Managing Acute Liver Failure: Biochemistry to Bedside

Ali Al-Khafaji, M.D., M.P.H., FACP, FCCP
University of Pittsburgh
Pittsburgh, Pennsylvania

Notes:

Physiologic Basics and Clinical Applications of Pulse Pressure and Stroke Volume Variations in Mechanically Ventilated Patients

Azriel Perel, M.D.
Professor and Chairman, Department of Anesthesiology and Intensive Care,
Sheba Medical Center, Sackler School of Medicine, Tel Aviv University, Tel-Hashomer,
52621 Israel.

Fluid loading fails to increase the cardiac output (CO) in more than 50% of critically ill patients and patients that undergo elective surgery. The importance of this problem cannot be overestimated since unnecessary fluid administration may be harmful especially in patients with respiratory, renal and/or cardiac failure. Overzealous fluid administration may indeed be an underestimated occult source of mortality in the ICU, since the excess fluid may increase interstitial edema in various organs, increase lung water content, postpone weaning and increase the risk of sepsis. Hence the importance of an accurate assessment of fluid responsiveness lies not only in the detection of latent hypovolemia or a meticulous 'prophylactic optimization', but also in the withholding of fluids when their administration may not be of benefit.

In patients who are on fully controlled mechanical ventilation with tidal volumes of at least 8 ml/kg the intermittent increase in intrathoracic pressure serves as a repetitive challenge of the circulation, resulting in measurable functional hemodynamic parameters which are derived mainly from the arterial pressure (e.g., systolic pressure variation (SPV), pulse pressure variation (PPV), stroke volume variation (SVV)). The degree by which these parameters are influenced by the normally occurring inspiratory decrease in venous return offers unique information about the fluid responsiveness of the ventilated patient. All these parameters have been shown to be superior to commonly used static preload parameters (e.g., CVP, PAOP, LV end-diastolic area, global end-diastolic volume). Within their respective limitations, functional hemodynamic parameters offer immediate, dynamic, and essential information about cardiovascular function. Following the recognition of its value, functional hemodynamic monitoring is being gradually implemented in new bedside monitors.

Acute Lung Injury Update

Daniel S. Talmor, M.D.
Harvard Medical School
Boston, Massachusetts

Notes:

The Most Influencial Critical Care Articles in 2009

Samuel M. Galvagno, Jr. , D.O.
Johns Hopkins Hospital, Baltimore, Maryland

JOHNS HOPKINS MEDICINE

Effect of Evidence-Based Feeding Guidelines on Mortality of Critically Ill Adults

15 October, 2009

Sam Galvagno, D.O.
Assistant Professor, Department of Anesthesiology and Critical Care Medicine
Research Fellow: Ruth L. Kirschstein Research Service Award (T32)
Johns Hopkins School of Public Health

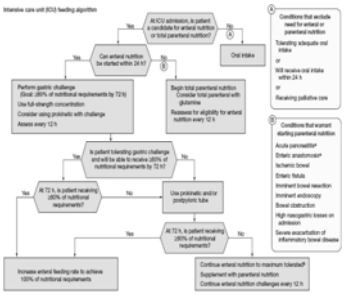
Doig GS, Simpson F, Finfer S, et al. ANZICS Clinical Trials Group*

- Hypothesis: ICU and hospital mortality and length of stay would be improved with implementation and adherence to an evidence-based feeding guideline
- Design: Cluster Randomized Controlled Trial
  - Unblinded
  - Setting: **27** ICUs in Australia & New Zealand
  - Follow up period: **20** weeks
  - Patients: **1118** adults
    - Mean age 59, 61% men, >2 day anticipated ICU stay
    - Paliative care, moribund, or brain-dead patients excluded

JAMA 2008; 300 (23): 2731-2741.

Study Design

- 14 ICUs / 561 Patients in "Guideline" group
- 13 ICUs / 557 Patients in control group
- Staff at intervention ICUs exposed to multifaceted practice change strategy



Outcome Measures

Main Results

Outcome Measure	Guideline Group	Control Group	P Value
Deaths at Hospital Discharge	172 [28 %]	153 [27.4 %]	.75
Mean Length of Stay	24.2 Hospital 9.1 ICU	24.3 Hospital 9.9 ICU	.97 .42
Renal Dysfunction	OR 1.54	OR 2.12	.04
Witnessed Aspiration	2.19 [1.18-4.08]	4.33 [2.33-8.05]	.28
Need for Therapeutic Interventions	RRT .75 Vent 7.69 ABX 7.41	RRT 0.91 Vent 7.21 ABX 7.19	.29 .70 .47

Conclusions

- Reasons for disappointing results
- Example of a strategy to change clinical practice (that worked)
- Previous work suggests mortality benefit, decreased LOS, and other potential benefits
- SCCM Guidelines

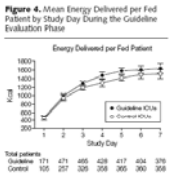


Figure 4. Mean Energy Delivered per Fed Patient by Study Day During the Guideline Evaluation Phase

Martin CM, et al. (ACCEPT). *CMAJ* 2004; 170: 197-204.
Jones NE, Heyland DK. *JAMA* 2008; 300 (23): 2798-2799.
Martindale RG, McClave SA, Vanek VW, et al. (SCCM Executive Summary). *Crit Care Med* 2009; 37 (5): 1757-1761.
Jones NJ, Heyland DK. *JAMA* 2009; 301 (15): 1544.
Jones NE, Heyland DK. *Curr Opin Gastroenterol* 2008; 24 (2): 215-222.

Dr. Galvagno received permission from Dr. Doig to use any figures from his paper on August 24th, 2009.

The Most Influencial Critical Care Articles in 2009

Sarah M. Cocoma, M.D.
University of Chicago, Chicago, Illinois

Current Teaching and Evaluation Methods in Critical Care Medicine: Has the Accreditation Council for Graduate Medical Education affected how we practice and teach in the intensive care unit?

Sarah M. Cocoma, M.D.
University of Chicago Medical Center
Department of Anesthesia and Critical Care
October 16, 2009

Current Teaching and Evaluation Methods in Critical Care Medicine

- **Study Objective:** To determine the impact of the ACGME mandates for duty hours and competencies on instruction, evaluation, and patient care in intensive care units in the United States.
- **Study Design:** A web based survey was sent to 380 critical care fellowship program directors with the focus on the current approach to teaching and evaluation, interest in altering existing methods, conditions that have forced changes, and the effects of ACGME mandates on teaching and care in the ICU.
- **Outcome measures:**
  - Desire to change teaching in the ICU
  - Adherence to ACGME regulations
  - Issues that have impacted education in the ICU
  - The impact of ACGME mandates on resident and fellow education and patient care from the resident and fellow perspective

Results

Table 2. Current teaching and evaluation methods in the intensive care unit

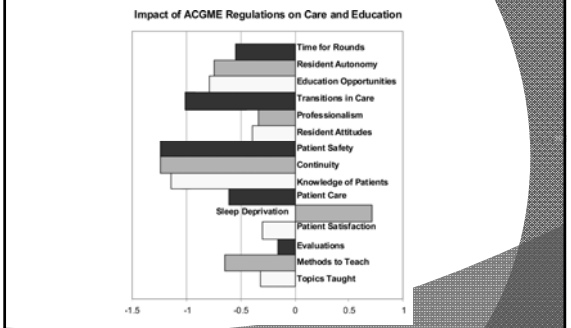
Teaching Methods	Percent	Evaluation Methods	Percent
Bedside, case-based teaching	94.4	Faculty evaluations	99.2
Lecture series	79.0	Fellow evaluations	67.5
Morbidity and mortality conference	72.6	Nurse evaluations	66.3
Syllabus of articles	63.7	Mini-CEX (observed clinical encounter with feedback)	17.9
Journal club	62.9		
Multidisciplinary rounds	60.5	Patient and family satisfaction evaluations	15.4
Rounding sheets	58.1		
Web-based syllabus of articles	29.0	Prerotation test or postrotation test	14.6
Web-based lectures	27.4	Resident self-assessment	8.9
Psychomotor skills laboratories	24.2	Performance on full-body simulator	8.1
Full-body simulator	15.3	Standardized patient evaluations	1.6
Cadaver/animal laboratories	8.1		
Computer simulation	4.8		
Palm Pilot algorithms	3.2		
Standardized patients	3.2		

CEX, clinical evaluation exercise.

Table 4. What barriers prevent you from changing your current teaching in the intensive care unit?

Barriers	No Effect (%)	Small Barrier (%)	Moderate Barrier (%)	Significant Barrier (%)	The Most Significant Barrier (%)
Lack of resident availability	15	20	21	28	16
Lack of resident interest	28	34	28	5	5
Faculty not interested in teaching	43	29	15	4	0
Clinical workload is too high	3	16	25	29	27
Lack of protected time	9	14	24	41	11
Lack of promotion/recognition	20	27	24	23	6
Too little funding	13	14	23	33	17
Lack of access to technology	21	32	31	22	4
Lack of technical support	18	24	31	22	4
Lack of published standards of what to teach	39	32	23	4	3
Faculty disagreement about what to teach	48	41	7	3	1
Accreditation Council for Graduate Medical Education core competencies	44	28	24	4	0

Results



Author's Conclusions

- Adverse effects on resident and fellow education and patient care in the ICU have been seen with ACGME mandates and regulations.
- Critical care medicine program directors are spending more time on direct patient care and less on education.
- Major changes are needed to enhance resident and fellow education and to ensure adequately trained physicians for the care of future critically ill patients.

Summary

- No easy solution and potentially even more restrictive work hours in the future.
- Consider increasing funding for educational tools such as simulator instruction and web based training.
- Recognize advancement in educational techniques with regards to academic promotion.

Bibliography

- Bion JF, Heffner JE: Challenges in the care of the acutely ill. Lancet 2004; 363(9413):970-7
- Chudgar SM, Cox CE, Que LG, et al: Current teaching and evaluation methods in critical care medicine: Has the Accreditation Council for Graduate Medical Education affected how we practice and teach in the intensive care unit? Critical Care Med 2009; 37: 49-60
- Clay AS, Petrusa E, Harker M, Andolsek K: Development of a web-based, specialty specific portfolio. Medical Teacher 2007;29:4,311 — 316
- Clay AS, Que LG, Petrusa ER, et al: Debriefing in the intensive care unit: A feedback tool to facilitate bedside teaching. Critical Care Med 2007; 35:738-746
- Jagannathan J, Vates GE, Pouratian N, et al: Impact of the Accreditation Council for Graduate Medical Education work-hour regulation on neurosurgical resident education and productivity. J. Neurosurg 2009; 110:820-827
- Leach DC: Changing education to improve patient care. Postgrad Med J. 2008; 84:437-441
- Prasad M, Iwashyna TJ, Christie JD, et al: Effect of work-hour regulations on intensive care unit mortality in United States teaching hospitals. Critical Care Med 2009; 37:2564-69
- Volpp KG, Rosen AK, Rosenbaum PR, et al: Mortality among hospitalized Medicare beneficiaries in the first 2 years following ACGME resident duty hour reform. JAMA 2007; 298:975-983
- Volpp KG, Rosen AK, Rosenbaum PR, et al: Mortality among patients in VA hospitals in the first 2 years following ACGME resident duty hour reform. JAMA 2007; 298:984-992

The Most Influencial Critical Care Articles in 2009

Breandan L. Sullivan, M.D.
Washington University School of Medicine, St. Louis, Missouri

Dexmedetomidine vs Midazolam for Sedation of Critically Ill Patients: A Randomized Trial

