



***Overnight ICU Physician Coverage:
Do We Need to Stay in Hospital 24-7?***

Allan Garland, MD, MA

Associate Professor of Medicine and Community Health Sciences

University of Manitoba

Introduction

- There are many problems in our health care systems -- including in ICUs (*Garland, Chest* 127:2151,2005)
 - many patients fail to get beneficial interventions
 - many receive interventions that are inappropriate, or have been shown to not improve outcomes
 - medical errors and complications are common -- leading to much disability, costs and death
 - large practice variation -- indicates suboptimal care is common
- A framework for solving these problems (*Berwick, Med Care* 27:763, 1989)
 - Know what works
 - Use what works
 - Do well what works

The Salient Fact of Performance Improvement

- Only 15% of errors and problems in complex organizations result from inadequate performance by individuals
- 85% of the opportunity for quality improvement relates to flaws in institutional systems and processes that hinder the ability of individuals to perform their jobs well
- So, we must alter the system itself (structures & processes) so that it becomes easy for people to do their job well, hard to forget things, make mistakes or otherwise perform poorly
- The organization of most ICUs is *not* the result of thoughtful planning driven by outcomes data, but rather reflects historical origins and subsequent growth by accretion

Deming, *Out of Crisis*. MIT Press, 1986; Juran, *Juran's Quality Handbook*. McGraw-Hill, 1998
Walton, *The Deming Management Method*, Perigee, 1986; Berwick, *Med Care* 27:763, 1989

Things That Can Be Changed

- The need for a function
- How a function is performed
- Which personnel perform a function
- Functional relationships between personnel
- How personnel communicate
- Existence, frequency, and nature of ICU rounds
- The role of equipment (e.g.computers)
- Interactions between personnel & equipment
- The administrative, medical, and functional structures of the ICU
- The administrative, medical, and functional structures of ICU personnel
- Rules governing responsibilities and practice privileges
- Training, skills, competence, knowledge & experience of personnel
- Scheduling of personnel, including shift, night & weekends
- Workload per worker
- Availability of supporting technology (e.g. computers, imaging)
- Choice of products used in the ICU
- Number of ICU beds
- Physical layout of the ICU
- Availability of intermediate care & ward beds
- Availability of outcomes data

Nighttime Physician Staffing

- *Highly* variable between ICUs
- Prevalent historical (“standard”) model
 - 1 attending physician makes rounds ICU → physically available in or near the ICU for much or most of daytime hours → takes call at night from home → returns to the ICU according to judgment
 - no assured in-hospital attending physician staffing
- Numerous alternative attending physician staffing models
 - both with/without nighttime in-hospital attending physician staffing
 - 24-7 shiftwork model
- Other variable elements intersect with intensivist staffing
 - presence & scheduling of: house officers, PAs, NPs -- particularly, whether any of these other personnel remain in ICU overnight

Issues Around 24-7 Shiftwork Staffing

- It might improve:
 - patient outcomes
 - sleep deprivation, job distress, and burnout prevalent in standard staffing models
 - patient/family dissatisfaction with communication in ICUs
 - poor communication with MDs often perceived by ICU nurses
 - house officer teaching
- Potential problems:
 - would require a larger pool of physicians to staff ICUs
 - many known detrimental effects of shiftwork on humans
 - shiftwork is the most common reason ED physicians give for leaving the field
 - might worsen trainees' sense of autonomy

The Logic of the 24-7 In-Hospital Coverage

- ICU patients are just as sick at night as during the day
- A substantial fraction of ICU patients are admitted at night
- If we believe we should be in the ICU during the daytime, why not during nighttime hours too?
- But, of course, this logic doesn't prove that 24-7 coverage is beneficial
- So, is there data supporting this concept? Yes:
 - a modest literature looking at outcomes at night
 - 2 papers directly assessing alternative nighttime staffing models

Nighttime in ICUs: Effect on Hospital Mortality

<i>Author</i>	<i>Study dates</i>	<i>Sites</i>	<i>Patients</i>	<i>Country</i>	<i>Night admission</i>	<i>Night discharge</i>	<i>Comments</i>
WORSE at NIGHT							
Beck	1996-2000	1	1654	UK		OR=1.70*	
Priestap	2001-04	31	47000	Canada		OR=1.22*	
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SAME or BETTER at NIGHT							
Uusaro	1998-2001	28	23100	Finland		OR=1.11	95% CI=0.93-1.31

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Arabi	1993-2003	1	2093	Saudi	RR=0.98		
Morales	1995-2000	1	6034	US	RR=0.81 *		
Luyt	2000-03	23	17800	France	OR=0.93 *		Combined nights, weekends

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- If worse outcome from night discharge is related to bed pressure issues, it may well *not* be improved by physician staffing changes

Nighttime in ICUs: Other Effects

<i>Author</i>	<i>Study dates</i>	<i>Sites</i>	<i>Patients</i>	<i>Country</i>	<i>Outcomes</i>
WORSE at NIGHT					
Merrer	1997-2000	8	289	France	OR=2.06 for mechanical complices of CVC insertion at night
SAME or BETTER at NIGHT					
Morales	1995-2000	1	6034	US	Shorter ICU & hospital LOS for nighttime ICU admission
Giraud	1999	2	382	France	9% of iatrogenic complications occurred MN-7am (29% of the day)

