24/7 Intensivist Staffing: A Bitter Pill Whose Time Has Come

Noel Gibney MB FRCP(C)
This issue will affect the majority of you more than me!

I enjoy and need my sleep as much as anyone else!
Annals of Internal Medicine

Association between Critical Care Physician Management and Patient Mortality in the Intensive Care Unit

Mitchell M. Levy, MD; John Rapoport, PhD; Stanley Lemeshow, PhD; Donald B. Chalfin, MD, MS; Gary Phillips, MAS; and Marion Danis, MD


Design: Retrospective analysis of a large, prospectively collected database of critically ill patients.

Setting: 123 ICUs in 100 U.S. hospitals.

Patients: 101,832 critically ill adults.

Conclusion: In a large sample of ICU patients in the United States, the odds of hospital mortality were higher for patients managed by critical care physicians than those who were not.
Thank you for your attention!
History of Critical Care

- 1850s Florence Nightingale - Crimean War
  - Aggregated sickest patients together
- 1939-45 WW II
  - Shock wards
- 1947-50 Poliomyelitis
  - Mechanical ventilation
- 1960
  - Spread of ICUs
- 1970-now
  - “Closed” ICUs
Team care: beyond open and closed intensive care units
Peter J. Pronovost, Christine G. Holzmueller, Lia Clattenburg, Sean Berenholtz, Elizabeth A. Martinez, Jose Rodriguez Paz and Dale M. Needham.

The organization of intensive care unit physician services
Peter J. Pronovost, MD, PhD, FCCM; David A. Thompson, DNSc, MS, RN; Christine G. Holzmueller, BLA; Todd Dorman, MD; Laura L. Morlock, PhD

The impact of organisational change on outcome in an intensive care unit in the United Kingdom
Graham Baldock, Peter Foley, Stephen Brett

Effect of Intensive Care Unit Organizational Model and Structure on Outcomes in Patients with Acute Lung Injury

Physician Staffing Patterns and Clinical Outcomes in Critically Ill Patients
A Systematic Review
Peter J. Pronovost, MD, PhD
Derek C. Angus, MB, ChB, MPH
Todd Dorman, MD
Karen A. Robinson, MSc
Tony T. Dremsizov, MBA
Tammy L. Young
Impact of Closed ICU

- Decreased ICU mortality by 40%

Why?
- Training
- Knowledge
- Protocols
- Procedural skills
- Presence
24/7 intensivist coverage

So, if the presence of an intensivist on-site is beneficial during “Bankers Hours”, what about after-hours at night and weekends?
## Weekend/night admission

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Country</th>
<th>Location</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bell</td>
<td>2001</td>
<td>Canada</td>
<td>Hospital</td>
<td>↑</td>
</tr>
<tr>
<td>Barnett</td>
<td>2002</td>
<td>USA</td>
<td>ICU</td>
<td>↑</td>
</tr>
<tr>
<td>Uusaro</td>
<td>2003</td>
<td>Finland</td>
<td>ICU</td>
<td>↑</td>
</tr>
<tr>
<td>Ensminger</td>
<td>2004</td>
<td>USA</td>
<td>ICU</td>
<td>→</td>
</tr>
<tr>
<td>Cram</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wunsch</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hixson</td>
<td>2005</td>
<td>USA</td>
<td>PICU</td>
<td>2</td>
</tr>
<tr>
<td>Laupland</td>
<td>2008</td>
<td>Canada</td>
<td>ICU</td>
<td>↑</td>
</tr>
<tr>
<td>Kujisten</td>
<td>2101</td>
<td>Netherlands</td>
<td>ICU</td>
<td>↑</td>
</tr>
</tbody>
</table>

Larger “weekend” effect shown in major teaching hospitals Even after adjustment for severity of illness
Weekend ICU admission