JAMA, February 4, 2009– Vol 301, No 5

Breandan Sullivan MD

DEXMEDETOMIDINE vs MIDAZOLAM

- **Design**
  - Prospective, double blind, multicenter
- **Outcomes**
  - Time at target RASS (PRIMARY OUTCOME)
  - Prevalence/Duration of delirium
  - Fentanyl and open label midazolam
  - Nursing assessments
  - Duration of mechanical ventilation
  - ICU length of stay
  - Adverse outcomes
- **Objectives**
  - Efficacy and safety *
    - Dexmedetomidine
    - Midazolam
- **Setting**
  - **Intensive Care unit**
    - **Medical**
    - **Surgical**

Subjects

Inclusion Criteria

- Adults
- Mechanically ventilated <96 hrs prior to start of study
- Anticipated ventilation at least 3 days

Exclusion Criteria

- Trauma, Burns
- Dialysis all types
- Pregnancy/lactation
- Neuromuscular blockade except for intubation
- Epidural or spinal anesthesia
- General anesthesia 24 hrs prior to start of study
- Acute hepatitis or severe liver disease
- Unstable angina/acute MI/EF<30%
- 2 or 3 degree heart block
- SBP<90 despite two pressors

Methods

- Received study drug w/in 96 hrs of intubation
  - Midazolam 0.02-0.1mg/kg/hr (Optional loading dose 0.05mg/kg)
  - Dexmedetomidine 0.2-1.4μg/kg/hr (Optional loading dose 1μg/kg)
- Target RASS -2 to +1
  - If Oversedated decrease first then stop study drug
- Both received
  - Open labeled midazolam every 10 min prn
  - Study drug adjusted every 4hrs
  - PRN fentanyl pain, PRN haldol agitation

Results

Difference

- Incidence of delirium
- Rate of infection *
  - Hospital acquired pneumonia
  - UTI
- Bradycardia
  - Designated as adverse rxn
- Tachycardia
- Hypertension
- Duration of ventilation
  - Midazolam 5.6 days
  - Dexmedetomidine 3.7 days

No Difference

- % of time w/in target sedation
- Survival
- Fentanyl/haldol/open label midazolam use
- Pt's requiring interruption of study drug for oversedation

Conclusions

- Well done randomized clinical double blinded clinical trial
- Dexmedetomidine
  - Less delirium
  - Less time on ventilator
  - Less hypertension, tachycardia
- No difference in time at target sedation level between midazolam and dexmedetomidine
- Study was not powered to determine safety
- Results not generalizable due to exclusion criteria

ASA Update

Alexander A. Hannenberg, M.D.
ASA President-Elect
Newton-Wellesley Hospital
Anesthesia Department
Newton, MA

I. ASA's progress on organizational improvement
II. Our partnership with our foundations
III. A growing educational portfolio for members' needs
IV. Economic conditions and ASA
V. Anesthesia Quality Institute: a national clinical registry
VI. Health Care Reform and the Anesthesiologist
    a. Growing demand for services
        i. Primary Care initiatives
        ii. Non-physician scope implications
    b. The Public Plan debate
VII. Professionalism and Participation: The Cost of Citizenship

A Personal Journey During Katrina: Reflections of an Anesthesiologist During the Storm of the Century

Alan D. Kaye, M.D.
Louisiana State University School of Medicine, Baton Rouge, Louisiana

How I came to New Orleans:

- Married a New Orleans girl in 1990
- Recruited back after 6 years as serving as Chairman of Anesthesia at Texas Tech Health Sciences Center, Lubbock in Feb, 2005
- Because I had been Program Director at Tulane Medical Center in the 1990's, I had selected about 100 residents in the NO area
- We had a party the Friday before Katrina to celebrate all of the new hirings for the anesthesia staff, almost all the staff at LSU is from Tulane originally

Emergency Preparedness in New Orleans (Pre-Katrina)

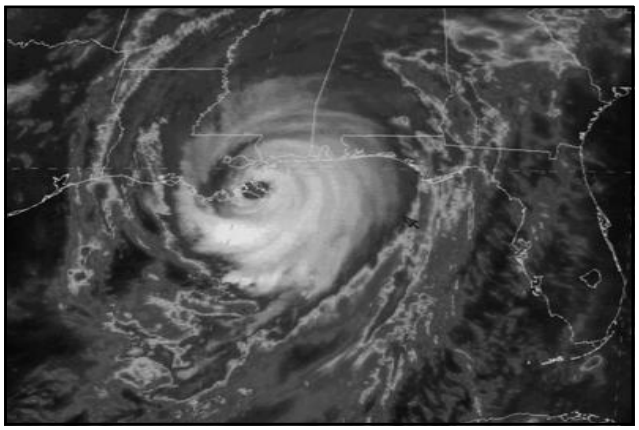
- Major Port City
  - Nation's busiest Port
  - World's longest wharf
- Tourism is number one industry
- Only major American city below Sea Level
- Hurricane Season June 1 – November 30

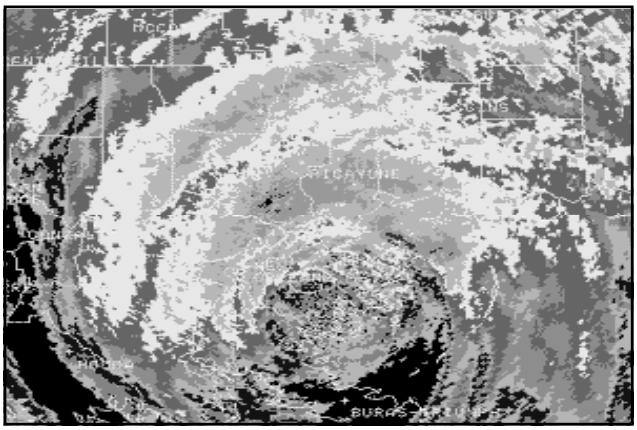
Preparing for the Inevitable

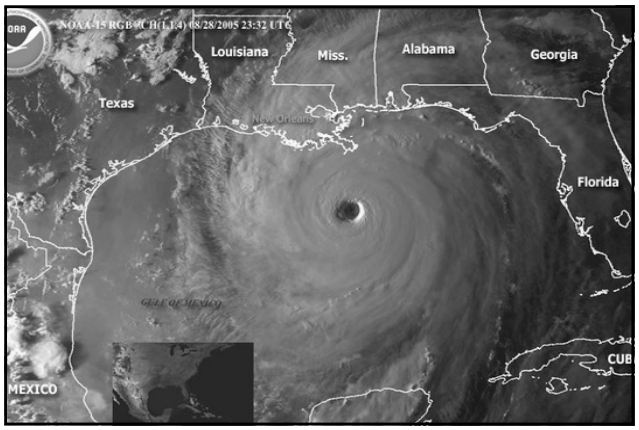
- Potential Barriers to Success:
  - Failure to understand your vulnerability
  - Failure to plan for disaster
  - Failure to drill and consolidate resources
  - Complacency
    - "I made in through Hurricane (pick your storm)"

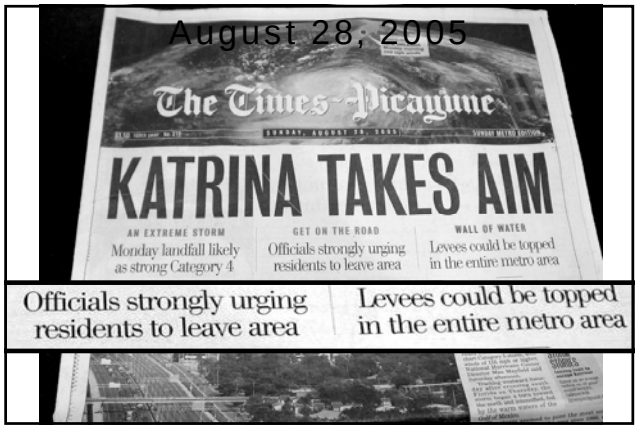
Near Misses since 1995

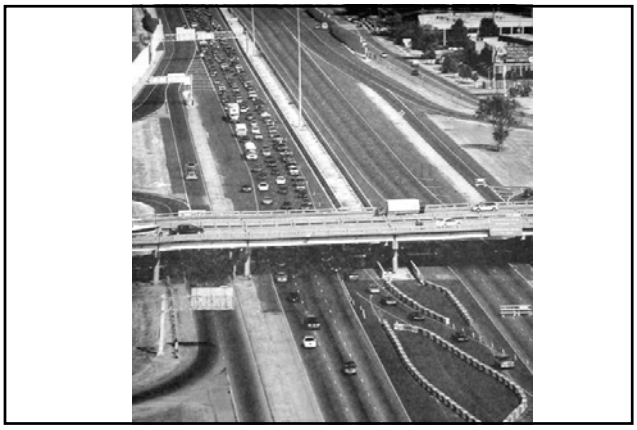
- Hurricane Erin – 1995
- Hurricane Opal – 1995
- Hurricane Danny - 1997
- Hurricane Georges – 1998
- Hurricane Isidore – 2002
- Hurricane Lilly – 2002
- Hurricane Ivan – 2004
- Hurricane Cindy – 2005

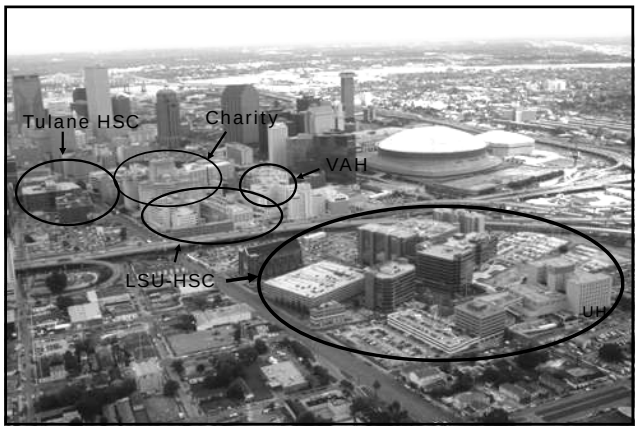






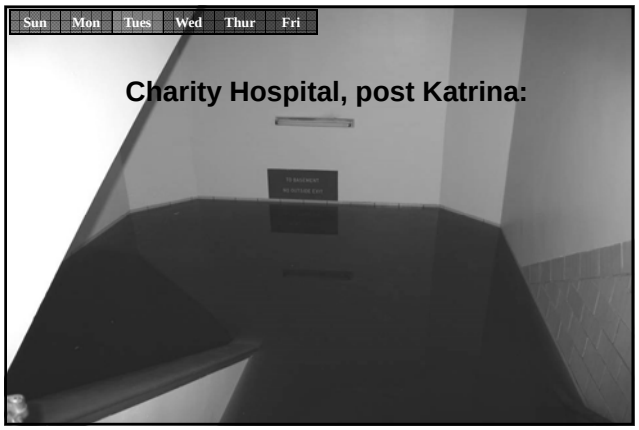






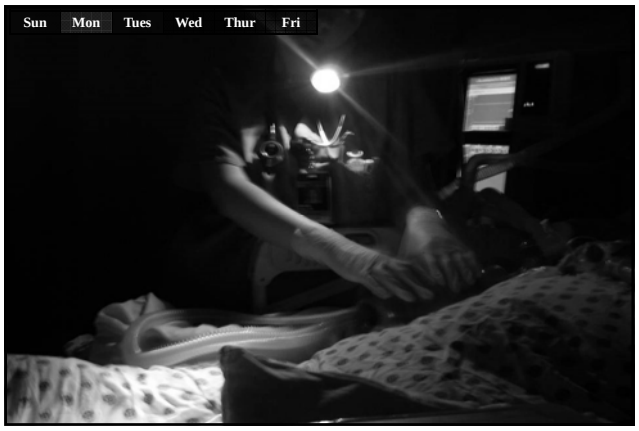
Louisiana Superdome vs. Katrina


Charity Hospital, pre Katrina:

