>Risk Ratio</th>
<th>Risk Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Events</td>
<td>Total</td>
<td>Events</td>
<td>Total</td>
<td>Weight</td>
</tr>
<tr>
<td>1.3.1 PTSD New onset</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Holmes 2007</td>
<td>4</td>
<td>27</td>
<td>4</td>
<td>31</td>
</tr>
<tr>
<td>Jones 2010</td>
<td>8</td>
<td>162</td>
<td>21</td>
<td>160</td>
</tr>
<tr>
<td>Subtotal (95% CI)</td>
<td>12</td>
<td>189</td>
<td>25</td>
<td>191</td>
</tr>
</tbody>
</table>

Heterogeneity: $\chi^2 = 2.12$, df = 1 ($P = 0.15$); $I^2 = 53$

Test for overall effect: $Z = 2.13$ ($P = 0.03$)

Test for subgroup differences: Not applicable

*Fig. 5* Forest plot of comparisons: III follow-up consultations versus standard care on new onset PTSD at 3–6 months measured with questionnaire and structural interview by diagnostic criteria. Jones et al. used PDS [36], and Holmes et al. reported SCID [35]
The conclusion:

• Evidence of the effect of post-ICU follow-up consultations is limited and overall rated as low quality.

• Existing evidence indicated that follow-up consultations do not improve
  • QOL, anxiety, depression, physical and cognitive function, and return to work.

• However, consultations appear to reduce symptoms of PTSD after ICU admission, perhaps as a result of individualized interventions aimed at reframing the ICU experience.
ICU registry-a source for outcome studies

- Other healthcare registries
- National patient register
- Social security registries
- Prescription registries
A reality in Denmark

Type 2 diabetes and 1-year mortality in intensive care unit patients

Christian F. Christiansen, Martin B. Johansen, Steffen Christensen, James M. O’Brien, Else Tønnesen, and Henrik T. Sørensen

1Department of Clinical Epidemiology, Aarhus University Hospital, Aarhus N, 2Department of Anesthesiology and Intensive Care, Aarhus University Hospital, Aarhus C, Denmark, 3Department of Internal Medicine, Division of Pulmonary, Allergy, Critical Care and Sleep Medicine, Center for Critical Care, Ohio State University Medical Center, Columbus, OH, USA
17 ICUs in Northern Denmark

DANISH CIVIL REGISTRATION SYSTEM

DANISH NATIONAL REGISTRY OF PATIENTS

ANTIDIABETIC DRUG REGISTRY

HBA1C TESTS
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>N</th>
<th>MRR* (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crude</td>
<td>39,286</td>
<td>1.28 (1.20–1.35)</td>
</tr>
<tr>
<td>Adjusted</td>
<td>39,286</td>
<td>1.18 (1.11–1.25)</td>
</tr>
<tr>
<td><strong>Age group (years)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40–59</td>
<td>11,083</td>
<td>1.05 (0.87–1.28)</td>
</tr>
<tr>
<td>60–79</td>
<td>21,545</td>
<td>1.22 (1.13–1.32)</td>
</tr>
<tr>
<td>80+</td>
<td>6,658</td>
<td>1.20 (1.08–1.34)</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>16,721</td>
<td>1.17 (1.07–1.28)</td>
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<tr>
<td>Male</td>
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<td><strong>Diagnostic category</strong></td>
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<td>Pneumonia</td>
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<td>Other infectious disease</td>
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<td>1.05 (0.88–1.24)</td>
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<td>Cardiovascular disease</td>
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<td>Respiratory disease</td>
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<td>1.18 (0.99–1.41)</td>
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<td>Gastrointestinal/liver disease</td>
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<td>1.25 (1.02–1.53)</td>
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<td>Trauma/poisoning</td>
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<td>Other</td>
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<td><strong>Surgery at or before ICU admission</strong></td>
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<td>Surgery</td>
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<td><strong>Mechanical ventilation</strong></td>
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<tr>
<td>No</td>
<td>23,493</td>
<td>1.29 (1.19–1.41)</td>
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* Adjusted for age and sex
Reduced fertility after ICU

• A “reproductive” study regarding fertile females admitted to the ICU 1994-1999

• The number of child-births before and after ICU was recorded and compared with normal birth in a reference female population

Flaatten K, ICM 2002 (abstract)
Results from a recent systematic review

- 8894 potentially relevant citations identified
  - 352 reports reviewed for evaluation of abstracts
    - 111 reports reviewed for evaluation of full text
      - 85 excluded
        - 47 QOL not measured or
        - Did not use SF-36, SIP, NHP pr EQ-5D
        - 26 Excluded more than 50% of ICU patients
        - 4 Not original results,
        - 4 lack of follow-up > 30 days
        - 4 No population of adult ICU survivors
      - 26 reports of 21 unique patients cohorts

Dowdy DW et al: QOL in adult survivors of critical illness: a systematic review of the literature. ICM 2005; 31: 611-20
Other results

• Measuring pre-ICU values
  • Five studies
    • Retrospectively by patients or proxy

• Comparison to age and sex matched population
  • Seven studies
    • All using SF-36

• Population comparison
  • Pre ICU (n=3)
    • Reduced values in all domains (physical and mental)
  • Post ICU (n=7)
    • 6 months to 13 years
    • All studies shows reduced values in both physical and mental domains
# Studies since the review

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Number</th>
<th>Instrument</th>
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<tr>
<td>Kaarlola A</td>
<td>2006</td>
<td>1099</td>
<td>SF-36/EQ-5D</td>
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<td>Boer K</td>
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<td>307</td>
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<td>Abelha F</td>
<td>2007</td>
<td>226</td>
<td>SF-36</td>
<td>Surgical ICU patients</td>
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<td>Fildissis G</td>
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<td>Ulvik A</td>
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<td>Tøien K</td>
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