Comments About This Literature

- All of these studies were observational -- i.e. looking at differences between daytime and nighttime outcomes from within a single physician staffing model
- The findings are not consistent in showing worse outcomes at night in ICUs
- Interpretation is complicated by the fact that the ICUs studied differed in the nature of physician nighttime coverage
 - some had intensivists or ICU fellows who remained in the hospital overnight, while most did not
- Observing worse outcomes at night does not necessarily mean that having an attending physician in ICU at night would change those outcomes -- though it might
- We need direct comparisons of alternative staffing models

Trial #1

(Blunt, *Lancet* 356:735,2000)

- Pre/post study (18 months each) in a single ICU in the UK
- Pre: Daytime intensivist, coverage at night and weekends by the anaesthetist consultant in hospital
- Post: 24-7 coverage by intensivists -- few details provided
- Compared SMR using APACHE II predictions of hospital mortality

	<i>Before</i>	<i>After</i>
N	452	372
APACHE II score	19.3	17.9 *
Actual:predicted hosp. mortality ratio	1.11	0.81 *

Trial#2: Study Design

(Gajic, *CCM* 36:36,2008)

- Pre/post study (1 year each) in 24 bed MICU at Mayo Clinic
 - median 7 admissions daily; numerous standardized order sets
- Pre model:
 - 2 ICU teams with intensivist attendings alternating admission days, and night coverage from home
 - rotation of ICU fellow & 2 IM residents remain in the ICU at night
- Post model:
 - daytime coverage as in *pre* model
 - additional night-shift intensivist, doing 1 week block in ICU, 7pm-7am, covering both teams (got next 5 days off)
- Outcomes: APACHE III adjusted mortalities & LOS; Adherence to processes of care; Rates of ICU-acquired Complications; Satisfaction of patients, families, ICU staff

Gajic Study: Process Results

- Patients: N=1,995 (pre) and 2,393 (post)
 - median age=69, 45% female, median APACHE 3 score=63, predicted hospital mortality=16.1%
 - 44% admitted at night
- Process results (%):

	<i>Pre</i>	<i>Post</i>	<i>p-value</i>
PUD prophylaxis	98	100	.002
VTE prophylaxis	91	94	.04
Daily sedation holiday	99	98	NS
HOB>30°	60	61	NS
Used sepsis order set	71	82	NS
Low V _T in ALI	72	81	NS
Cumulative rate of omissions/pt-day	24	16	.002

Gajic Study: Outcome Results

	<i>Pre</i>	<i>Post</i>	<i>p-value</i>
Complication rates (%):			
DVT	1.4	1.5	NS
PE	0.8	0.3	NS
Bleeding	2.2	1.8	.047
VAP	2.5	1.9	NS
Reintubation	3.6	2.2	NS
Cumulative	11	7	.023
ICU readmission rate (%)	9.2	7.6	NS
ICU mortality	10.2	10.4	NS
Hospital mortality	17	19	NS

- After multivariable adjustment:
 - NS difference in ICU or hospital mortality rates, ICU LOS
 - significant 1.4 day fall in hospital LOS (p=.02)

Gajic Study: Satisfaction Results

- Patient/family satisfaction
 - response rates only 46%
 - 5.87 vs. 5.95, $p=0.8$ --- on scale ranging 4(best)-22(worst)

- Staff satisfaction
 - queried intensivists, house officers, RNs, RRTs, pharmacists
 - more thought the 24-7 model was optimal for patient care (78 vs. 38%, $p<.001$)
 - intensivist burnout (very slightly, but significantly) lower in the 24-7 model

What's It All Mean?

- There are reasons to be seriously concerned about the standard ICU physician staffing model
- But there are also reasons to be seriously concerned about a shiftwork staffing model
- **We simply don't know the answer to this important question yet -- we need MUCH more data**
- Studies must take account of the full complexity of this issue:
 - different effect in different types of ICUs? -- e.g. tertiary vs. community
 - BL structure may be influential -- e.g. overnight ICU fellows
 - not all 24-7 models are the same: duration of blocks, # of nighttime attendings, concurrent responsibilities of nighttime attendings, etc.

Winnipeg Study: Design

- Directly compare 2 staffing models
- A = standard model -- 1 week blocks
- B = 24-7 shiftwork model -- 1 week blocks
 - single daytime intensivist (8am-5:30pm)
 - 2 other intensivists alternate to cover the 7 days of night shifts
- Done in 2 ICUs
 - 10 bed tertiary MICU -- 1 resident in-house at night
 - 6 bed community med-surg ICU -- no physicians regular in-house at night
- **Alternate in 8 week blocks** (ABAB, BABA) -- 32 weeks total
- Outcomes: ICU & hospital mortality; ICU & hospital LOS; rates of ICU-acquired complications; intensivist burnout; **conflict between day/night intensivists**; nursing satisfaction; resident satisfaction; family satisfaction

We can't solve problems by using the same kind of thinking we used when we created them.

Albert Einstein