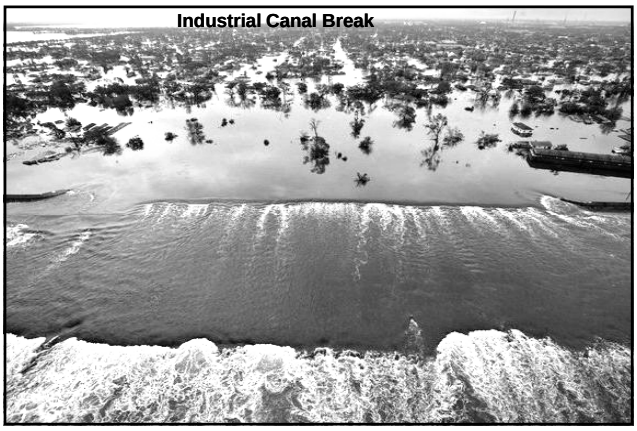

Sun Mon Tues Wed Thur Fri
Charity Hospital, post Katrina:

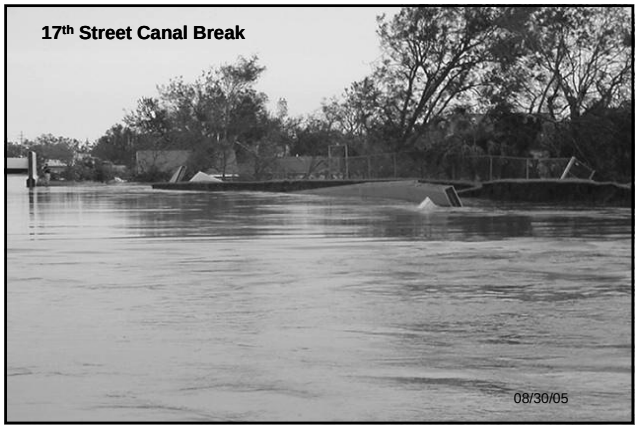

Sun Mon Tues Wed Thur Fri


Sun Mon Tues Wed Thur Fri

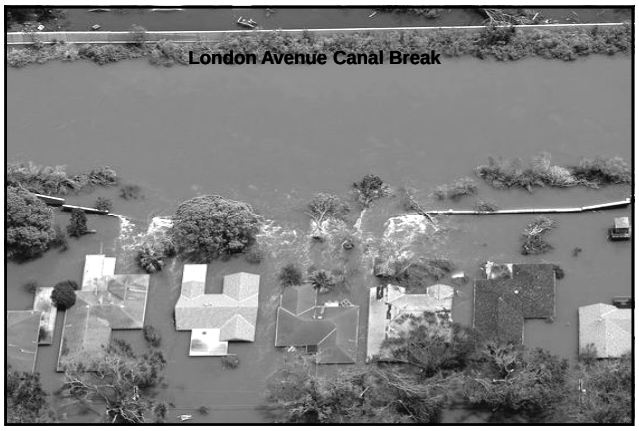

Sun
Mon
Tues
Wed
Thur
Fri


Sun
Mon
Tues
Wed
Thur
Fri
DO NOT
UNPLUG!!
connected
to patient's
Ventilator
Machine.
Thanks

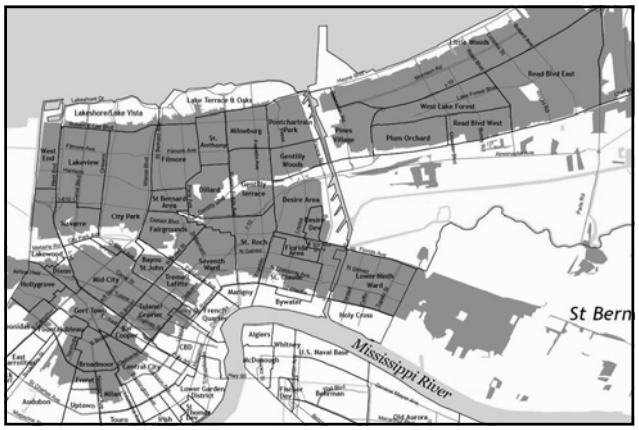

Industrial Canal Break

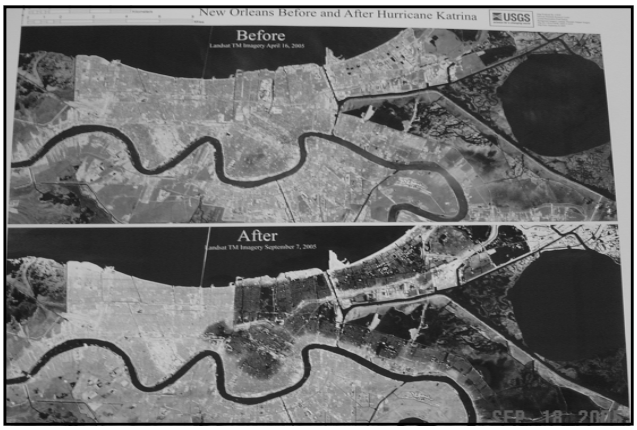

17th Street Canal Break
08/30/05

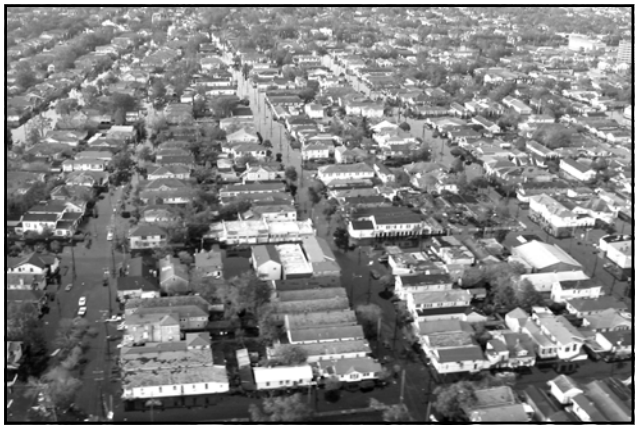

HAIR - NAILS


London Avenue Canal Break


American
Red Cross
Disaster Relief
2107


Lakeshore/Lake Vista
Lake Terrace & Oaks
Little Woods
Read Blvd East
West Lake Forest
Plum Orchard
Read Blvd West
Pontchartrain Park
Gentilly Woods
Desire Area
St. Roch
Lower Ninth Ward
Holy Cross
Bywater
Algiers
Whitney
U.S. Naval Base
Mississippi River


New Orleans Before and After Hurricane Katrina
USGS
Before
Landsat TM Imagery April 16, 2005
After
Landsat TM Imagery September 7, 2005



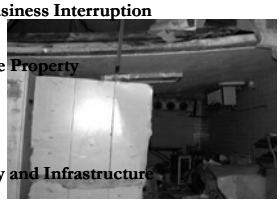
Tulane University Hospital pre Katrina


Tulane University Hospital post Katrina
ılane
UNIVERSITY
HOSPITAL & CLINIC


Tulane University Health Science Center

Katrina Consequences-LSU

- **$90 Million in Lost Revenue from Business Interruption**
- **$88.4 Million in Damage to Moveable Property**
- **$128 Million for Campus Cleanup**
- **$75.6 Million for Temporary Capacity and Infrastructure**



- **Loss of 1,900 staff and faculty through furlough, retirement, or termination for LSU alone**
- **1/2** ***of hospitals closed, hundreds of anesthesiologists gone***
  No one from the LSU Dept left related to Katrina!

Tulane Medical Center Cleanup & Rebuild

- Remediation - $20-23 million
- Equipment and Supplies - $20-25 million
- Construction - $20-25 million
- Timeline
  - Hospital shutdown – September 1, 2005
  - Remediation begins – September 17, 2005
  - Urgent care/walk-in clinic – December 1, '05
  - ED, 65 beds, Rad, Lab, etc. – February 14, 06
  - Complete Reopen – March 1, '07

Katrina: Lessons Learned
August 29th

"Katrina created the biggest migration of doctors in the United States since the 1940s, when the World War II draft siphoned thousands of health-care workers from the nation's economy."

Thomas Ricketts, University of North Carolina's Cecil G. Sheps Center for Health Services Research.

Katrina: Lessons Learned
August 29th

New Orleans Hospitals: Pre-K

15 hospitals

5,000 beds

104 Anesthesiologists

Chalmette Medical Center
Charity Hospital
Children's Hospital
East Jefferson Hospital
Kenner Medical Center
Lakeside Hospital
Lindy Boggs Medical Center
Meadowcrest Hospital
Memorial Medical Center
Methodist Hospital
Ochsner Medical Center
Touro Infirmary
Tulane University Hospital
University Hospital
West Jefferson Hospital

Katrina: Lessons Learned
August 29th

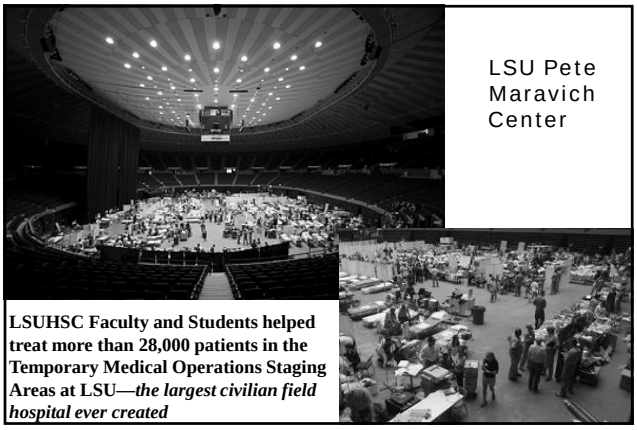
New Orleans Hospitals: Post-K

East Jefferson Hospital
Ochsner Medical Center
West Jefferson Hospital

3 hospitals

1,200 beds

35 Anesthesiologists



LSU Pete Maravich Center

LSUHSC Faculty and Students helped treat more than 28,000 patients in the Temporary Medical Operations Staging Areas at LSU—*the largest civilian field hospital ever created*

LSU Health Sciences Center

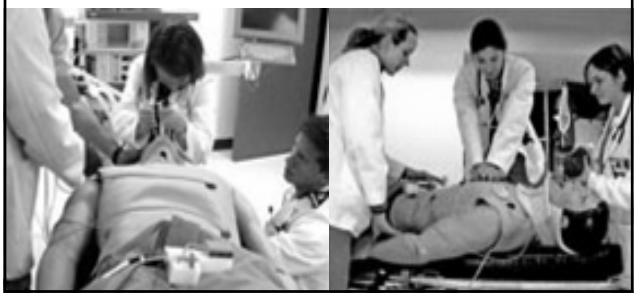
- Impact of the Storm and Floods
  - All teaching and research facilities flooded under 4-5 feet of water
  - $150 million in damages to 21 of 22 buildings
  - Power, air handling systems in basement were all destroyed
  - Destruction of research equipment, records, cell lines, support vehicles, etc.
  - Resulted in the evacuation of over 6,000 students, faculty and staff of the HSC