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Ratio (95% CI)</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barnett</td>
<td>2002</td>
<td>1.09 (1.04, 1.15)</td>
<td>63.66</td>
</tr>
<tr>
<td>Uusaro</td>
<td>2003</td>
<td>1.20 (1.01, 1.43)</td>
<td>5.32</td>
</tr>
<tr>
<td>Ensminger</td>
<td>2004</td>
<td>1.06 (0.96, 1.18)</td>
<td>14.83</td>
</tr>
<tr>
<td>Sheu</td>
<td>2007</td>
<td>0.79 (0.50, 1.25)</td>
<td>0.77</td>
</tr>
<tr>
<td>Laupland</td>
<td>2008</td>
<td>1.05 (0.95, 1.17)</td>
<td>14.83</td>
</tr>
<tr>
<td>Lee</td>
<td>2008</td>
<td>1.03 (0.61, 1.73)</td>
<td>0.59</td>
</tr>
<tr>
<td>Overall</td>
<td></td>
<td>1.08 (1.04, 1.13)</td>
<td>100.00</td>
</tr>
</tbody>
</table>

NOTE: Weights are from random effects analysis
CCM Fellow vs. Attending Intensivist:

- Presence of Critical Care fellow:
- Independent risk factor for increased:
  - Hospital days (OR 1.3)
  - ICU LOS (OR 1.5)

“Lack of full-time ICU physician involvement increased the probability of prolonged ICU stay.” Higgins et al. Crit Care Med 2003; 31:45–51

Decreased resource utilization with attending intensivists

Exaggerated “weekend” effect with fellows

Ensminger et al. Chest 2004; 126:1292
It appears that patients admitted during nights/weekends may do worse than those admitted during regular hours.

Some data that being cared for by trainees may not be ideal

Is there evidence that presence of intensivists helps?
# Impact of 24 hour critical care physician staffing on case-mix adjusted mortality in paediatric intensive care

Adrian Yu-Teik Goh, Lucy Chai-See Lum, Mohd El-Amin Abdel-Latif

*Lancet* 2001;357:445-446

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Intensivists</th>
<th>Pediatricians</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>355</td>
<td>264</td>
</tr>
<tr>
<td>Age (months)</td>
<td>4.0 (1-132)</td>
<td>12.0 (1.0-131.4)</td>
</tr>
<tr>
<td>PRISM II score</td>
<td>9.0 (0-31)</td>
<td>11.5 (0-35)</td>
</tr>
<tr>
<td>Mortality predicted by PRISM II</td>
<td>2.57%</td>
<td>4.85%</td>
</tr>
<tr>
<td>PICU ALOS</td>
<td>3.0 (1.0-14.0)</td>
<td>4.0 (1.0-27.4)</td>
</tr>
<tr>
<td>Expected deaths</td>
<td>47.7 (36.0-62.1)</td>
<td>52.2 (39.8-66.0)</td>
</tr>
<tr>
<td>Observed deaths</td>
<td>42</td>
<td>82</td>
</tr>
<tr>
<td>Standardized mortality ratio</td>
<td>0.88 (0.63-1.19)</td>
<td>1.57 (1.25-1.95)</td>
</tr>
</tbody>
</table>
Weekend and weeknight admissions have the same outcome of weekday admissions to an intensive care unit with onsite intensivist coverage*

Yaseen Arabi, MD, FCCP; Abdullah Alshimemerri, MD, FRCP(C); Saadi Taher, MD, FRCP
Crit Care Med 2006;34:605–611

Mortality among patients admitted to intensive care units during weekday day shifts compared with “off” hours*

Charles-Edouard Luyt, MD, PhD; Alain Combes, MD, PhD; Philippe Aegerter, MD, PhD; Bertrand Guidet, MD; Jean-Louis Trouillet, MD; Claude Gibert, MD; Jean Chastre, MD; for the CUB-Réa Network
Crit Care Med 2007; 35: 3-11

Both studies found no variation in outcomes between night and weekend patients admitted to ICUs with 24/7 onsite intensivist coverage
Effect of 24-hour mandatory versus on-demand critical care specialist presence on quality of care and family and provider satisfaction in the intensive care unit of a teaching hospital*

Ognjen Gajic, MD, MSc; Bekele Afessa, MD; Andrew C. Hanson, BS; Tami Krpata; Murat Yilmaz, MD; Shehab F. Mohamed, MBBS; Jeffrey T. Rabatin, MD, MSc; Laura K. Evenson, MS, RN, CNS, APRN-BC, CCRN; Timothy R. Aksamit, MD; Steve G. Peters, MD; Rolf D. Hubmayr, MD; Mark E. Wylam, MD

Crit Care Med 2008; 36:36–44


Interventions: Introduction of night-shift coverage to provide continuous 24-hr on-site, as opposed to on-demand, critical care specialist presence.