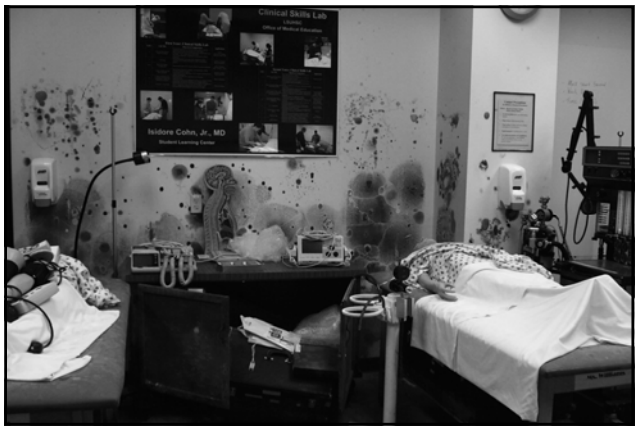
LSU Health Sciences Center

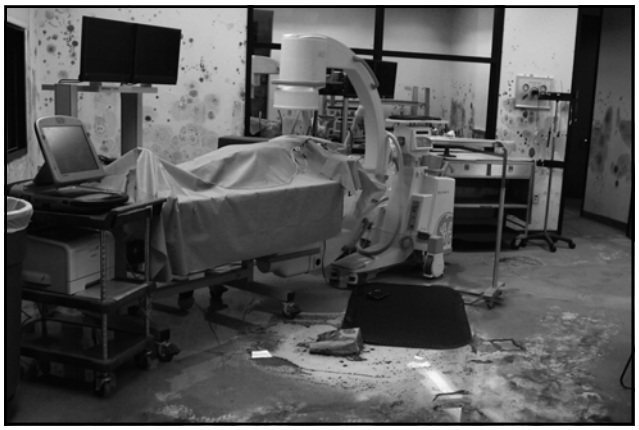
- Example of Impact:
  - Destroyed our Anesthesia run Isidore Cohn Learning & Simulation Center led by Dr. Kozmenko:
    - Computer based curriculum
    - Skills laboratory
    - Laparoscopic and CV simulators
    - Integrated teams training simulators
    - OR of the Future

LSU Health Sciences
Isidore Cohn Learning Center

LSU Health Sciences
Isidore Cohn Learning Center



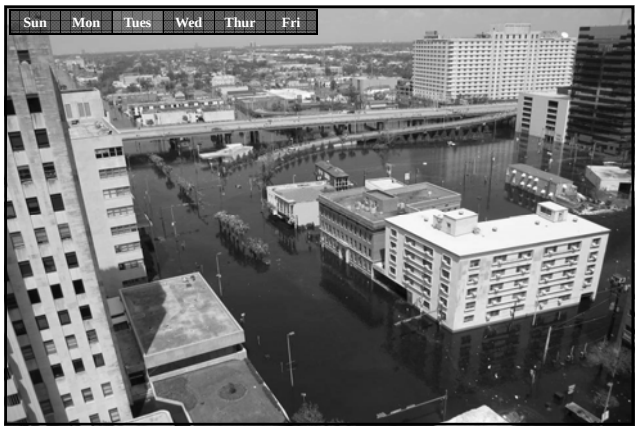




LSU Health Sciences Center

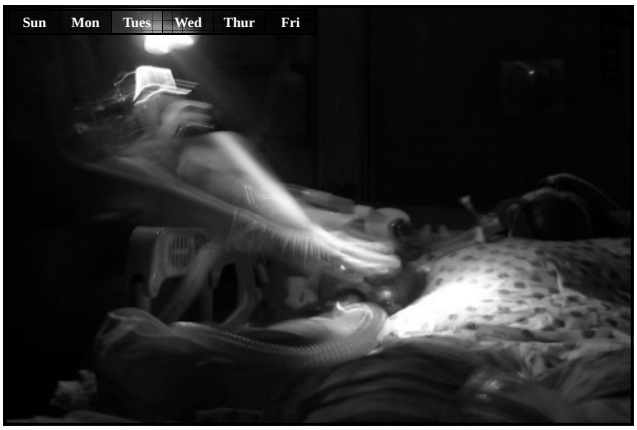
- Responses of LSUHSC
  - Relocated all schools to Baton Rouge
    - Medicine — Pennington
    - Dentistry — LSU South Campus
    - Nursing — Movie theaters
    - Allied Health — Pennington
    - Public Health — LSU Ag Center
    - Graduate Studies — LSU labs
  - *Obtained a 1400 passenger ferry and 200 trailers to provide housing for 2600 displaced students, residents and faculty*


FINNJET SILJA LINE


Sun
Mon
Tues
Wed
Thur
Fri


Sun Mon Tues Wed Thur Fri

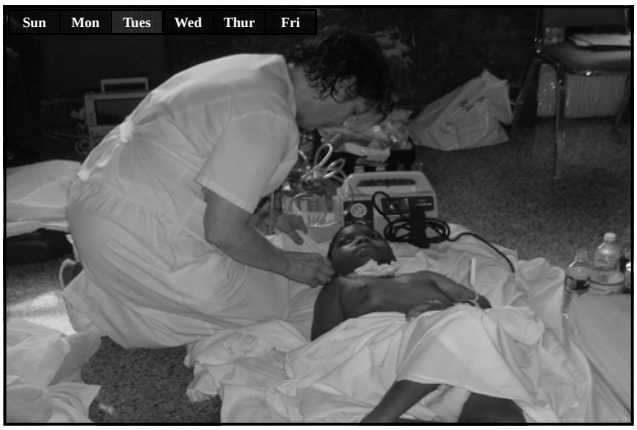

Sun Mon Tues Wed Thur Fri
United Rentals


Sun Mon Tues Wed Thur Fri

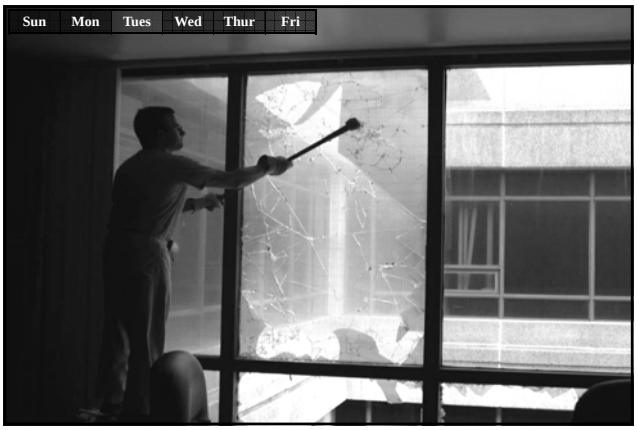

Sun Mon Tues Wed Thur Fri

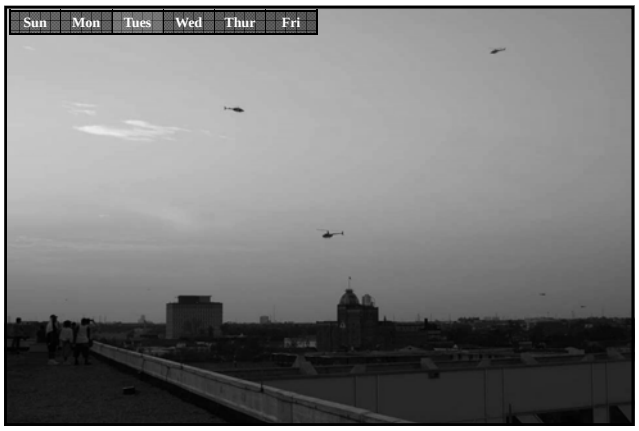

Sun Mon Tues Wed Thur Fri


Sun Mon Tues Wed Thur Fri
Heroes, many lost houses,
jobs, and have left the region.


Sun Mon Tues Wed Thur Fri

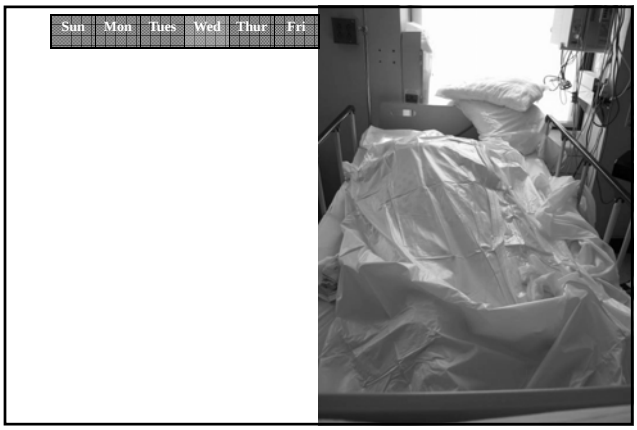

Sun Mon Tues Wed Thur Fri


Sun Mon Tues Wed Thur Fri


Sun Mon Tues Wed Thur Fri


Sun Mon Tues Wed Thur Fri

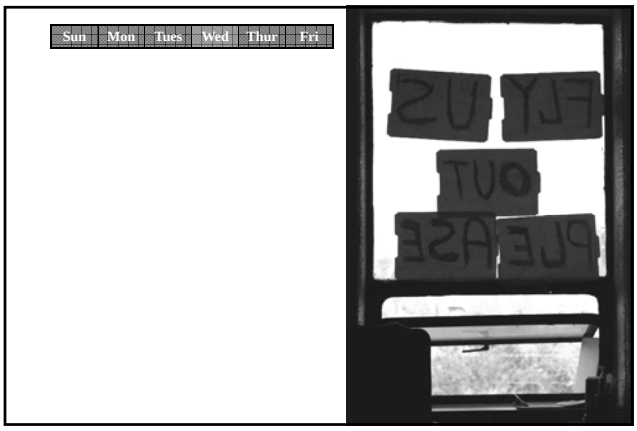

Sun Mon Tues Wed Thur Fri


Sun Mon Tues Wed Thur Fri


Sun Mon Tues Wed Thur Fri
297
RESERVED GRAY DECAL
298
RESERVED GRAY DECAL
Dead Bodies at Our Parking Garage


PLEASE
HELP
US

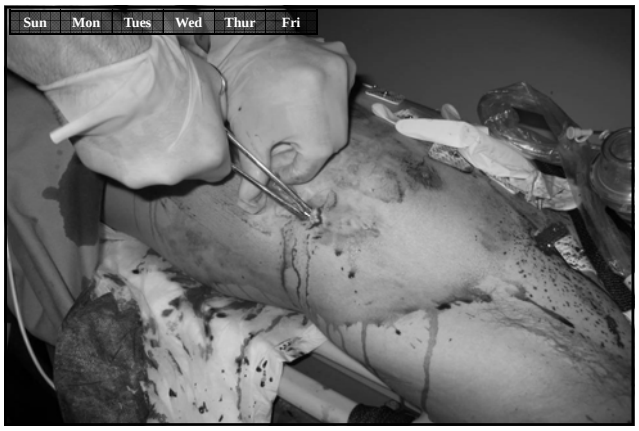

Sun Mon Tues Wed Thur Fri
God of Abraham
Help us oh
Lord please
HELP This City

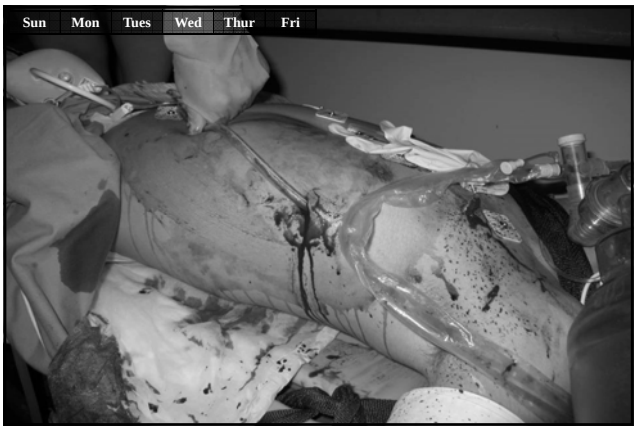

Sun Mon Tues Wed Thur Fri

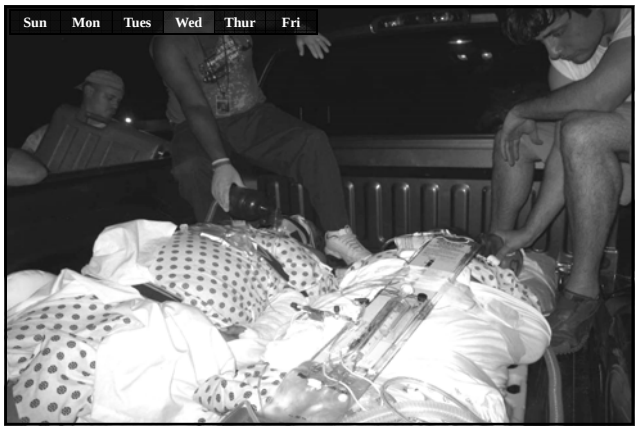

Sun Mon Tues Wed Thur Fri


Sun Mon Tues Wed Thur Fri


Sun Mon Tues Wed Thur Fri


Sun Mon Tues Wed Thur Fri


Sun Mon Tues Wed Thur Fri


Sun Mon Tues Wed Thur Fri


Sun Mon Tues Wed Thur Fri


Sun Mon Tues Wed Thur Fri


Sun Mon Tues Wed Thur Fri

Sun	Mon	Tues	Wed	Thur	Fri

Sun	Mon	Tues	Wed	Thur	Fri

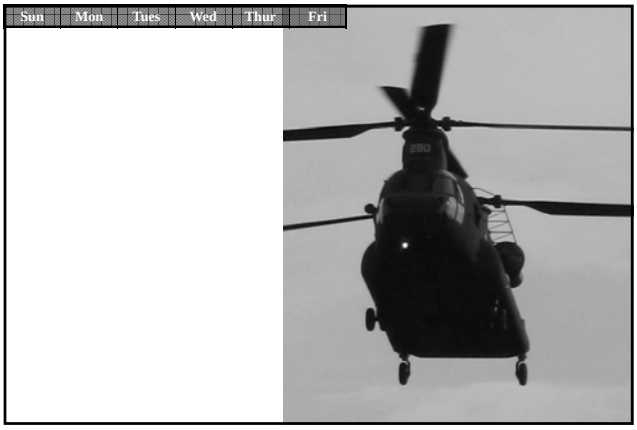
Sun	Mon	Tues	Wed	Thur	Fri

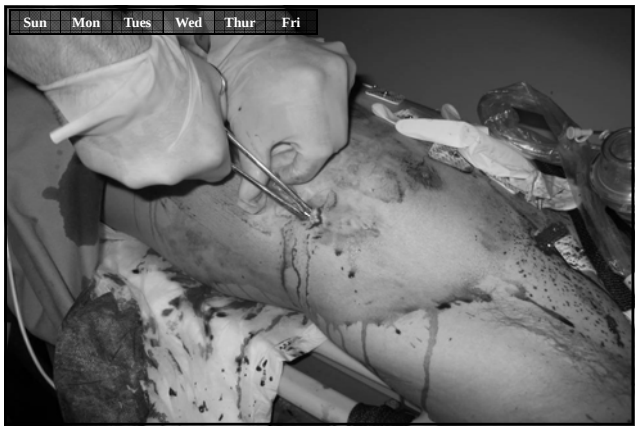
Sun	Mon	Tues	Wed	Thur	Fri

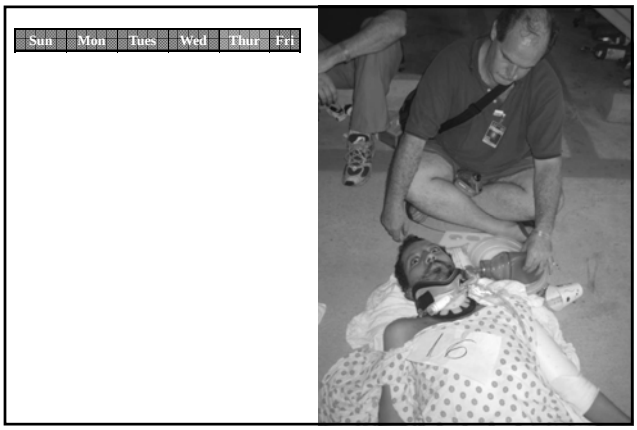
Sun	Mon	Tues	Wed	Thur	Fri

Sun	Mon	Tues	Wed	Thur	Fri


Sun Mon Tues Wed Thur Fri

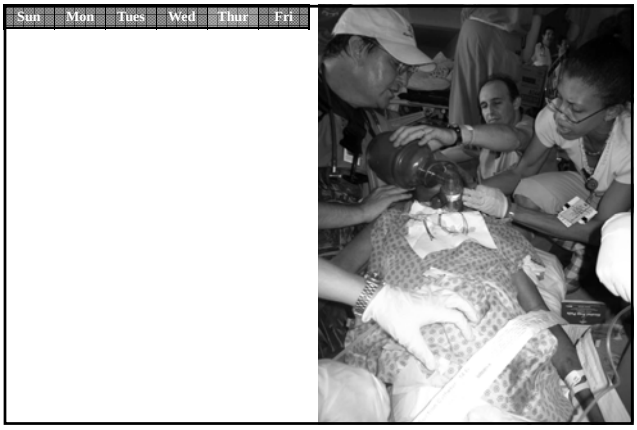

Sun Mon Tues Wed Thur Fri

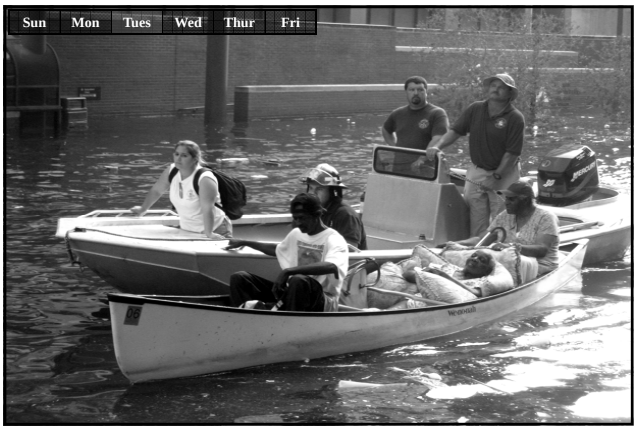

Sun Mon Tues Wed Thur Fri


Sun Mon Tues Wed Thur Fri


Sun Mon Tues Wed Thur Fri


Sun Mon Tues Wed Thur Fri





LSU Health Sciences Center

- Katrina and the ensuing flood destroyed 7 of LSU`s major teaching hospitals
  - Charity
  - University
  - VAH
  - Lindy Boggs
  - Memorial
  - Touro
  - Kenner Regional

LSU Anesthesia

- Entire Anesthesia Staff Away from NO
  - Faculty raced to obtain new state licenses:
    - I assured them we would survive
    - I met with new hospital CEOs
  - My family was sent back to Lubbock for the next 10 months
    - We finally began work, Dec, 2005.

- **LSU Anesthesia Dept-disaster**
- Lost all 3 hospitals:
  - University
  - Big Charity
  - Lindy Boggs

- **LSU Anesthesia Dept-looking good**
- Gained 3 new hospitals & 1 surgery center:
  - NorthShore and Surgery Center
  - Kenner Regional
  - Elmwood
  - University Hospital reopened Oct, 2006

LSU Anesthesia Residency

- Lost in 1997
- Reapplied for new program in 2007
- RRC approved new independent anesthesia residency
- First residents started in July, 2009

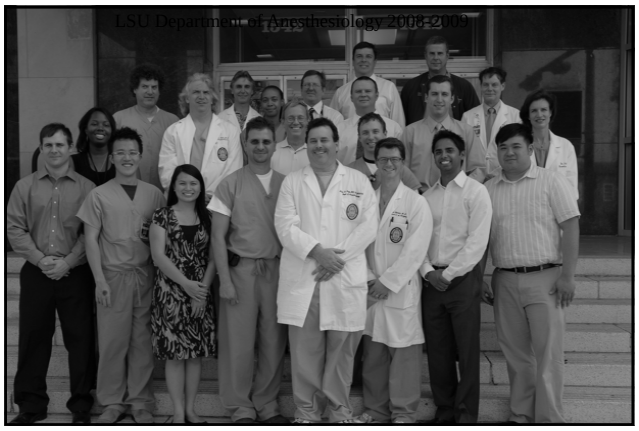
Legislature approved $74 million for land acquisition and another $276 million for construction of LSU/VA Hospital

Other Academic Training Sites

- Tulane Medical Center reopened in Feb, 2006, the residency was shrunk from 30 to 14, now run by Parrish Anesthesia.
- Ochsner Clinic never closed & purchased 3 additional hospitals in the region, one is Kenner Regional where LSU Anesthesia still runs the Anesthesia Services.
- There is an intense friendship among the 3 groups, which have relied on each other to survive post Katrina.

• LSU Anesthesia, where we are today

- Dept Library Destroyed
- New One, John Adriani Library, opened, Dec. 2008.
- After six temporary work areas, our new offices were opened in Dec, 2008.
- There are 86 physicians and scientists who hold appointments as faculty at LSU Anesthesia Department.

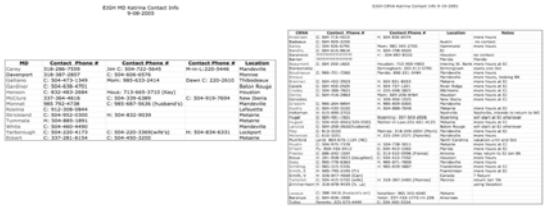


Katrina: Lessons Learned

Lessons Learned

Katrina: Lessons Learned
Management Hurdles

Personnel: Incomplete Contact Information



Katrina: Lessons Learned

Communications

Katrina: Lessons Learned

Data Storage

Katrina: Lessons Learned

HR Management

Katrina: Lessons Learned

HR Management

LSU Health Sciences Center New Orleans

Use of Statins in the ICU

Mark E. Nunnally, M.D.
The University of Chicago, Chicago, Illinois

A lot of patients take statins these days, testimony to the scope of the problem of vascular disease. Although developed and marketed to lower cholesterol, these HMG CoA reductase inhibitors receive a lot of attention for their *pleiotropic effects*, effects other than from lowering of LDL-C. The existence of these is still subject to debate. [1] The pleiotropic effects make statins one of the first drug classes to specifically treat the vascular organ system.

The first thing to emphasize about statins is that although they work many different ways, it is not clear which are most important for the treatment of disease. Accordingly, it is not clear what diseases statins are best suited to treat. Benefits in coronary artery disease may be independent of low density lipoprotein (LDL) levels. Statins have effects on inflammation, coagulation and vasoreactivity, in particular nitric oxide-mediated vasodilation; these all might be beneficial in the treatment of other diseases.