Conclusions: Improved processes of care and staff satisfaction and decreased intensive care unit complication rate and hospital length of stay.
Effect of 24-hour mandatory vs on-demand critical care specialist presence on long-term survival and quality of life of critically ill patients in the intensive care unit of a teaching hospital ★,★★,★★

Martin Periani MB, ChB\textsuperscript{a,b}, Michelle Biehl MD\textsuperscript{a,b}, Jeff A. Sloan PhD\textsuperscript{c}, Michael Malinchoc MS\textsuperscript{b,d}, Ognjen Gajic MD\textsuperscript{a,b,*}  

Journal of Critical Care (2012) 27, 421.e1–421.e7

No difference in long term survival
Economic implications of nighttime attending intensivist coverage in a medical intensive care unit*

Ritesh Banerjee, PhD; James M. Naessens, ScD; Edward G. Seferian, MD; Ognjen Gajic, MD; James P. Moriarty, MSc; Matthew G. Johnson, MPH; David O. Meltzer, MD, PhD

- Adjusted mean total cost estimates were 61% lower in the post period for patients admitted during night hours (7 PM to 7 AM) who were in the highest Acute Physiology and Chronic Health Evaluation III quartile.
- No significant differences were seen at other severity levels.
- The unadjusted ICU LOS fell in the post period relative to the pre period (3.5 vs. 4.8) with no change in hospital LOS.
- Cost savings $10,000 per patient admitted at night covered cost of $2,500 intensivist night stipend.
Impact of 24-Hour In-House Intensivists on a Dedicated Cardiac Surgery Intensive Care Unit

Kanwal Kumar, MD, Ryan Zarychanski, FRCPC, Dean D. Bell, FRCPC, Rizwan Manji, PhD, FRCSC, Joel Zivot, FRCPC, Alan H. Menkis, FRCSC, and Rakesh C. Arora, PhD, FRCSC; on behalf of the Cardiovascular Health Research in Manitoba Investigator Group


Methods.
Retrospective, propensity-matched, cohort study of all patients undergoing a cardiac surgical procedure at a single tertiary center before and after creation of a new CICU staffed by intensivists 24/7.

Results.
Reduced transfusion of prbcs, platelets and FFP in ICU.
Reduction in ICU LOS and hospital LOS by 1 day.
Fewer patients admitted intubated to ICU
No difference in mortality, post-op complications or ICU readmission
Twenty-four–Hour Intensivist Presence
A Pilot Study of Effects on Intensive Care Unit Patients, Families, Doctors, and Nurses

Allan Garland¹, Dan Roberts¹, and Lesley Graff¹

¹Faculty of Medicine, University of Manitoba, Winnipeg, Manitoba, Canada

• 32-week, crossover pilot trial where intensivists alternated 8 week blocks of two staffing models:
  • standard model, 7 days, taking night call from home
  • shift work model, 7 day shifts, 7 night shifts

• Less intensivist burnout.

• No difference in adjusted mortality or family satisfaction

• Nurses reported more role conflict

• Nighttime house-staff reported less autonomy, more supervision, but no difference in learning opportunities.
Nighttime Intensivist Staffing and Mortality among Critically Ill Patients

David J. Wallace, M.D., M.P.H., Derek C. Angus, M.D., M.P.H.,
Amber E. Barnato, M.D., M.P.H., Andrew A. Kramer, Ph.D.,
and Jeremy M. Kahn, M.D.

Retrospective study of patients admitted to ICUs in 34 hospitals using the APACHE clinical information system (Cerner) from 2009 through 2010.

Patient-level outcome data from APACHE linked to data from a 2010 organizational survey about ICU-level structures and care processes.

Primary outcome variable was in-hospital mortality.

Primary exposure variable was nighttime intensivist staffing.
95,727 Patients were admitted to 79 ICUs in 34 hospitals

9 Hospitals did not complete the survey

66,083 Patients were admitted to 49 ICUs in 25 hospitals

321 Patients were excluded
- 233 Had data lacking on primary outcome
- 80 Had data lacking on acute physiology score
- 13 Had data lacking on sex
- 3 Had data lacking on admission source
- 2 Had data lacking on mechanical ventilation status on ICU day 1

65,752 Patients were admitted to 49 ICUs in 25 hospitals
Results

- ICUs with low-intensity daytime staffing,
  - Nighttime intensivist staffing was associated with a reduction in risk-adjusted in-hospital mortality (adjusted odds ratio for death, 0.62; P=0.04).