In the intensive care unit (ICU), it is possible that statins might help mitigate the effects of severe systemic illness, or help avoid some illness altogether.[2] Inflammation, coagulation and vascular reactivity are all implicated in critical illness. Any drug with so much potential to influence the evolution of disease could become an ICU staple. A number of conditions could benefit from statin therapy:

Infection: Statins affect the immunologic system, and also might be toxic to bacteria, viruses, even fungi by altering lipid metabolism and blocking intracellular signaling mechanisms.[3] Data to date suggest a substantial decrease in the incidence of infection, progression of sepsis or infection-associated mortality in statin users.[4-9] With one exception,[10] however, these data are from observational trials. These results were not replicated in a recent large cohort study,[11] and a large case control study.[12]

Septic shock: The vascular effects of statins fit nicely into many common models of septic vasculopathy.[13] Through their pleiotropic mechanisms, statins seem ideally suited to treat the vascular triad of inflammation, stasis and coagulopathy. Again, observational data suggest these drugs might improve outcomes and reduce the severity of sepsis.[6,7,14-17]

Atrial fibrillation: Postoperative atrial fibrillation can be a resource-intensive complication, leading to extra time spent in the ICU and the added costs of anti-arrhythmic medications. There appears to be an inflammatory component to atrial fibrillation that statins could improve. Observational data suggest as much.[18]

ARDS: Although statins can decrease endothelial leak, to-date the data regarding therapy for ARDS do not support their use. [19]

Practical limitations: One of the most important limitations of statin therapy in the ICU is the lack of a parenteral formulation. This is in development. It is likely that, if approved, this formulation will generate substantial interest in the application of statins perioperatively and in the ICU.

Adverse effects: As a class of drugs, statins are remarkably well tolerated for the outpatient therapy of hypercholesterolemia. Multiple therapeutic effects and a good safety record suggest that therapy in the ICU should be beneficial as well. However, this is incompletely studied and one must be vigilant for potential adverse effects:

Hepatic injury: This is a rare finding in outpatient therapy. It is generally dose-dependent, and reversible if caught early, frequently only manifesting as transaminitis.[20] Data on critically ill patients at risk for hepatic injury or taking other hepatotoxic agents are limited, however.

Myositis/rhabdomyolysis: This complication with cerivastatin was enough to take the drug off the market. Other statins are associated with myopathic pain, and even severe rhabdomyolysis, although the incidence in the literature is rare.[21] This is also incompletely explored in critically ill patients. Furthermore, this process may not be as reversible as hepatic injury.

Rebound vasculopathy: The most alarming adverse effect of statins may be the rebound disease one sees after discontinuation.[22] It may very well be that recent discontinuation of statins confers more harm from vascular-related injury than never having taken one. Perioperative data of patients discontinuing statins for surgery suggest this.[23,24] The risk of incurring harm in an effort to mitigate disease may be an important factor to weigh in the decision to start a critically ill patient on a statin.

Coagulopathy: Statins affect the coagulation system by decreasing tissue factor and promoting fibrinolysis, in addition to decreased platelet activation. In a trial of statins in hernia repair, postoperative bleeding was higher in patients receiving statins.[25]

Clinical Evidence: Experience with sepsis research suggests that many potentially useful therapies have had little effect or a negative effect on disease outcomes. In fact, the beneficial effects of the most successful "triumphs" of sepsis therapy: steroids, intensive insulin therapy and drotrecogin alpha, are being called into question.

There is currently one published randomized controlled trial studying the use of statins in critical illness. [10] Although several trials are under way or concluded, there is still a paucity of good evidence to support the use of statins in the ICU. Multiple large observational studies suggest a strong effect on important outcomes, including mortality and sepsis, but these are prone to significant bias. The "healthy user bias" is based on the possibility that patients taking statins are more compliant and/or have better overall control of their health than non-users.[12] Many would dispute this, arguing that statins instead are a marker for increased cardiovascular comorbidities and any bias, if present, would appear to diminish their therapeutic effect. Either bias is not possible to disprove with observational data. Many studies compare a small number of patients on statins to a larger group. One wonders how equivalent these groups are. Statin use is often determined by prescription records; this may not be a reliable indicator of which patients are taking them. Furthermore, the issue of discontinuation is not well addressed in many retrospective analyses. Attempts to compensate for asymmetry in the study groups include propensity analyses. This technique works best if all the relevant confounding factors are known. This is less likely in the case of statins. Randomized clinical trial data will be helpful.

Whether stains become as popular in the intensive care unit as they have in outpatient therapy for hypercholesterolemia remains to be seen. Their far-reaching effects on cellular metabolism and signaling inspire interest, but history has so far cast doubt on the existence of a "magic bullet". One is left to wonder why evolution would favor a "statin deficiency" if this class of drugs is so helpful.

References:

Robinson JG, Smith B, Maheshwari N. Pleiotropic effects of statins: benefit beyond cholesterol reduction? J Am Col Cardiol 2005;46:1855-1862

Merx MW, Weber C. Statins in the intensive care unit. Curr Opin Crit Care 2006;12:309-314
Terblanche M, Smith TS, Adhikari NKJ. Statins, bugs and prophylaxis: intriguing possibilities.Crit Care 2006;10:168

Almog Y, Novack V, Eisinger M, et al. The effect of statin therapy on infection-related mortality in patients with atherosclerotic diseases. Crit Care Med 2007;35:372-378

Liappis AP, Kan VL, Rochester CG, Simon GL. The effect of statins on mortality in patients with bacteremia. Clin Infect Dis 2001;33:1352-1357

Kopterides P, Falagas ME. Statins for sepsis: a critical and updated review. Clin Microbiol Infect 2009;15:325-334

Falagas ME, Makris GC, Matthaiou k, Rafailidis PI, Statins for infection and sepsis; a systematic review of the clinical evidence. J Antimicrobial Chemotherapy 2008;61:774-785

Almog Y, Shefer A, Novack V, et al. Prior statin therapy is associated with a decreased rate of severe sepsis. Circulation 2004;110:880-885

Myles PR, Hubbard RB, McKeever TM, et al. Risk of community-acquired pneumonia and the use of statins, ace inhibitors and gastric acid suppressants: a population-based case-control study. Pharmacoepidemiology Drug Safety 2009;18:269-275

Tseny M-Y, Hutchinson PJ, Czosnyka M et al. Effects of acute pravastatin treatment on intensity of rescue therapy, length of inpatient stay, and 6-month outcome in patients after aneurismal subarachnoid hemorrhage. Stroke 2007;38:1545-1550

Mohamed R, McAlister FA, Pretorius V, et al. Preoperative statin use and infection after cardiac surgery: a cohort study. Clin Infect Dis 2009;48:e66-e72
Dublin S, Jackson ML, Nelson JC, et al. Statin use and risk of community acquired pneumonia in older people: population based case-control study. Brit Med J 2009;338:b2137-b2145

Merx MW, Liehn EA, Graf J, et al. Statin treatment after onset of sepsis in murine model improves survival. Circulation 2005;112:117-124

Terblanche M, Almog Y, Rosenson RS, et al. Statins: panacea for sepsis? Lancet 2006;6:242-248

Chua D, Tsang RS, Kuo IF. The role of statin therapy in sepsis. Ann pharmacotherapy 2007;41:647-652

Gao F, Linhartova L, Johnston A McD, Thickett DR. Statins and sepsis. Brit J Anaesth 2008;100:288-298

Hackam DG, Mamdani M, Li P, Redelmeier DA. Statins and sepsis in patients with cardiovascular disease: a population-based cohort analysis. Lancet 2006;367:413-418

Fauchier L, Pierre B, de Labriolle A, et al. Antiarrhythmic effect of statin therapy and atrial fibrillation. J Am Coll Carddiol. 2008;51:828-835

Kor DJ, Iscimen R, Yilmaz, M et al. Statin administration did not influence the progression of lung injury or associated organ failures in a cohort of patients with acute lung injury. Inten Care Med 2009;35:1039-1046

Bhardwaj SS, Chalasani N. Lipid lowering agents that cause drug-induced hepatotoxicity. Clin Liver Dis 2007;11:597-vii

Cholesterol Treatment Trialists' Collaborators. Efficacy and safety of cholesterol-lowering treatment: prospective meta-analysis of data from 90 056 participants. Lancet 2005;366:1267-1278

Ho PM, Spertus JA, Masoudi FA, et al. Impact of medication therapy discontinuation on mortality after myocardial infarction. Arch Intern Med 2006;166:1842-1847

Le ManachY, Coriat P, Collard CD, Riedel B. Statin therapy within the perioperative period. Anesthesiology 2008;108:1141-1146

Le ManachY, Godet G, Coriat P, et al.. The impact of postoperative discontinuation or continuation of chronic statin therapy on cardiac outcome after major vascular surgery. Anesth Analg 2007;104:1326-1333

Hauer-Jensen M. Fort C. Mehta JL. Fink LM. Influence of statins on postoperative wound complications after inguinal or ventral herniorrhaphy. Hernia 2006;10:48-52

Modern Stroke Management: Early Interventions to Reduce and Support the Ischemic Penumbra

Michael L. Ault, M.D.
Northwestern Memorial Hospital, Chicago, Illinois

Modern Stroke Management: Early Interventions to Reduce and Support the Ischemic Penumbra

Modern Stroke Management:
Early Interventions to Reduce and
Support the Ischemic Penumbra

FCCM
Northwestern University Feinberg School of Medicine

NORTHWESTERN UNIVERSITY

Modern Strokes

- Neuronal Ischemia/Infarction
  - Thrombotic CVA
  - Embolic CVA
  - SAH/Vasospasm
  - Trauma
  - Toxin/Infection
  - Spinal cord injury (Deferred)

Masquerading Pathologies

- Conversion disorder (Lack of consistent focal findings)
- Hypertensive encephalopathy/PRES
- Hypoglycemia
- Complicated migraine (HA, history)
- Seizures (Witnessed seizure)

Early Mangmt (Do & Don't)

- Time is Neuron
  - Organized protocol (Class IB)
    - Eval & Treatment Plan—60 mins
  - Use common language (Class IB)
    - NIHSS
  - Limited heme, coag, biochem (Class IB)
  - PCXR & EKG (Class IB)
  - Avoid LP unless infect etiol (Class IIIB)

Early Diagnosis

- Brain imaging
  - Non-contrast for most (Class IA)
    - Insensitive for hyperacute, small or post fossa
  - Multimodal CT for some (Class IA)
    - Whole brain perfusion (whole CBV not CBF)
    - Dynamic perfusion (2-4 slices; CBF but limited vascular visualization)[1,2]

Bread &Butter: A & B

- Airway
  - Inability to Protect
  - Intubation is Marker for Poor Prognosis
    - (50% mortality in 30 days)

Breathing (Mech. Ventilation)
Posterior fossa pathology
Cheyne-Stokes
No Benefit from hyperbaric oxygen[4]

Temperature

- Fever=Poor Outcome
  - Inc. CMRO2? Inc. NT's? Inc. Free radicals? Inc. complications?
- Antipyretic use
  - Prevents hyperthermia
- Hypothermia
  - Does not improve outcome after SAH[5]
  - No evidence for use in acute stroke[6]

Hypertension Management

- Elevated BP after stroke common
- Both inc and dec BP after stroke associated with poor outcome
- Goldilocks Syndrome
  - "Just Right BP"

Antihypertensive Agents

- Nimodipine—unfavorable data for use as an antihypertensive[6]
- Diuretics, beta blocker, nitrates—mixed results from data
- Candesartan—lower death rate in patients treated with candesartan versus rescue treated group

Anti-HTN Approach

- Treatment of HTN for SBP > 185 mmHg or DBP > 110 mmHg before rtPA administration
- Use of labetalol, nitropaste, nicardipine or (nitroprusside if intractable HTN)
- Goal to lower BP 15-25% per day using urine output as guide for systemic perfusion

Hyperglycemia

- Blood glucose > 200 mg/dL during 1st 24h associated with expansion of size of CVA and poor outcomes[7]
- Too tight control also worsens outcomes
- Reasonable approach—aim for glucose of 80-140 mg/dL

Thrombolytic Usage

- Recombinant TPA
  - (0.9 mg/kg IV, maximum 90 mg)
- No CT preclusion (except hemorrhage) for thrombolytics within 4.5h[3]
- Vascular imaging needed for vascular intervention (Class IIaB)

Intra-arterial Thrombolysis

- Indicated in acute ischemic stroke secondary to MCA occlusion
- Indicated in some patients in whom rtPA is contraindicated
- Requires treatment at dedicated stroke center with IR services (Class IC)

Anticoagulants

- Early treatment with LMW heparin is associated with an increased risk of bleeding complications
- Early treatment with heparin does not lower risk of recurrent stroke
- IV antiplatelet agents (IIb/IIIa antagonists) may be useful as adjuncts

Anticoagulants

- Early aspirin should be used after stroke (Level IA)
- Aspirin as an adjunctive therapy for thrombolysis is not recommended (Level IIIA)

Other Therapies

- Intentional hemodilution is not supported[8]
- Utilization of vasodilators has not been shown to improve outcomes
- Drug induced hypertension has been shown to be useful in select patient populations

Other Therapies

- Limited data exist for clot retrieval (Level IIbB)[9]
- No utility has been shown for neuroprotective agents

Tx of Neuro Complications

- Potential Complications Warrant Tx
  - Ischemic Brain Swelling
  - Hemorrhagic Transformation
  - Seizures

NORTHWESTERN UNIVERSITY

References

- 1. Kloska et al. Acute stroke assessment with CT: do we need multimodal evaluation? *Radiology*. 2004;233:79-86
- 2. Wintermark et al. Prognostic accuracy of cerebral blood flow measurement by perfusion computed tomography, at the time of emergency room admission in acute stroke patients. *Ann Neurol*. 2002;51:417-432
- 3. del Zoppo et al. Expansion of the Time Window for the Treatment of Acute Ischemic Stroke With IV TPA: A Science Advisory From the AHA/ASA. *Stroke*. 2009;40:2945-2948

NORTHWESTERN UNIVERSITY

References

- 4. Alternative Therapy Evaluation Committee for the Insurance Corporation of British Columbia. A review of the scientific evidence on the treatment of TBI's and strokes with hyperbaric oxygen. *Brain Inj*. 2003;17:225-236
- 5. Todd MM et al. Intraoperative Hypothermia for Aneurysm Surgery Trial (IHAST) Investigators. Mild intraoperative hypothermia during surgery for intracranial aneurysm. *N Engl J Med*. 2005;352:135-145
- 6. Fogelholm R et al. Blood pressure, nimodipine and outcome of ischemic stroke. *Acta Neurol Scand*. 2004; 109:200-204

NORTHWESTERN UNIVERSITY

References

- 7. Baird TA et al. Persistent poststroke hyperglycemia is independently associated with infarct expansion and worse clinical outcome. *Stroke*. 2003;34:2208-2214
- 8. Aichner FT et al. Hypervolemic hemodilution in acute ischemic stroke: the Multicenter Austrian Hemodilution Stroke Trial (MAHST). *Stroke*. 1998;29:743-749.
- 9. Smith et al. MERCI Trial Investigators. Safety and efficacy of mechanical embolectomy in acute ischemic stroke; results of the MERCI trial. *Stroke*. 2005;36:1432-1438

What's New on the Horizon for The Joint Commission (formerly JCAHO), CMS, IHI, and Other Regulatory and Quality Agencies?

Brenda G. Fahy, M.D., FCCM, FCCP
Professor, Departments of Anesthesiology and Neurosurgery
Division Chief, Critical Care
University of Kentucky, College of Medicine
Lexington, Kentucky

Background

Many groups have an interest in the future of regulation and quality in healthcare, including national and regional regulatory organizations and accrediting agencies. Hospital and healthcare focus measures have been proposed by Centers for Medicaid and Medicare Services (CMS), Institute for Healthcare Improvement (IHI), and the Joint Commission (TJC). National collaboratives have included Surgical Care Improvement Project (SCIP) which was formed by the CMS and the Centers for Disease Control (CDC) in 2003. The SCIP steering committee has a public and private consortium, including the CMS, TJC, IHI, CDC, Agency for Healthcare Research and Quality, American Society for Anesthesiologists (ASA), American College of Surgeons, Association of Perioperative Registered Nurses, American Heart Association, and the Veteran's Health Administration. Other entities concerned in these matters include state and local legislature, departments of public health, and other federal government agencies.

Regulatory and quality agencies have been attempting to implement changes which will result in improved care with the hope to decrease costs. Some proposals have attempted to link payments to benchmarks on specific performance measure hoping these incentives will promote changes that improve quality. At the same time, as of August 2009, the debate regarding national health care reform remains heated. While some definitive approaches may be clarified by the time of the ASCCA Annual meeting, it is currently difficult to predict how a reform plan will be structured – or if any definitive plan will be approved by Congress. Since the debate about national healthcare reform will be taking place over the next 60-90 days, it is beyond the scope of this discussion to predict the outcome. This handout will therefore concentrate on specific examples of some of the ongoing changes with CMS, IHI, and TJC.

Centers for Medicare and Medicaid Services (CMS)

One example among the many looming on the horizon as of August 2009 is the Centers for Medicare and Medicaid Services (CMS) proposed elimination of hospital inpatient consultation codes. In the current proposal, consultation codes will be replaced with initial inpatient hospital visits. For intensive care delivery models where the anesthesiology intensivists function as the primary care providers for critically ill patients and bill almost exclusively with critical care minutes (99291 and 00202), this proposal may have a small or no direct financial impact. However, for models in which intensivists serve as consults, including triage and treatment roles in patient evaluation; settings including the emergency room and the inpatient regular ward for admission to the ICU, elimination of consultation codes [highest level (level 5 consultation code 99255)] could have a direct financial impact. In these cases intensivists could potentially provide higher levels of services than reimbursed. Consultants requested to provide additional non-critical care expertise (e.g. nephrologists) to ICU patients may also be providing higher levels of services than reimbursed. If the hospital inpatient consultation codes are eliminated, CMS has proposed transferring some of the relative value units of consultation codes to other areas (e.g. nephrologists would bill inpatient initial visit with a lesser value, or bill critical care minutes with a greater value, instead of using the consult code.) Even in models where the financial effects of the proposed elimination of consultation codes is minimal, critical care providers will probably be impacted in some indirect ways. With the elimination of consult codes, if a service that formerly billed using consultation codes opts to bill critical care minutes; this is likely to result in more denials for reimbursement by CMS. The use of inpatient consult codes disambiguated the claim so that it was clear that the services were consultants on a critically ill patient's care. The current CMS proposal does not entail moving any potential e savings generated by the elimination of the consultation code to the codes used for critical care minutes.

CMS also requested input regarding the use of Telehealth services, including virtual ICU services. Currently CMS does not provide remuneration for Telehealth provided critical care services. With the current economic constraints, will CMS support future advancement of Telehealth with reimbursement to anesthesiology critical care providers? If so, what is CMS willing to pay for this service?

The public comment period for elimination of inpatient consultation codes and Telehealth ends August 31, 2009. It is unlikely that a final decision will have been reached by CMS on its proposed elimination of the hospital inpatient consultation codes or Telehealth by the time of the Annual Meeting of the American Society of Critical Care Anesthesiologists in October.

Table 1. Critical Care Billing Codes and Pay-for-Performance Measure Codes.[1]

Coding Specifications:
Codes required to document insertion or replacement of a central venous catheter (CVC)::
A CPT procedure code is required to identify patients to be included in this measure.
All measure-specific coding should be reported ON THE SAME CLAIM.
CPT procedure codes: 36555, 36556, 36557, 36558, 36560, 36561, 36563, 36565, 36566, 36568, 36569, 36570, 36571, 36578, 36580, 36581, 36582, 36583, 36584, 36585, 93503 (CVC insertion or replacement)
CPT II Code descriptors (Data collection sheet should be used to determine appropriate code.)
CPT II 6030F: Maximal barrier precautions (hand hygiene, 2% chlorhexidine for cutaneous antisepsis, cap, mask, sterile gown, gloves, and sheet) followed
CPT II 6030F–1P: Documentation of medical reason(s) maximal barrier precautions were not followed during CVC insertion (including CVC insertion performed on emergency basis)
CPT II 6030F–8P: Maximal barrier precautions (hand hygiene, 2% chlorhexidine for cutaneous antisepsis, cap, mask, sterile gown, gloves, and sheet) not followed, reason not otherwise specified

Although physician reimbursement is not intended as the sole focus of this particular handout, the cost of healthcare including physician reimbursement are issues that continue to be addressed. In 2005, there was a significant push to repeal the sustainable growth rate which in part determines physicians' Medicare reimbursement. There were also ongoing concerns raised about significant flaws in the physician reimbursement program and rising health care costs.[2-4] The federal government, through CMS, viewed this as an opportunity to minimize rising healthcare costs while attempting to reward for improved quality by using pay-for-performance (P4P) programs.[5] This led to an agreement between the United States Congress and the American Medical Association to develop quality measures to gauge physician performance. Some of the developed measures are directly (provider-based) and indirectly (hospital-based) applicable to anesthesiology intensivists. The financial incentives paid to the anesthesiology intensivist provider may be a small percentage of reimbursement. For example, 1.5% can be earned for 2008 reporting with payment in mid-2009 from the federal supplemental medical insurance Part B trust fund.[6] (For a more detailed assessment of critical care P4P billing codes, please see Table 1.) Hospital-based measures may have a greater impact as hospitals may rely on provider performance including anesthesiology intensivists for reimbursement for performance on certain measures. The hospital performance on certain measures is publically reported. Additionally, anesthesiology intensivists will also play a crucial role in patient management to prevent complications and the associated pecuniary ramifications. Hospitals that are participating in Medicare reimbursement are currently required to disclose all hospital acquired conditions. Costs associated with those hospital acquired conditions and "never events" are not eligible for Medicare reimbursement. A hospital acquired condition is a reasonably preventable condition that is not present or able to be identified at hospital admission, but present upon discharge. The National Quality Forum defines never events as "errors in medical care that are: (1) clearly identifiable, preventable, and serious in their consequences for patients; and (2) indicative of a real problem in the safety and credibility of a healthcare facility."[7] (Examples of hospital acquired conditions that may be applicable to anesthesiology intensivists are located in Table 2.)

Institute for Healthcare Improvement (IHI)

The IHI is an independent, nonprofit organization with the mission to improve healthcare throughout the world. The IHI launched, "The 5 Million Lives Campaign" which supported hospitals by providing targeted information on specific interventions that had been shown to reduce mortality and morbidity. More than two-thirds of United States hospitals

reportedly engaged in this campaign[9] which encouraged hospitals to show improvement more rapidly than previously. The overarching goal was to improve the care provided to patients to protect them from five million incidents over a 24 month period.