- ICUs with high-intensity daytime staffing,
  - Nighttime intensivist staffing conferred no benefit with respect to risk-adjusted in-hospital mortality (odds ratio, 1.08; P=0.78)
Do the ICUs in this study resemble your ICU?

<table>
<thead>
<tr>
<th>Study</th>
<th>Edmonton Zone ICUs</th>
</tr>
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<tbody>
<tr>
<td>Admissions 17:00-07:00 hrs</td>
<td>N/A</td>
</tr>
<tr>
<td>Active treatment</td>
<td>66-68%</td>
</tr>
<tr>
<td>Mechanical ventilation on admission</td>
<td>44-46%</td>
</tr>
<tr>
<td>Emergency surgery</td>
<td>3.7-5.1%</td>
</tr>
<tr>
<td>In-hospital death</td>
<td>12-14%</td>
</tr>
<tr>
<td></td>
<td>67%</td>
</tr>
<tr>
<td></td>
<td>100%</td>
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<tr>
<td></td>
<td>81%</td>
</tr>
<tr>
<td></td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>26%</td>
</tr>
</tbody>
</table>
Resident work hours directives

European Union working time directive - 48-hour week with a maximum of 13 consecutive duty hours.

US Accreditation Council for Graduate Medical Education - 16 consecutive hours for first-year residents and 24 hours in subsequent years.

Arbitrator in Quebec ruled in June 2011 that 24-hour shifts pose a danger to residents’ health and, therefore, violate the Canadian Charter of Rights and Freedoms and the Quebec Charter of Rights and Freedoms.

“Quebec’s new rules governing call duty schedules have raised some issues in intensive care units, where the schedule has proven awkward, and has raised concerns about the increasing number of handovers of information between shifts”. - Montreal Gazette July 5, 2012
So…. who will provide first response 24/7 to critically ill patients in our hospitals?
<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
<th>Date</th>
<th>Activity</th>
<th>Date</th>
<th>Activity</th>
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</thead>
<tbody>
<tr>
<td>7/1-7/26</td>
<td></td>
<td>7/27-8/23</td>
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<td>8/24-9/20</td>
<td></td>
</tr>
<tr>
<td>8/21-10/18</td>
<td></td>
<td>10/19-11/15</td>
<td></td>
<td>11/16-12/13</td>
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<tr>
<td>12/14-1/10</td>
<td></td>
<td>1/11-2/7</td>
<td></td>
<td>2/8-3/7</td>
<td></td>
</tr>
<tr>
<td>3/8-4/4</td>
<td></td>
<td>4/5-5/2</td>
<td></td>
<td>5/3-5/30</td>
<td></td>
</tr>
<tr>
<td>5/31-7/1</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Schedule for kahn (8-24 to 9-20, 2012)**

19 August  | 20 IM/EM CCM Interview Date | 21 Tu | 22 IM/EM CCM Interview Date | 23 Th | 24 Fr | 25 Sa
26 Su      | 27 IM/EM CCM Interview Date | 28 Tu | 29 We                        | 30 Th  | 31 Fr | 1 September
2 September| Labor day                    | 4 Tu  | 5 IM/EM CCM Interview Date   | 6 Th   | 7 Fr  | 8 Sa
9 Su       | 10 IM/EM CCM Interview Date  | 11 Tu  | 12 We                        | 13 Th  | 14 Fr | 15 Sa
16 Su      | 17 IM/EM CCM Interview Date  | 18 Tu  | 19 IM/EM CCM Interview Date  | 20 Th  | 21 Fr | 22 Sa
23 Su      | 24 IM/EM CCM Interview Date  | 25 Tu  | 26 We                        | 27 Th  | 28 Fr | 29 Sa

‡ = On call

MUH CI Night 4786,#4129580098
Who should provide first response 24/7 to critically ill patients in our hospitals?

- Must be competent to assess, resuscitate, intubate and insert central venous catheter.
  - Intensivist
  - Anesthetist
  - Emergency physician
  - Internist/Surgeon with those skills
- For most of our hospitals that means INTENSIVIST if we wish to continue “closed” ICU model of care
- The main questions are do we have enough intensivists and who will pay?
Thank you for your attention!