Table 2. Hospital Acquired Conditions Covered Under the 2009 Provision to the Deficit Reduction Act of 2005.[8]

Hospital Acquired Conditions	"Never Events"
Catheter-associated urinary tract infection	Air embolism
Surgical site infection (e.g. Mediastinitis after coronary artery bypass graft surgery)	Blood incompatibility
Surgical site infections following certain orthopedic procedures and bariatric surgery for obesity	Hospital-acquired injury due to external causes (e.g., fractures, dislocations, burns, etc)
Vascular catheter-associated bloodstream infection	Foreign body left in patient during surgery
	Pressure ulcers (e.g. sacral decubitus)

While striving to improve the quality of care, IHI recommends tracking both outcomes and processes. For outcome measures, IHI recommends for the intensive care unit (ICU) length of stay and mortality rate in the ICU with a goal of reduced length of stay and reduced mortality. For process measures, IHI recommends measures that will provide feedback on results of changes implemented. Process measures can provide an indication of the reliability with which you have implemented a bundle of elements. Examples include the ventilator and central line bundles, which both involve all or nothing indicators which require documentation of all of the bundled elements for compliance. Documented exceptions for patient safety are permitted for a particular patient. The goal of the ventilator bundle is to reduce the ventilator associated pneumonia rate per 1,000 ventilator days; the goal of the central line bundle is to reduce the central line catheter related bloodstream infection rate per 1,000 central line days.

Evaluation of glycemic control is currently an IHI targeted specific intervention based on studies suggesting that glycemic control during the ICU stay reduces mortality and morbidity in the critically ill.[10-11] Of particular interest to intensivists is a recent meta-analysis that conferred a higher benefit to surgical patients compared to medical patients.[12] The IHI recommends reporting the percentage of blood sugars in the 60-180 mg/dL range compared with all blood glucoses obtained in the current month as a desired outcome measure. This recommendation is based on the recent NICE-SUGAR trial.[13] An example of an IHI desired goal would be 80% or more of all blood glucoses to fall within the 60-180 mg/dL range.

When evaluating the glycemic control, he IHI also recommends measurement one of its complications - severe hypoglycemic episodes. A patient's risk of infection and mortality may be decreased with glycemic control, however lowering these risks may entail the potentially life threatening risk of severe hypoglycemia.[10-11, 14-17] To assess the incidences of severe hypoglycemic episodes that are defined by glucose values ≤ 40 mg/dL, divide by the total number of blood glucoses collected. The goal, from an IHI standpoint is to have ≤ 0.5% of all glucose values in the severe hypoglycemic range. This is the rate of severe hypoglycemia in the NICE-SUGAR study.[13]

The Joint Commission (TJC)

Hospitals in the United States (and now international as well) depend on TJC for accreditation for Medicare reimbursement eligibility and certification for quality reporting purposes. As mentioned previously, TJC has been on the steering committee for SCIP and the 2009 reporting for National Quality Improvement Goal Performance includes rates for three SCIP measures. Of these three measures, the one with most applicability to the anesthesiology intensivist is the cardiac surgery patient with controlled 6 a.m. postoperative blood glucose (≤ 200 mg/dL). TJC has a commitment to publish organization-specific results that will be available publically and can be compared with other organizations' results.

In addition, TJC has six measures for the ICU in the specification manual for the National Hospital Quality Measures, which has been adopted for national implementation. The ICU measure set is a unique measure set in that several of them are rate-based, while others are episode-of-care-based, and are listed in the Table 3, below.

Table 3. The Joint Commission measures applicable to the intensive care unit.[18]

ICU measure 1	Ventilator associated pneumonia (VAP) prevention patient positioning	This measure looks at the number of ventilator days before the patient's head of bed is elevated two times per day ≥ 30° with the included population being patients receiving care in the ICU who are 18 years of age or older and receiving mechanical ventilation. The recommendation is that a patient should be monitored at least two times in a 24 hour period. The observation shouldn't coincide with the structure of the ICU shifts, and should be made on two different shifts within the 24 hour period. When counting on-ventilator days, the patient must be on the ventilator at the time of the head of bed elevation.
ICU measure 2	Stress-ulcer disease prophylaxis	Measure 2 is germane to patients in the ICU who are ventilated. This population receives stress-ulcer disease prophylaxis. Number of ventilator days where a patient receives stress-ulcer disease prophylaxis for patients in the ICU who are 18 years of age or older.
ICU measure 3	Deep venous thrombosis (DVT) prophylaxis	Included populations are patients in the ICU who are 18 years of age or older and are receiving mechanical ventilation. DVT prophylaxis entails intermittent pneumatic compression devices or anticoagulation with heparin or warfarin. This measure does not include the use of antiembolism stockings such as ted hose, or therapy such as range of motion.
ICU measure 4	Central line associated primary blood stream infection	This measure pertains to ICU patients who 18 years of age or older, with a laboratory-confirmed blood stream infection with central lines in place for at least 48 hours before the development of bacterial spontaneous with blood stream infection.
ICU test measure 5	ICU length of stay	Patients who have an ICU length of stay of 4 or more hours defined by ICU admission date and time, and ICU discharge date, and ICU discharge time are included in this measure. An observed length of stay and prediction are reported for each ICU encounter within the hospital stay.
ICU test measure 6	ICU mortality	ICU mortality applies to patients who have an ICU stay of 4 or more hours, defined by ICU admission date and time, and ICU discharge date, and ICU discharge time. The population is further delineated by excluding burns or transplants. An observed mortality rate and prediction are reported for only the initial ICU encounter.

Conclusion

The climate in the United States government with regard to healthcare is rapidly shifting. If the President and the government are successful in developing a plan to restructure the healthcare system, the changes will have impact on the delivery of critical care services, payment for the services including use of and payment for high cost technologies that are the mainstay of critical care medicine. It is impossible to define with certainty what the future holds for healthcare in general, but there is no doubt that both the government and other oversight organizations will continue to advance their agendas for improved safety and quality – in some cases based on evidence and in some cases based on emotional appeal. As a result, the practice of critical care medicine, the services offered to patients and the economic underpinnings will be greatly affected. Our goal must be to understand the internal and external pressures to control cost and utilization, but most importantly to use our expertise in critical care to ensure that our patients receive high quality care that is evidence-based, safe, and sensitive to patient and family expectations.

References

1. American Medical Association. PQRI 2009 Measure 76, Effective on January 1, 2009. Prevention of Catheter-Related Bloodstream Infections (CRBSI) — Central Venous Catheter Insertion Protocol. Available at: http://www.acr.org/SecondaryMainMenuCategories/quality_safety/p4p/FeaturedCategories/P4PInitiatives/ValueBasedPurchasing/pqri/FeaturedCategories/PQRI-Tools/interv-measures/IR-measure76.aspx. Accessed on August 24, 2009
2. Position statement of the American College of Physicians on Pay-for-Performance. Subcommittee on Pay-for-Performance, Institute of Medicine. July 25, 2005. Available at: http://www.acponline.org/ppvl/policies/e001066.html. Accessed on August 25, 2009
3. CMS quality improvement roadmap. Centers for Medicare & Medicaid Services. Available at: http://www.cms.hhs.gov/CouncilonTechInnov/downloads/qualityroadmap.pdf. Accessed on August 25, 2009
4. Epstein AM, Lee TH, Hamel MB. Paying physicians for high-quality care. N Engl J Med 2004; 350:406–410
5. Egol A, Shander A, Kirkland L, Wall MH, Dorman T, Dasta J, Bagwell S, Kaufman D, Matthews P Jr, Greenwald BM, Herr DL, Stavish C, Thompson C, Fahy BG. Pay for performance in critical care: an executive summary of the position paper by the Society of Critical Care Medicine. Crit Care Med. 2009 Sep; 37(9):2625-31
6. Physician Quality Reporting Initiative. Centers for Medicare & Medicaid Services Website. http://www.cms.hhs.gov/pqri/. Accessed on August 22, 2009
7. Centers for Medicare & Medicaid Services. Eliminating Serious, Preventable, and Costly Medical Errors - Never Events. Available at: http://www.cms.hhs.gov/apps/media/press/release.asp?Counter=1863. Accessed on August 26, 2009
8. CMS Hospital Pay-for-Performance Workgroup. U.S. Department of Health and Human Services Medicare Hospital Value-Based Purchasing Plan Development. Issues paper. 1st public listening session, January 17, 2007. Available at: http://www.cms.hhs.gov/AcuteInpatientPPS/downloads/hospital_VBP_plan_issues_paper.pdf. Accessed on August 24, 2009
9. Kabcenell A, Gunther-Murphy C; Institute for Healthcare Improvement. IHI's Improvement Map. A new concept to help hospitals achieve better patient outcomes. Healthc Exec. 2009 Jul-Aug; 24(4):60, 62-3
10. Van den Berghe G, Wouters P, Weekers F, et al: Intensive insulin therapy in the critically ill patients. *N Engl J Med* 2001; 345:1359-1367
11. Van den Berghe G, Wilmer A, Hermans G, et al: Intensive insulin therapy in the medical ICU. *N Engl J Med* 2006; 354:449-461

12. Griesdale DE, de Souza RJ, van Dam RM, Heyland DK, Cook DJ, Malhotra A, Dhaliwal R, Henderson WR, Chittock DR, Finfer S, Talmor D. Intensive insulin therapy and mortality among critically ill patients: a meta-analysis including NICE-SUGAR study data. CMAJ. 2009 Apr 14; 180(8):821-7
13. NICE-SUGAR Study Investigators, Finfer S, Chittock DR, Su SY, Blair D, Foster D, Dhingra V, Bellomo R, Cook D, Dodek P, Henderson WR, Hébert PC, Heritier S, Heyland DK, McArthur C, McDonald E, Mitchell I, Myburgh JA, Norton R, Potter J, Robinson BG, Ronco JJ. Intensive versus conventional glucose control in critically ill patients. N Engl J Med. 2009 Mar 26; 360(13):1283-97
14. Furnary AP, Gao G, Grunkemeier GL, et al: Continuous insulin infusion reduces mortality in patients with diabetes undergoing coronary artery bypass grafting. *J Thorac Cardiovasc Surg* 2003; 125:1007–1021
15. Furnary AP, Wu YX: Eliminating the diabetic disadvantage: the Portland Diabetic Project. *Semin Thorac Cardiovasc Surg* 2006; 18:302-308
16. Furnary AP, Zerr KJ, Grunkemeier GL, et al: Continuous intravenous insulin infusion reduces the incidence of deep sternal wound infection in diabetic patients after cardiac surgical procedures. *Ann Thorac Surg* 1999; 67:352–362
17. Furnary AP, Wu Y: Clinical effects of hyperglycemia in the cardiac surgery population: the Portland Diabetic Project. *Endocr Pract* 2006; 12:22-26
18. Joint Commission Measure Reserve Library. Available at: http://www.jointcommission.org/PerformanceMeasurement/MeasureReserveLibrary/Spec+Manual+-+ICU.htm. Accessed on August 26, 2009

Suggested Reading

1. The Joint Commission Requirements, from Joint Commission Resources. Available at: http://www.jcrinc.com/Joint-Commission-Requirements/. Accessed on August 21, 2009.
2. The Joint Commission. Available at: http://www.jointcommission.org/. Accessed on August 21, 2009.
3. Institute for Healthcare Improvement. Available at: http://www.ihi.org/ihi. Accessed on August 20, 2009.
4. Centers for Medicare & Medicaid Services. Available at: http://www.cms.hhs.gov/. Accessed on August 20, 2009.

Interactive Pro-Con Panel
55F, Post Cholectomy with Sepsis (CDS, EMR) Bleeding and AKI

Moderator: Andrew L. Rosenberg, M.D.
Andrew Gettinger, M.D.; Michael A. Gropper, M.D., Ph. D.; Andrew D. Shaw, M.B.
University of Michigan Health System, Ann Arbor, Michigan; University of Kentucky, Lexington Kentucky; University of California, San Francisco, California; Duke University Medical Center, Durham, North Carolina

Notes: