

**Developing More Effective Means of Achieving Improved Performance  
among Practicing Physicians through Use of Metric Based Quality  
Improvement Focused Curricula, Pedagogical Innovation and  
Simulated and Immersive Learning**

**Final Report**

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## Overall summary of the impact of the grant

As the result of the Pfizer grant, The Stanford Center for Continuing Medical Education (SCCME) has been able to transform the activities that are offered into innovative programs and courses that focus on activities that have an impact on quality of patient care and physician performance. Over the course of the past 3 years, through the end of CY 2013, there have been 58 activities (includes recurring sessions) offered. These courses were developed by utilizing innovative teaching modalities such as gaming, simulation and quality improvement methodologies. The SCCME, under the leadership of the Stanford School of Medicine redefined the industry support policies that enabled Stanford faculty to design high impact educational activities based solely upon the educational needs of our physician learners.

The redesign of the educational curricula enabled meeting all 6 deliverables of the grant:

1. A thoroughly redesigned CME curriculum at a leading university built upon the best use of emerging educational technology and grounded in contemporary adult learning practices.  
***Demonstrated by developing courses using gaming technology, massive open online courses (MOOCs), and other web-based courses***
2. A collection of QI/Patient safety targeted simulation and scenario based curriculum available for widespread use.  
***As evident by courses using simulation environment focusing on high risk clinical care (adult and pediatric).***
3. Evidence driven evaluations of the comparative effectiveness of novel educational programs using specific physician performance data from Stanford's medical centers.  
***As evident by courses that measure performance changes through self-reported data and medical center data.***
4. A faculty development program, open to a national audience of medical educators, designed to improve CME teaching quality.  
***As evident by courses focused on improving teaching effectiveness of physicians and clinical educators, clinical facilitator training and professional development of faculty.***
5. A program to educate physicians in the creation of simulation and immersive based teaching for CME purposes.  
***As evident by courses that provided training in simulation instruction and development of simulation programs (adult and pediatric).***
6. National and international dissemination of our findings at professional CME meetings and high impact scholarly publications.  
***As evident by the publication about an innovative game/course "Septris –Management of Sepsis" that was featured in the New Media Consortium 2012 Horizon Report on Game-Based Learning. They describe Septris as an example of "Alternate Reality Games" in which players solve puzzles in a blur between game and real life.***

This report will provide highlights of the activities that support all of the above stated deliverables and the impact of the courses in: 1) improving patient safety and quality of care at the SHC and LPCH, 2) changes in learners' competence and performance and 3) developing innovative types and delivery methods of CME activities.

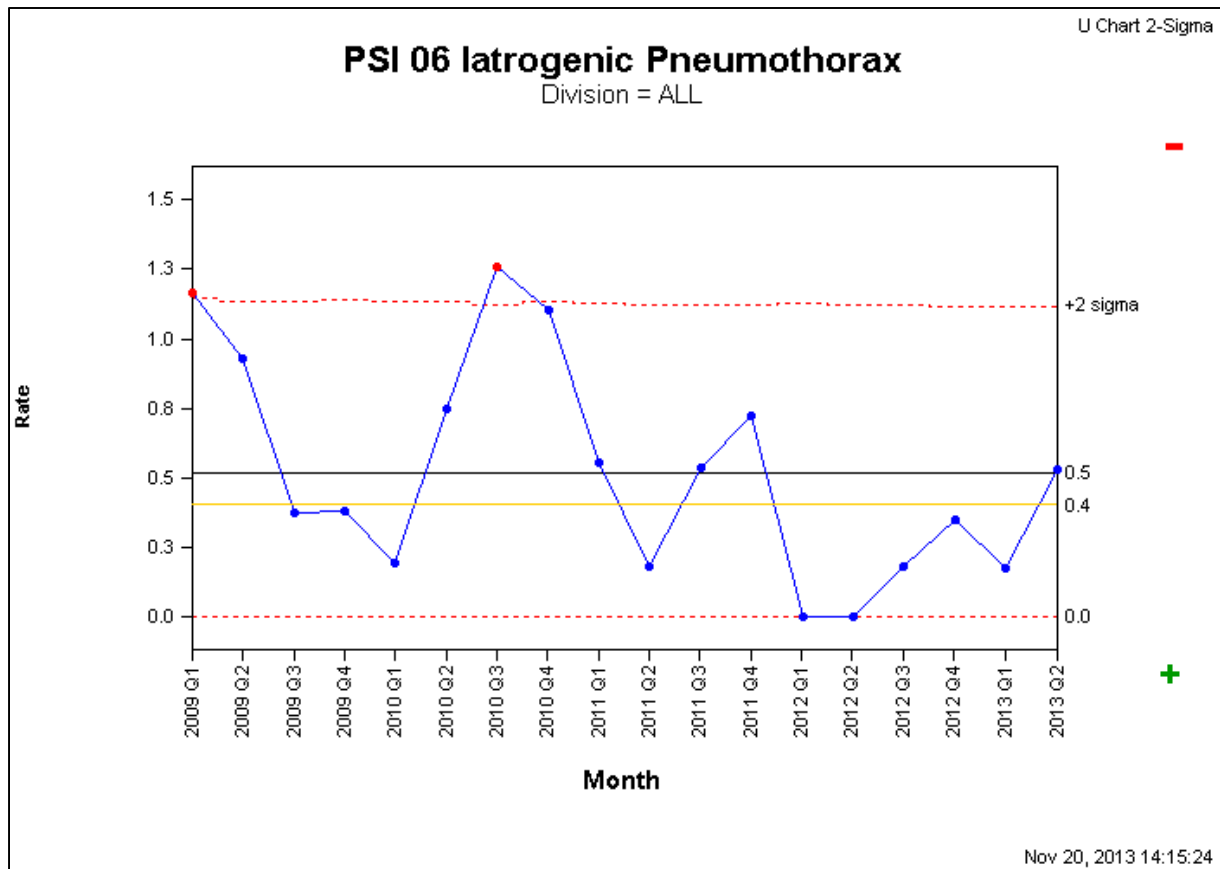
## Impact on improvement in patient safety and quality of patient care at the Stanford Hospital and Clinics and Lucile Packard Children's Hospital

### 21st Century Medicine: Utilizing Point-of-Care Ultrasound to Optimize Patient Care, Safety, and Satisfaction (held on 6/7/12, 9/27/12 and 2/28/13)

Utilizing point of care ultrasound based on evidence-based guidelines in performing high risk procedures and early identification of life threatening conditions.

#### Learning Objectives

- Utilize strategies on the use of point of care ultrasound as part of patient care.
- Utilize ultrasound when performing invasive procedures such as placing central lines, paracentesis, thoracentesis and arthrocentesis.
- Implement evidence-based ultrasound strategies in diagnosing and interpreting emergency conditions including sepsis, acute abdominal pain and both traumatic and non-traumatic hypotension.



#### Analysis

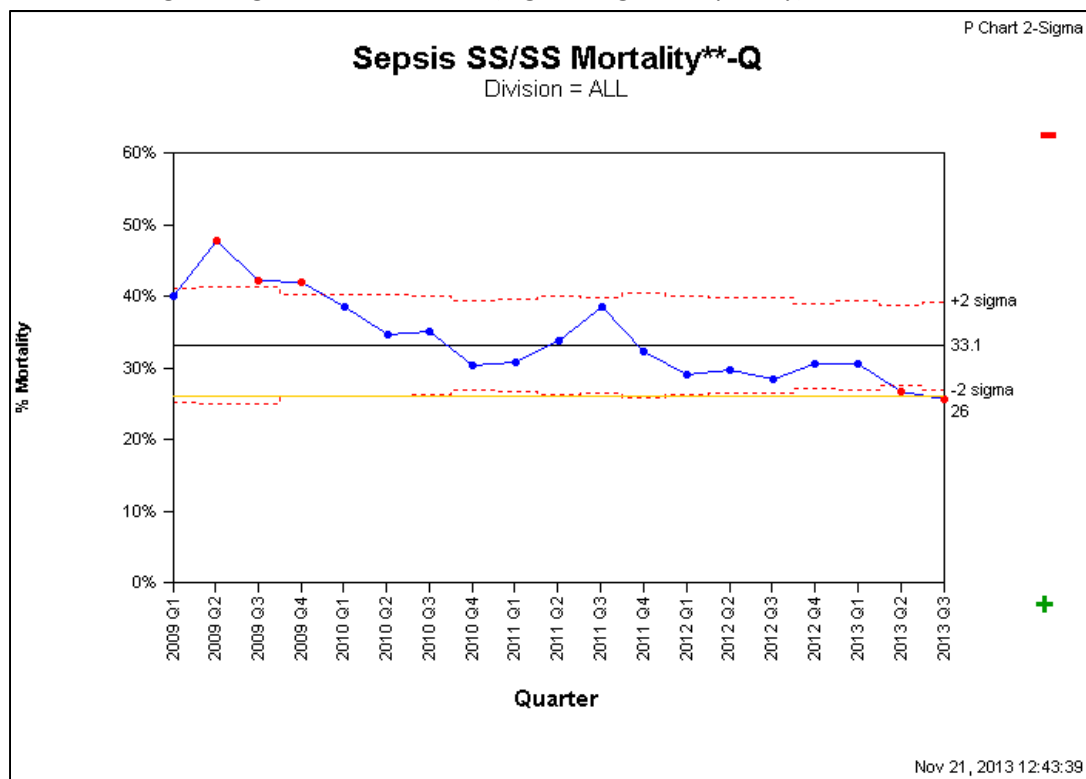
Rate of the iatrogenic pneumothorax was one of the hospital metrics utilized in this course. Since Q1 2012 the rate remained below target rate (0.4) except Q2 2013 (1 case).

## **Septris – Management of Sepsis (released on 12/11/11)**

An interactive game with case studies offers learners an opportunity to apply the referenced information in a clinical management setting.

### **Learning Objectives**

- Classify epidemiology of sepsis syndrome and differentiate between the different forms of sepsis syndromes (simple, severe and septic shock).
- Integrate best evidence practices, clinical expertise and diagnostic test results for early identification and optimal management of septic states using evidenced-based guidelines and clinical decision support tools (e.g. Order sets, best practice alerts etc.)
- Demonstrate specific best practice strategies such as fluid resuscitation, early identification with laboratory markers, screening and transfer of patients with sepsis to higher level of care.
- Describe priority actions for establishing and implementing early goal directed therapies for the septic patients along the continuum of care.
- Develop and apply communication skills related to identification and management of sepsis when working among healthcare teams. (e.g. Calling for help early).



### **Analysis**

*% Mortality in Severe Sepsis/ Septic Shock patients is one of the metrics from the hospital measured for this course. Since Q3 2011 the rate has been significantly declining and reaching the goal of 26% in Q2 and Q3 2013.*

### **IHI: Improvement in Action (11/10/10)**

Practical approach to performance improvement (PI) process and implementation of PI methodologies in the actual projects.

#### **Learning Objectives**

- Develop a project charter that clearly justifies and focuses the performance improvement work to be done during and after the educational activity
- Frame a challenging yet realistic performance improvement project aimed to improve patient safety, service or quality outcomes.
- Use principles of organizational dynamics of change and the psychology of improvement work to build an effective team
- Use systems thinking, driver diagrams, and change concepts to generate effective process changes
- Use PDSA cycles to identify promising ideas for change, then developing and refining them to achieve more reliable and effective processes
- Create a comprehensive measurement plan, including operational definitions, data collection methods, reporting, and training
- Use the distinction between common and special cause variation to identify successful process changes and avoid common misinterpretations of the data
- Apply analytical tools including run charts, Pareto diagrams, scatter plots, and control charts to analyze, interpret, and respond appropriately to data
- Apply important principles of reliability science to the design of processes
- Continue the quality initiative to demonstrate improvement in patient safety, service or quality outcomes.

#### **Analysis**

*The following metrics were measured in this course (data from July, 2011)*

1. *Reduced CA-BSI rate in the CVICU by 50% - 100 days with no CA-BSI infection and infection rates dropped 63% (1.3 infections/1000 line days in CVICU)*
2. *Reduced handoff related care failures by 25% and achieved 90% compliance with the best practice bundle for the OR to PICU handoffs; improvement in the Culture of Safety Survey - handoff and transition of care dimension by 10%*
3. *Decreased the days to the 3rd next available appointment by 80%, decreased the wait time for provider by 40% and improved on-time arrivals by 50%.*
4. *Decrease in the organizational cost of iNO (high cost medications) by 10% (a \$100,000 savings)*

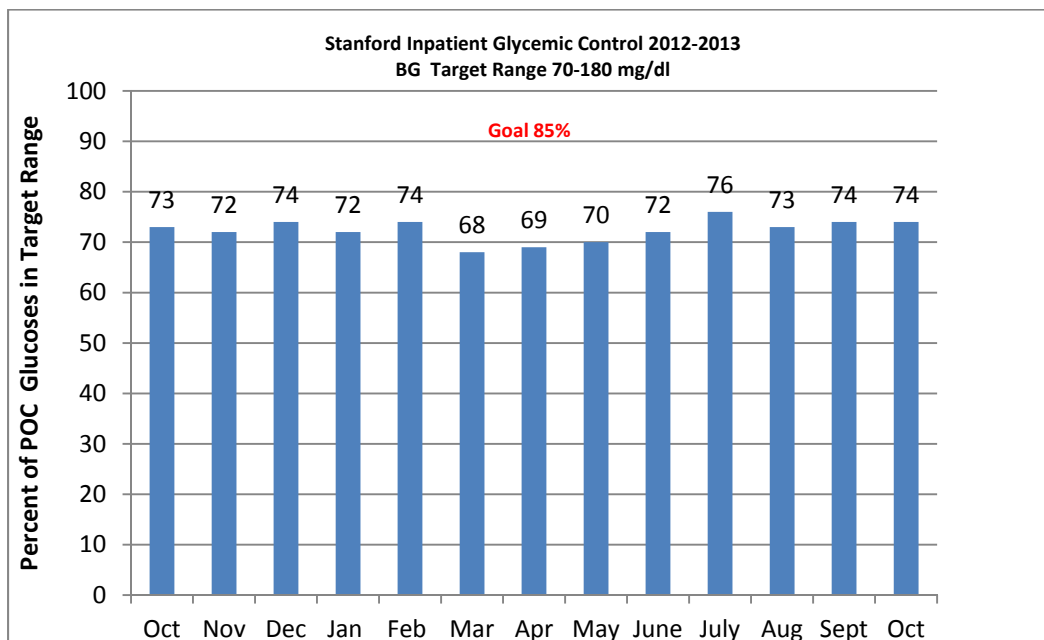
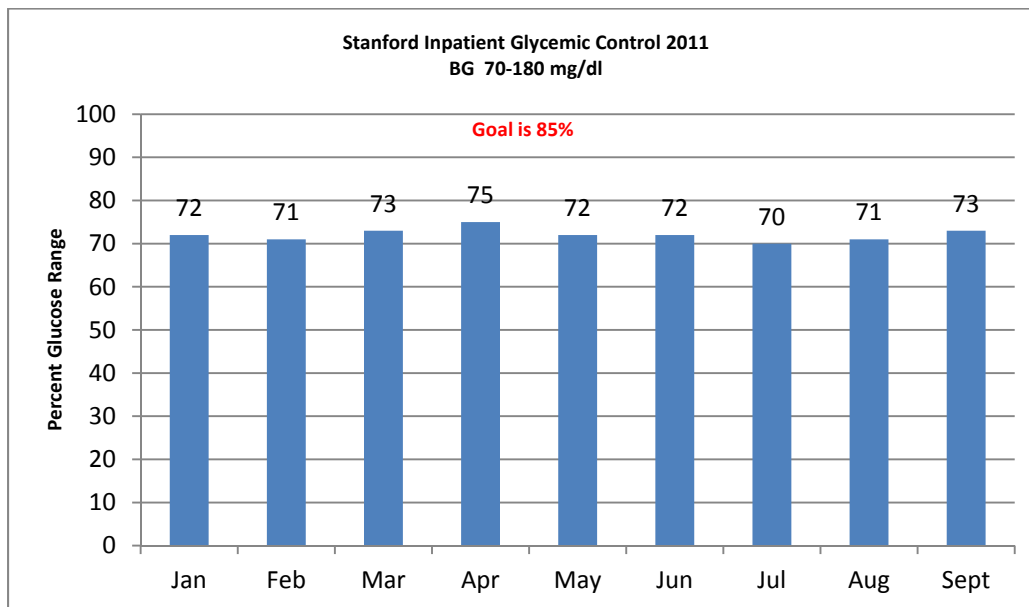
### **Update on In-Patient Hyperglycemia Management (10/22/11)**

Updates on national guidelines for managing inpatient blood glucose as well as strategies to implement these guidelines, utilize insulin order sets and integrate the Diabetes Treatment Team into the care of patients with labile blood glucose.

#### **Learning Objectives**

- Consistently use the standard order sets for in-patient insulin therapy.

- Integrate the Diabetes Team and Diabetic Educators to ensure proactive management of patients with labile blood glucose levels.
- Apply 2009 ADA guidelines to the care of the patient with unstable blood glucose levels in the hospital setting.



### Analysis

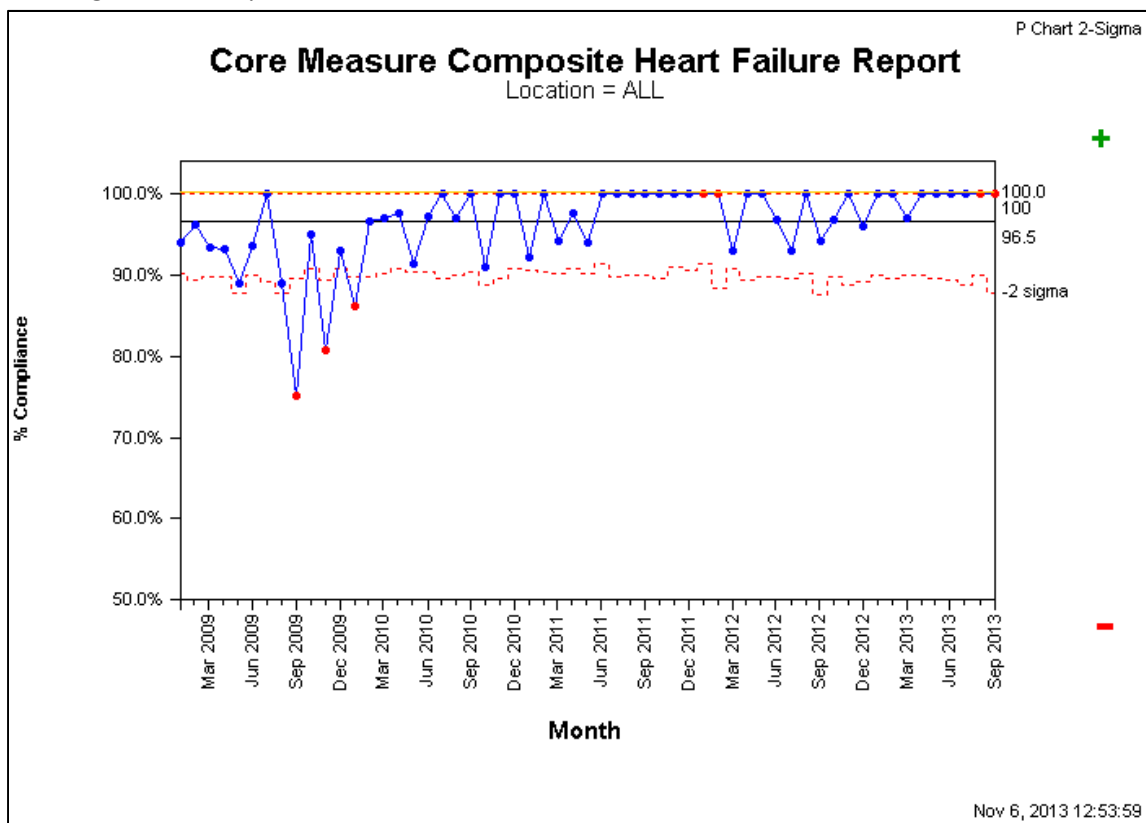
Inpatient glycemic control (Blood Glucose 70-180 mg/dl) was one of the metrics used in this course. No significant changes have been demonstrated. In Q2 and Q3 2013, the % in target range is on average at 75% with goal to achieve 85% in target range. Hospital-wide education has been rolled out to nurses and physicians.



## **CHF: Heart Failure Program concepts and practical approach to implement in a medical institution (12/4/2010)**

### **Learning Objectives**

- Construct a comprehensive heart failure education system that is consistent across disciplines and regardless of hospital unit
- Revise a medication reconciliation process that enhances patient understanding of and compliance with their medication regimen
- Choose a strategy of dietary sodium restriction for heart failure patients that translates to both inpatient and outpatient settings
- Revise a program that allows for early follow-up and clinic access for heart failure patients discharged from hospital



### **Analysis**

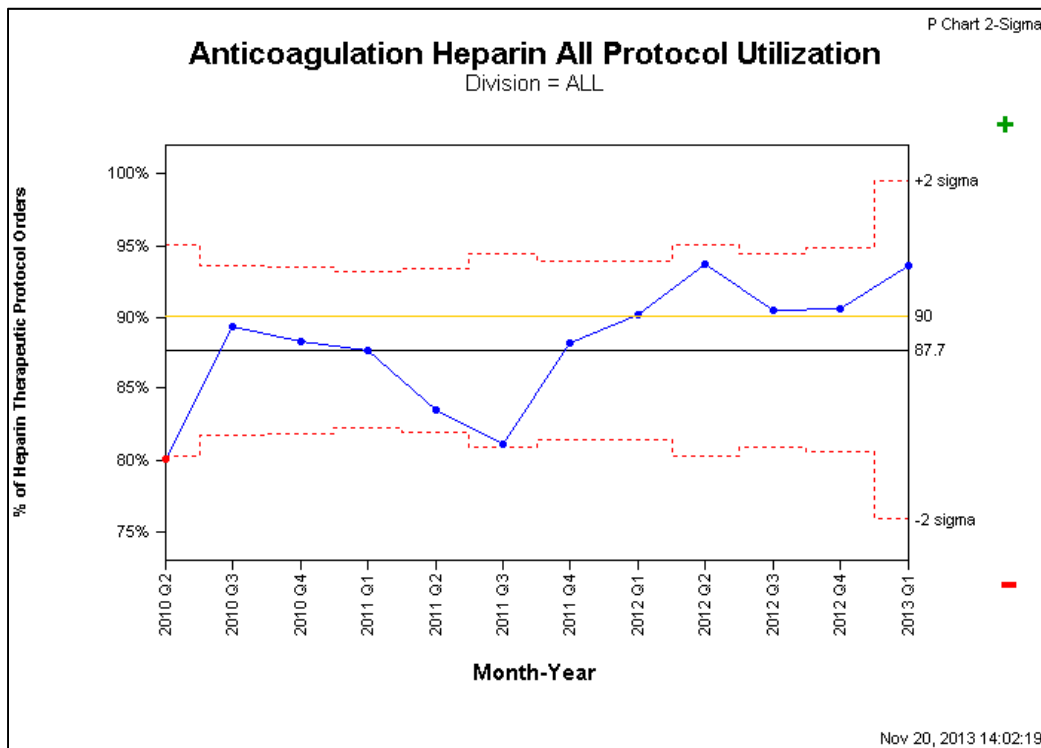
*Core Measure Composite Heart Failure rate was unstable in 2011-2012. The rate but has been at 100% in Q1, Q2 (except March) and Q3 of 2013*

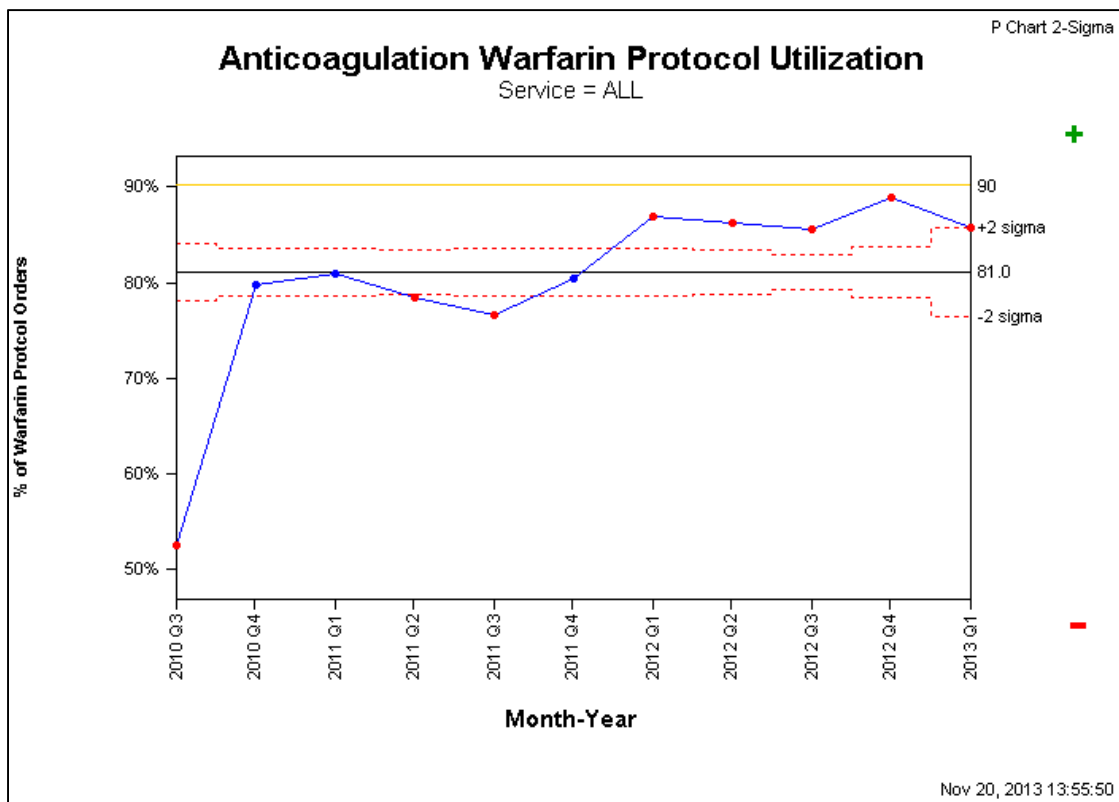
## **Everything You Need to Know about the Safe Management of Anticoagulation (11/11/11)**

Practical strategies to utilize Heparin and Warfarin protocols and follow best practices.

### **Learning objectives**

- Apply evidence based approaches for the prevention and treatment of thrombotic disease and understand new therapies.
- Develop strategies for utilization of Warfarin and Heparin protocols that include Pharmacy involvement to reduce the risks of adverse drug events and to ensure patient safety.
- Develop strategies in applying the key aspects of the National Patient Safety Goal for anticoagulation therapy in management of patients.
- Demonstrate ability to apply PTT and HAL measurements for anticoagulation levels and use the most accurate measurement for therapeutic drug monitoring.





### Analysis

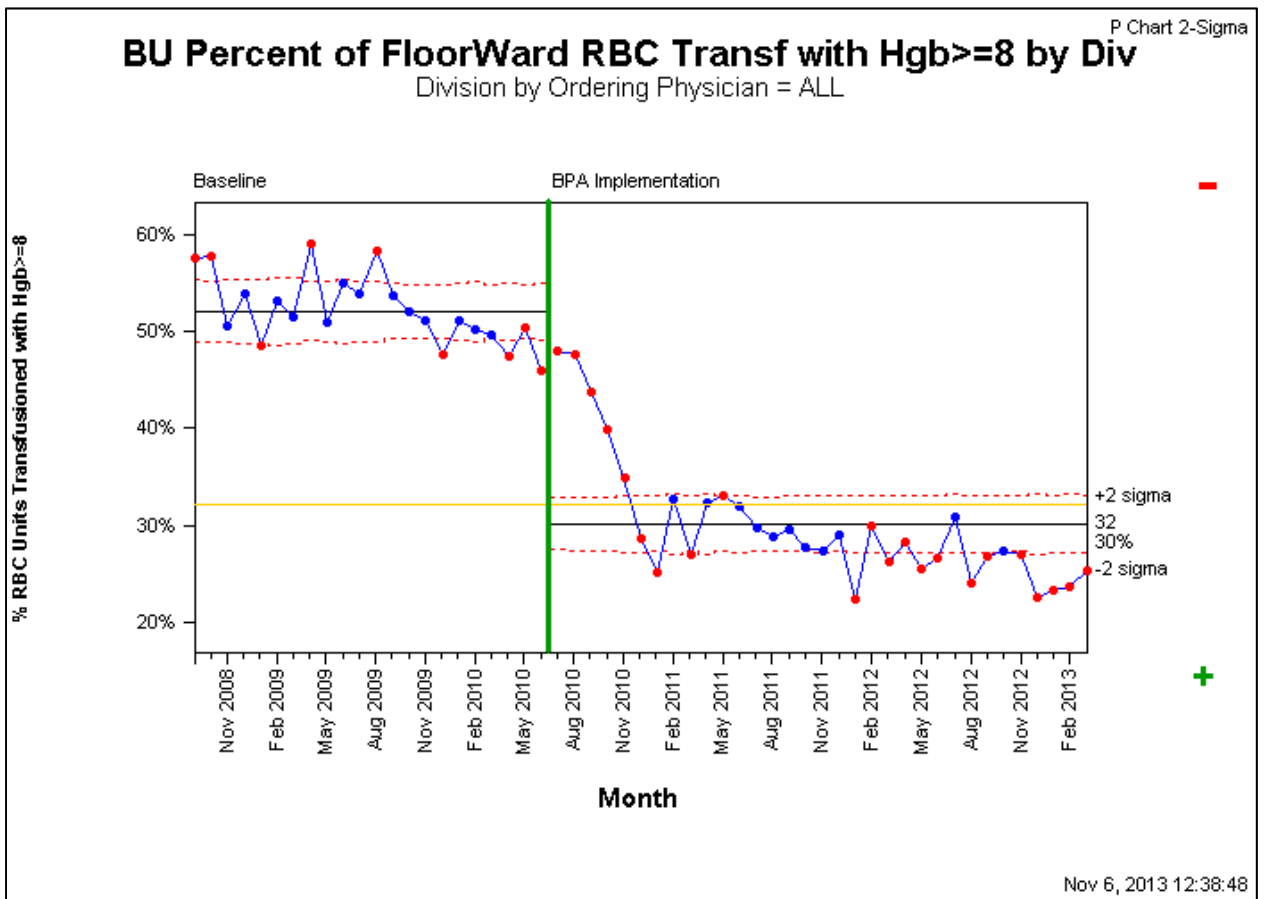
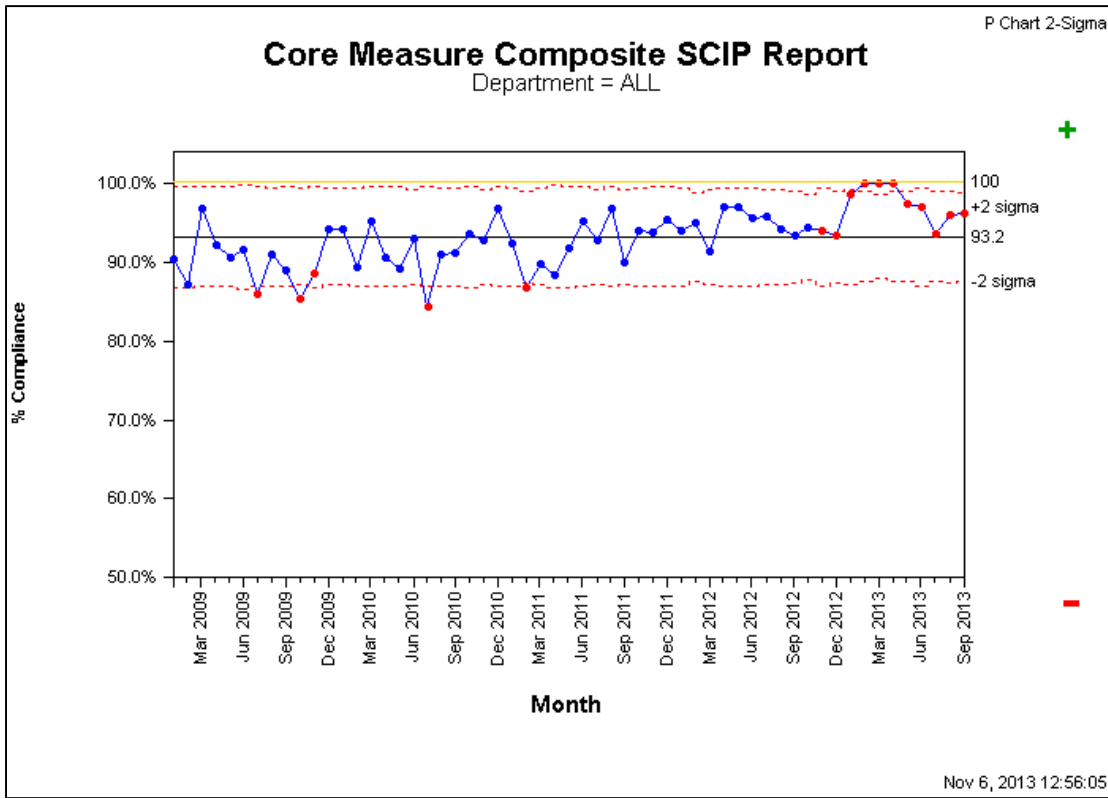
Utilization of Warfarin and Heparin protocols were one of the metrics used in this course. Utilization of Heparin Protocol has had a significant increase and met 90% goal in Q1 2013. Utilization of Warfarin Protocol also has had a significant improvement and reached 85% utilization in Q1 2013.

### **Surgical Quality Best Practice & Innovation (9/10/2010)**

Use of metric-based quality improvement and simulated immersive learning in order to improve surgical outcomes and patient safety.

### Learning objectives

- Develop strategies to prevent complications, reduce length of stay, improve quality of care, reduce resource utilization and manage and rescue patients from surgical complications to reduce patient mortality.
- Develop strategies to prevent venous thromboembolism prophylactically.
- Develop strategies to consistently implement the surgical time out as required by Joint Commission and Stanford Hospital & Clinics.
- Develop strategies to consistently implement evidence-based guidelines for blood transfusions as required by Joint Commission and Stanford Hospital & Clinics.



## **Analysis**

*Surgical Quality Improvement Measures composite score has had a steady improvement and reached 100% compliance over several months in 2013 and it remains at average of 95% in Q01 and Q02 2013. RBC transfusion rate significantly declined and remains below the target rate of 32%*

## **Impact on learners: competence and performance changes (highlights from symposia)**

### **Palliation Therapy (4 sessions) (2012)**

End of life patient management included: communication, pain management, advanced care planning and managing patient expectations.

#### **Learning Objectives**

- Develop strategies to recognize and address the emotional aspects of life limiting illnesses and effectively manage patients' expectations.
- Assess the primary causes of cancer-related pain and determine an individualized treatment plan, including both pharmacologics and non-pharmacologics to manage your patients' complex pain syndromes.
- Develop strategies to facilitate and perform advanced care planning including ethical issues, consistently in practice.
- Develop or enhance communication skills and incorporate into practice for your patients with serious life limiting illnesses.

#### **Competence changes**

At the conclusion of the event, learners reported an increase in competence for the course objective as stated below (average based, used 1-5 Likert Scale 1 – never use strategy, 5 – always use strategy):

- Recognize and address the emotional aspects of life limiting illnesses and effectively manage patients' expectations – increased by 28% on average
- Assess the primary causes of cancer-related pain and determine an individualized treatment plan, including both pharmacologists and non-pharmacologists to manage your patients' complex pain syndromes. – increased by 9%
- Develop strategies to facilitate and perform advanced care planning including ethical issues, consistently in practice. – increased by 13% on average
- Develop or enhance your communication skills and incorporate into practice for your patients with serious life limiting illnesses. – increased by 15% on average

#### **Performance changes**

3 month follow-up survey was conducted to evaluate changes in performance. 71% of learners who completed the survey, indicated that they made changes to their practice as a result of attending this course. Likert scale (1-5, 1=never, 5=always) was used to measure the utilization of the specific strategies in practice (average based):

- Recognize and address the emotional aspects of life limiting illnesses and effectively manage patients' expectations -4.38
- Develop strategies to facilitate and perform advanced care planning including ethical issues, consistently in practice – 4.44

- Develop or enhance your communication skills and incorporate into practice for your patients with serious life limiting illnesses – 4.24
- Assess the primary causes of cancer-related pain and determine an individualized treatment plan, including both pharmacologists and non-pharmacologists to manage your patients' complex pain syndromes – 4.46

### **Utilizing Point-of-Care Ultrasound to Optimize Patient Safety, Care and Satisfaction (2012-2013)**

Utilize point of care ultrasound based on evidence-based guidelines in performing high risk procedures and early identification of life threatening conditions.

#### **Learning Objectives**

- Utilize strategies on the use of point of care ultrasound as part of patient care.
- Utilize ultrasound when performing invasive procedures such placing central lines, paracentesis, thoracentesis, and arthrocentesis.
- Implement evidence-based ultrasound strategies in diagnosing and interpreting emergency conditions including sepsis, acute abdominal pain and both traumatic and non-traumatic hypotension.

#### **Competence changes**

At the conclusion of the event, learners reported an increase in competence for all course objectives (average based, used 1-5 Likert Scale 1 – never use strategy, 5 – always use strategy). The strategies with significant increase (>50%) in competence were utilizing ultrasound when performing the following procedures and diagnosing the following conditions:

- thoracentesis – increased by 92% (9/27/12)
- arthrocentesis – increased by 106% (9/27/12), 85% (2/28/13)
- foreign body localization – 93% (9/27/12), 79% (2/27/13)
- abscess drainage – 100% (9/27/12), 80% (2/27/13)
- pneumothorax – 128% (9/27/12), 125% (2/28/13)
- undifferentiated hypotension, including sepsis – 141%(9/27/12), 81% (2/28/13)
- fluid status: dehydration/volume overload - 120% (9/27/12)
- abdominal aortic aneurysm – 100% (9/27/12)
- obstructive hydronephrosis – 126% (9/27/12)
- cholecystitis – 143% (9/27/12)

## **Performance changes**

Based on the post 3 months survey responses.

### ***Session on 9/27/12***

46% respondents have made changes in their practices as a result of attending this activity.

Likert scale (1-5, 1=never, 5=always) was used to measure the utilization of the specific strategies in practice (average based):

1. Personally use point of care ultrasound as part of your patient care at the bedside – 3.2
2. Utilize ultrasound when performing the following procedures:
  - Placing central lines – 3.83
  - Performing thoracentesis – 4.25
  - Performing paracentesis – 4.8
  - Lumbar puncture – 1.67
  - Pericardiocentesis – 3.4
  - IV access – 2.4
  - Arthrocentesis - 2.2
  - Foreign body localization – 3.0
  - Abscess drainage – 2.8
3. Implement evidence-based ultrasound strategies in diagnosing and interpreting emergency conditions including:
  - Intra-abdominal bleeding – 3.63
  - Pericardial tamponade - 4.0
  - Pneumothorax - 3.56
  - Undifferentiated hypotension, including sepsis - 3.14
  - Fluid status: dehydration/volume overload – 3.22
  - Abdominal aortic aneurysm – 3.43
  - Obstructive hydronephrosis – 3.14
  - Cholecystitis – 4.29

### ***Session on 2/28/13***

76% of responders indicated that they implemented changes in their practices as a result of this course such as assessing IVC filling and assessing the heart during resuscitation

41% indicated barriers in implementing changes in practice: mainly time and equipment availability

Likert scale (1-5, 1=never, 5=always) was used to measure the utilization of the specific strategies in practice (average based):

1. Personally use point of care ultrasound as part of your patient care at the bedside – 3.1
2. Utilize ultrasound when performing the following procedures:
  - Placing central lines - 4.58
  - Performing thoracentesis - 4.33
  - Paracentesis - 4.50



- Lumbar puncture -1.80
  - Pericardiocentesis -4.00
  - IV access -2.60
  - Arthrocentesis -1.67
  - Foreign body localization - 2.29
  - Abscess drainage - 2.33
3. Implement evidence-based ultrasound strategies in diagnosing and interpreting emergency conditions including:
- Intra-abdominal bleeding -4.00
  - Pericardial tamponade -4.20
  - Pneumothorax -3.86
  - Undifferentiated hypotension, including sepsis -3.73
  - Fluid status: dehydration/volume overload -4.07
  - Abdominal aortic aneurysm -3.67
  - Obstructive hydronephrosis -3.45
  - Cholecystitis -3.15

### **Psychiatry Faculty Supervision Training (2013)**

Effective supervision of residents through the most up-to-date, trans-modality, evidence-based supervision techniques.

#### **Learning objectives**

- Apply the following supervisory techniques in your practice:
  - Clearly establish supervisory goals
  - Encourage learner-centered approach
  - Evaluate learners competency
  - Provide effective feedback
- Develop skills to manage challenging supervisory situations effectively such as:
  - professionalism
  - failure to accept supervisors suggestions/directives
  - negligent supervision
  - boundary violations
  - managing competency issues of resident
- Utilize standardized evaluation tools to improve teaching and supervisory methods.

#### **Competence changes**

At the conclusion of the event, learners reported an increase in competence for all course objectives (average based, used 1-5 Likert Scale 1 – never use strategy, 5 – always use strategy):

- Apply the following supervisory techniques:
  - Clearly Establish Supervisory Goals – increased by 47%
  - Encourage learner-centered approach – increased by 14%
  - Be explicit about process of supervision – increased by 36%

- Be explicit about role of resident & supervisor model within supervision – increased by 34%
- Directly observe residents (A/V, 2-way mirror, sit in) – increased by 26%
- Evaluate learners' competency – increased by 17%
- Provide effective feedback – increased by 18%
- Manage challenging supervisory situations effectively such as:
  - Professionalism – increased by 14%
  - failure to accept supervisors' suggestions/directives – increased by 22%
  - negligent supervision – increased by 22%
  - boundary violations – increased by 12%
  - managing competency issues of resident – increased by 20%
- Utilize standardized evaluation tools to improve teaching and supervisory methods – increased by 42%

### **Performance changes**

Based on the post 2 months survey responses:

- 65% of learners who completed the survey indicated that they implemented changes to their practice.
- Likert scale 1-5 (1-never, 5 – always) was used to measure Utilization of Supervisory Techniques. The mean response to implementation of all techniques is 3.71-4.59
- Likert scale 1-5 (1-never, 5 – always) was used to measure Manage Challenging Supervisory Situations Effectively. The mean response to implementation of all techniques is 3.94-4.82

## **Innovations in the type and delivery methods of CME courses**

### **MOOCs/Apps**

#### **Practical Tips to Improve Asian American Participation in Cancer Clinical Trials**

Educates healthcare providers and allied health professionals about cancer clinical trials and cultural humility skills as well as provides educational resources and tips for reinforcing change in practice to improve outcomes in Asian American clinical trial participation.

#### **Learning Objectives**

- Develop strategies to determine appropriate patients for clinical trials.
- Apply cultural humility skills to effectively communicate with Asian American patients about cancer clinical trials.
- Identify at least 5 ways that will reinforce change in practice to incorporate clinical trials education and referral among Asian American patients and apply it in practice.
- Recognize how to access at least 5 cancer clinical trial resources and use them in education and referral

#### **Competence changes**

At the completion of the course, learners reported an increase in competence for all course objectives as stated below (average based, used 1-5 Likert Scale 1 – never use strategy, 5 – always use strategy):

- Effectively apply knowledge about cancer clinical trials in practice with Asian Americans – increased by 35%
- Efficiently communicate with Asian Americans about cancer clinical trials, using cultural humility skills that promote a positive response from this population group – increased by 42%
- Identify at least 5 ways that will reinforce change in practice to incorporate clinical trials education and referral among Asian Americans and apply it in practice – increased by 35%
- Recognize at least 5 cancer clinical trial resources and successfully use them in patient/community education and referral – increased by 29%

#### **Performance changes**

Based on the post 2 months survey responses:

- 44% of learners who completed the survey indicated that they implemented changes to their practice. The changes included getting more comfortable with communicating with patients from different cultures and more open to considering clinical trials for patients
- 44% reported barriers to implement changes. The most common barrier reported is language.

- Likert scale 1-5 (1-never, 5 – always) was used to measure utilization of course strategies in practice:
  - Effectively apply knowledge about cancer clinical trials in practice with Asian Americans - mean response is 3.25
  - Efficiently communicate with Asian Americans about cancer clinical trials, using cultural humility skills that promote a positive response from this population group – mean response is 3.75
  - Use at least 5 different ways that reinforce change in practice to incorporate clinical trials education and referral among Asian Americans and apply it in practice – mean response is 4.67
  - Use at least 5 cancer clinical trial resources and successfully in patient/community education and referral – mean response is 3.0

### **Antimicrobial Stewardship**

Offers a practical approach to prescribing antibiotic therapy and development of antimicrobial stewardship across all specialties and settings.

#### **Learning Objectives**

- Develop skills to apply IDSA guidelines in treating common infections such as acute rhinosinusitis.
- Apply evidence based antibiotic management to treat sepsis.
- Implement principles of antimicrobial stewardship when providing care to special populations and in various settings.
- Apply evidence based antibiotic management to surgical patients requiring antibiotic prophylaxis.
- Apply evidence based antibiotic stewardship program in the outpatient setting.

#### **Competence changes**

At the completion of the course, learners reported an increase in competence for all course objectives as stated below (average based, used 1-5 Likert Scale: 1 – never use strategy, 5 – always use strategy):

- Develop skills to apply IDSA guidelines in treating common infections such as acute rhinosinusitis – increased by 21%.
- Apply evidence based antibiotic management to treat sepsis – increased by 4%.
- Implement principles of antimicrobial stewardship when providing care to special populations and in various settings – increased by 14%.
- Apply evidence based antibiotic management to surgical patients requiring antibiotic prophylaxis – increased by 20%.
- Apply evidence based antibiotic stewardship program in the outpatient setting – increased by 14%.

## **Focused Basic Bedside Transthoracic Echocardiography Examination to Evaluate Hypotension and Hypoxemia**

Use of hand carried ultrasound devices (HCU) to diagnose serious cardio-pulmonary conditions and interpret HCU results at the clinic and the bedside.

### **Learning Objectives**

- Develop skills to personally use HCU devices and interpret echo examinations such as identifying cardiac and pulmonary anatomy from HCU exam images and performing a basic HCU exam of the heart and lungs
- Develop skills to use HCU devices in diagnosing serious cardio-pulmonary conditions such as hypotension, hypoxemia, cardiac tamponade, pneumothorax and assessing ventricular function during CPR.

### **Competence changes**

At the completion of the course, learners reported an increase in competence for all course objectives as stated below (average based, used 1-5 Likert Scale 1 – never use strategy, 5 – always use strategy):

- Use of HCU devices and interpret echo examinations such as identifying cardiac and pulmonary anatomy from HCU exam images and performing a basic HCU exam of the heart and lungs – increased by 25%
- Use of HCU to diagnose and confirm appropriate therapeutic treatment of pneumothorax – increased by 77%
- Use of HCU to assess hypoxemia and hypotension – increased by 60%
- Use of HCU to assess presence of cardiac tamponade – increased by 70%
- Use of HCU to assess ventricular function during CPR – increased by 16%

### **Performance changes**

Based on the 2 months post course completion survey data:

67% of learners who completed the survey indicated that they implemented changes to their practice. The changes included utilizing HCU for evaluating of pulmonary conditions.

Likert scale 1-5 (1-never, 5 – always) was used to measure utilization of course strategies in practice:

- Use of HCU devices and interpret echo examinations such as identifying cardiac and pulmonary anatomy from HCU exam images –mean 3.3
- Performing a basic HCU exam of the heart and lungs –mean 3.0
- Use of HCU to diagnose and confirm appropriate therapeutic treatment of pneumothorax – mean 3.0
- Use of HCU to assess hypoxemia – mean 3.7
- Use of HCU to assess hypotension – mean 3.3
- Use of HCU to assess presence of cardiac tamponade – mean 2.7
- Use of HCU to assess ventricular function during CPR – mean 3.3

### **Safe Opioid Prescribing and Risk Evaluation and Mitigation Strategies (REMS)**

Assessment and recognition of psychological co-morbidities that increase the risk for opioid abuse and diversion, developing treatment plans and implementing interventions aimed at decreasing risk for unintentional misuse in addition to abuse of and addiction to opioid analgesics.

#### **Learning Objectives**

- Determine the general characteristics, toxicities and drug interactions associated with opioids and incorporate this knowledge in practice.
- Utilize various opioid risk assessment tools to reduce the risk of opioid misuse and to ensure patient safety.
- Evaluate and interpret functional improvement, urine drug testing, and data from prescription drug monitoring systems.
- Develop and implement strategies for termination of opioid therapy and perform the required steps for proper documentation and referral
- Integrate counseling of patients/caregivers on the safe use of opioids into the practice.

#### **Competence changes**

Data is not available at this time as the course will not be released until Feb 2014

### **Case Studies in Medical Care Events**

Uses medical events to investigate and analyze root causes and/or contributing factors to comprehend how medical errors can occur and translate this into ensuring safe patient care in practice.

#### **Learning Objectives**

- Integrate NPSG requirements in clinical practice in the areas of patient identification, Universal Protocol, labeling and medication reconciliation.
- Develop practical skills to improve team communication and apply these skills when medical errors occur and to prevent medical errors in the future, i.e. immediate feedback, Team STEPPS.
- Evaluate root causes and contributing factors that lead to various medical errors.
- Develop skill to apply in practice the appropriate procedures or steps to assure that such events are prevented in the future.

#### **Competence changes**

Data is not available at this time as the course will not be released until Feb 2014

### **Crisis Management Skills to Enhance Management of ACLS**

An interactive approach to managing cardiac arrest by applying ACLS evidence-based techniques and Crisis Resource Management skills.

#### **Learning Objectives**

- Develop strategies to implement Crisis Resource Management principles and their application during cardiac arrest treatment.

- Develop strategies to utilize updated guidelines for management of cardiac arrest.
- Develop strategies to build skills for: 1) airway management and vascular access, 2) management of PEA (Pulseless Electrical Activity)/Asystole, ventricular tachycardia/fibrillation, symptomatic bradycardia, unstable supraventricular tachycardia, and 3) post-resuscitation management

### **Competence changes FY12**

At the conclusion of the course, learners reported an increase in competence for all course objectives as stated below (used 1-5 Likert Scale 1 – never use strategy, 5 – always use strategy):

- Use closed loop communication during a medical crisis situation – increased by 12%
- Distribution of workload and mobilization of help early in a crisis – increased by 12%
- Use cognitive aids as a resource to assist patient care management in a crisis situation – increased by 29%
- Anticipate and plan for crisis situations – increased by 6%
- Use all available resources, all available information, and cross-checking of redundant data – increased by 12%
- Re-evaluate situations – increased by 12%
- Use assertive communication and leadership skills – increased by 12%
- 
- Skills Level A. Airway management and vascular access – increased by 5%
- Skills Level B. Management of PEA (Pulseless Electrical Activity)/Asystole, ventricular tachycardia/fibrillation, symptomatic bradycardia, unstable supraventricular tachycardia – increased by 25%
- Skills Level C. Post-resuscitation management – increased by 11%

### **Competence changes FY13:**

- Use closed loop communication during a medical crisis situation – increased by 29%
- Distribution of workload and mobilization of help early in a crisis – increased by 29%
- Use cognitive aids as a resource to assist patient care management in a crisis situation – increased by 63%
- Anticipate and plan for crisis situations – increased by 13%
- Use all available resources, all available information, and cross-checking of redundant data – increased by 20%
- Re-evaluate situations – increased by 15%
- Use assertive communication and leadership skills – increased by 24%
- Skills Level A. Airway management and vascular access – increased by 7%
- Skills Level B. Management of PEA (Pulseless Electrical Activity)/Asystole, ventricular tachycardia/fibrillation, symptomatic bradycardia, unstable supraventricular tachycardia – increased by 21%
- Skills Level C. Post-resuscitation management – increased by 28%

## **Games**

### **Septtris - Learn to Identify and Manage Sepsis**

An interactive game with case studies offers learners an opportunity to apply the referenced information in a clinical management setting.

#### **Learning Objectives**

- Classify epidemiology of sepsis syndrome and differentiate between the different forms of sepsis syndromes (simple, severe and septic shock).
- Integrate best evidence practices, clinical expertise and diagnostic test results for early identification and optimal management of septic states using evidence-based guidelines and clinical decision support tools (e.g. order sets, best practice alerts etc.)
- Demonstrate specific best practice strategies such as fluid resuscitation, early identification with laboratory markers and screening and transfer of patient to higher care with sepsis.
- Describe priority actions for establishing and implementing early goal directed therapies for the septic patients along the continuum of care.
- Develop and apply communication skills related to identification and management of sepsis when working among healthcare teams. (e.g. Calling for help early)

#### **Competence changes**

##### ***9/1/11-8/31/12***

At the conclusion of the event, learners reported an increase in competence for all course objectives as stated below (average based, used 1-5 Likert Scale 1 – never use strategy, 5 – always use strategy):

- Identify sepsis syndromes and different forms of sepsis in determining the best treatment approach - increased by 10%
- Integrate best evidence practices, clinical expertise and diagnostic test results for early identification and optimal management of septic states using Stanford's Sepsis Guidelines and order sets – by 13%
- Apply Stanford Sepsis Guidelines including fluid resuscitation and transfer of patient with sepsis – by 24%
- Perform priority actions for establishing and implementing early goal directed therapies for the septic patients along the continuum of care (initiating of antibiotics within 2 hours of identification, confirmative diagnostic tests within 6 hours of identification) – by 7%
- Apply interpersonal and communication skills related to early sepsis identification and management of sepsis states when working with other healthcare teams. (e.g. SBAR with identification) - by 9%

##### ***9/1/12-12/11/12 (course was renewed on 12/12/12)***

- Identify sepsis syndromes and different forms of sepsis in determining the best treatment approach : increased by 6%



- Integrate best evidence practices, clinical expertise and diagnostic test results for early identification and optimal management of septic states using Stanford’s Sepsis Guidelines and order sets – by 6%
- Apply Stanford Sepsis Guidelines including fluid resuscitation and transfer of patient with sepsis – by 6%
- Perform priority actions for establishing and implementing early goal directed therapies for the septic patients along the continuum of care (initiating of antibiotics with 2 hours of identification, confirmative diagnostic tests within 6 hours of identification) – no changes
- Apply interpersonal and communication skills related to early sepsis identification and management of sepsis states when working with other healthcare teams. (e.g. SBAR with identification) - no changes

**12/12/12-8/31/13**

- Classify epidemiology of sepsis syndrome and differentiate between the different forms of sepsis syndromes (simple, severe and septic shock) – increased by 11%
- Integrate best evidence practices, clinical expertise and diagnostic test results for early identification and optimal management of septic states using evidenced-based guidelines and clinical decision support tools (e.g. Order sets, best practice alerts etc.)Guidelines and order sets – no changes
- Apply specific best practice strategies such as fluid resuscitation, early identification with laboratory markers, screening and transfer of patients with sepsis to higher level of care - decreased by 10%
- Perform priority actions for establishing and implementing early goal directed therapies for the septic patients along the continuum of care – decreased by 10%
- Apply communication skills related to identification and management of sepsis when working among healthcare teams. (e.g. Calling for help early) – increased by 13%

Overall data analysis of changes in competence. Changes in strategies for all course objectives were statistically significant:

	Strategies Currently Mean (SD)	Strategies Intended Mean (SD)	p-val
Identify sepsis syndromes and different forms of sepsis in determining the best treatment approach.	4.1 (0.13)	4.5 (.12)	<0.001
Integrate best evidence practices, clinical expertise and diagnostic test results for early identification and optimal management of septic states using Stanford’s Sepsis Guidelines and order sets.	3.8 (0.14)	4.4 (0.14)	0.001
Apply Stanford Sepsis Guidelines including fluid resuscitation and transfer of patient with sepsis.	3.5 (0.19)	4.3 (0.15)	<0.001
Perform priority actions for establishing and implementing early goal directed therapies for the septic patients along the continuum of care.	4.2 (0.13)	4.5 (0.12)	<0.001
Identify sepsis syndromes and different forms of sepsis in determining the best treatment approach.	4.2 (0.13)	4.5 (0.12)	<0.001

### **Surgical Improvement Ops**

Provides an opportunity to learn and apply surgical decision making skills for practicing surgeons in treating acute and sub-acute surgical conditions and complications through interactive training to facilitate deliberate practice without compromising patient safety.

#### **Learning objectives**

- Apply safe surgical decision making skills through clinical practice when treating surgical conditions.
- Develop skills to become discerning and efficient in the use of diagnostic tests in the approach of treating surgical diseases or problems.
- Development and improvement of triage and addressing multiple patient problems at once in a given time frame.

#### **Competence changes**

No data available at this time

### **SonoDoc: Case-based learning in bedside ultrasound**

Provides strategies on how to use bedside focused ultrasound, image interpretation, and integrate it in the clinical practice by utilizing interactive game format.

#### **Learning objectives**

- Develop skills to screen for and diagnose emergent conditions
- Develop skills and integrate them in clinical practice for ultrasound guided high risk procedures

#### **Competence changes**

Data is not available at this time as the course will not be released until mid Jan 2014

## **Simulation**

### **Advanced Pediatric Life Support with Immersive Simulation**

Addresses knowledge and skill set gap through didactic presentations, hands on procedure training and simulations in order to be better prepared to care for pediatric emergencies.

#### **Learning objectives**

- Apply strategies to manage pediatric emergencies based on knowledge of pediatric acute disease processes.
- Apply appropriate pediatric emergency medical procedural skills within realistic scenarios.
- Demonstrate improved patient management based on objective assessment criteria.
- Acquire and refine technical skills applicable to pediatric emergency medicine physicians including bag mask ventilation, endotracheal intubation, chest tube insertion, foreign body removal, intraosseous access, lumbar puncture and tracheostomy and gastric tube care.
- Acquire, refine and utilize Crisis Resource Management (CRM) skills through participation in immersive, high fidelity scenarios.

#### **Competence changes**

Overall data analysis of changes in competence. Changes in strategies for all course objectives were statistically significant:

	Strategies Currently Used Mean (SD)	Strategies Intend to Use Mean (SD)	p-val
Apply strategies to manage emergencies	4.2 (0.12)	4.8 (0.06)	<0.001
Bag mask ventilation	4.0 (0.14)	4.5 (0.11)	<0.001
Chest tube insertion	2.5 (0.19)	3.4 (0.19)	<0.001
Foreign body removal	2.8 (0.17)	3.9 (0.16)	<0.001
Intraosseous access	2.8 (0.16)	4.2 (0.12)	<0.001
Lumbar puncture	3.9 (0.15)	4.3 (0.13)	<0.001
Tracheostomy care	2.7 (0.15)	3.8 (0.14)	<0.001
Gastric tube care	2.8 (0.15)	3.7 (0.14)	<0.001
Endotracheal intubation	3.7 (0.16)	4.4 (0.12)	<0.001
Crisis Resource Management skills	3.4 (0.17)	4.5 (0.10)	<0.001

### **Maintenance of Certification in Anesthesiology (MOCA) (2012-2013)**

Designed to meet the American Board of Anesthesiology requirement for anesthesiologists to participate in one simulation-based training course every ten years in order to maintain certification. The course offers hands-on practice related to current techniques, diagnosis and treatment of difficult anesthesia cases, as well as teamwork in crisis situations through Crisis Resource Management (CRM) training.

### Learning objectives

- Develop strategies to apply technical skills to appropriately diagnose and treat anesthesia emergencies.
- Develop strategies to apply crisis resource management skills during clinical crisis situations.
- Develop strategies to apply reflective and self-assessment skills to review and analysis of clinical performance.

### Competence changes

Overall data analysis of changes in competence. Changes in strategies for all course objectives in 2012 and 2013 were statistically significant:

#### **MOCA 2012**

	Strategies Currently Used Mean (SD)	Strategies Intend to Use Mean (SD)	p-val
Use cognitive aid tool in the management of a patient with malignant hyperthermia using scenarios specific to anesthesia.	3.4 (0.26)	4.8 (0.10)	<0.001
Significant hemodynamic instability.	3.4 (0.23)	4.5 (0.15)	<0.001
Significant hypoxemia from any cause.	3.4 (0.23)	4.4 (0.18)	<0.001
Difficult airway management.	3.3 (0.27)	4.3 (0.22)	<0.001
Effective communication including the use of "repeat-backs" and addressing team members by name or role (CRM).	3.5 (0.18)	4.7 (0.09)	<0.001
Allocate your attention wisely, manage the problem without losing sight of the bigger picture (CRM).	3.6 (0.18)	4.8 (0.08)	<0.001
Call for help (CRM).	4.0 (0.13)	4.9 (0.06)	<0.001
Use cognitive aid (CRM).	2.9 (0.18)	4.7 (0.15)	<0.001
Utilize all available resources (CRM).	3.8 (0.14)	4.9 (0.06)	<0.001

#### **MOCA 2013**

	Strategies Currently Used Mean (SD)	Strategies Intend to Use Mean (SD)	p-val
Apply technical skills to appropriately diagnose and treat anesthesia emergencies.	4.4 (0.11)	4.9 (0.06)	<0.001
Apply crisis resource management skills during clinical crisis situations.	3.7 (0.16)	4.9 (0.06)	<0.001
Apply reflective and self-assessment skills to review and analysis of clinical performance.	4.0 (0.18)	4.8 (0.08)	<0.001

### **Neonatal Simulation (2011-2013)**

Through immersion in intense, dynamic and complex simulation scenarios and constructive video debriefings, course offers practice in key cognitive, technical and behavioral skills necessary to achieve optimal performance in unpredictable neonatal emergencies. The curriculum synthesizes the updated 2010 NRP guidelines.

### Learning Objectives

- Utilize updated 2010 Neonatal Resuscitation Program (NRP) guidelines and algorithm when managing care of the neonate
- Practice and perform a variety of hands-on resuscitation skills while demonstrating accurate knowledge of NRP guidelines
- Utilize effective communication skills including thinking out loud and closed loop communication during neonatal resuscitation to maximize delivery of care to the neonate
- Develop strategies to work effectively in a team to assess the neonatal emergencies and respond in a timely, clinically appropriate manner based on best practice principles for the safety and care of the neonate

### Competence changes

Overall data analysis of changes in competence. Changes in strategies for 3/4 course objectives were statistically significant:

	Strategies Currently Used Mean (SD)	Strategies Intend to Use Mean (SD)	p-val
Utilize updated 2010 NPR guidelines and algorithm when managing care of neonate.	4.3 (0.19)	4.9 (0.08)	0.006
Practice and perform a variety of hands-on resuscitation skills while demonstrating accurate knowledge of NPR guidelines.	4.0 (0.21)	4.7 (0.09)	0.001
Utilize effective communication skills including thinking out loud and closed loop communication during neonatal resuscitation to maximize delivery of care to the neonate.	3.4 (0.17)	4.9 (0.07)	<0.001
Develop strategies to work effectively in a team to assess neonatal emergencies and respond in a timely, clinically appropriate manner based on best practice principles for safety and care of the neonate.	3.6 (0.17)	4.9 (0.06)	<0.001

### ***Maternal and Neonatal Arrest (2013)***

Increases and improves the fund of knowledge and technical skills necessary to resuscitate maternal and neonatal patients.

### Learning Objectives

- Develop strategies to incorporate in practice ACLS algorithm pertaining to maternal arrest according to AHA guidelines.
- Develop strategies to utilize team skills during resuscitation, including communication, leadership skills and role delegation.
- Develop and refine cognitive and technical skills necessary to resuscitate critically ill neonates in the delivery room according to the 2011 NRP guidelines.

### **Competence changes**

At the conclusion of the event, learners reported an increase in competence in 3 course objectives as stated below (average based, used 1-5 Likert, Scale 1 – never use strategy, 5 – always use strategy):

- Incorporate in practice ACLS algorithm pertaining to maternal arrest according to AHA guidelines. – increased by 75%.
- Utilize team skills during resuscitation including communication skills, leadership skills and role delegation – increased by 21%.
- Use cognitive and technical skills necessary to resuscitate critically ill neonates in the delivery room according to the 2011 NRP guidelines – increased by 17%.

### **Crisis Resource Management Simulation Instructor Program**

Directed at the learning need of physicians and other members of simulation teams whose area of clinical or technical practice may be enhanced through simulation methodologies.

#### **Learning objectives:**

- Develop a strategy to provide educational programs utilizing Crisis Resource Management (CRM) techniques for the purpose of addressing patient safety and the systematic training of clinicians.
- Design and evaluate simulation scenarios to train clinicians in skills including decision-making, teamwork and communication.
- Compare and contrast various modes of simulation and their specific educational or training uses.
- Develop a framework for improving team collaboration and individual skills utilizing interactive debriefing, assessment, and constructive feedback skills.

### **Competence changes**

At the conclusion of the event, learners reported an increase in competence (strategies to apply knowledge) for all course objectives as stated below (average based; used 1-5 Likert Scale 1 – never use strategy, 5 – always use strategy; score averages):

**4/4/13**

- Provide educational programs utilizing Crisis Resource Management (CRM) techniques for the purpose of addressing patient safety and the systematic training of clinicians – increased by 48%
- Design and evaluate simulation scenarios to train clinicians in skills including decision-making, teamwork, and communication – increased by 23%
- Compare and contrast various modes of simulation and their specific educational or training uses – increased by 31%
- Develop a framework for improving team collaboration and individual skills utilizing interactive debriefing, assessment, and constructive feedback skills – increased by 39%

**5/13/13**

- Provide educational programs utilizing Crisis Resource Management (CRM) techniques for the purpose of addressing patient safety and the systematic training of clinicians – increased by 38%
- Design and evaluate simulation scenarios to train clinicians in skills including decision-making, teamwork, and communication – increased by 24%
- Compare and contrast various modes of simulation and their specific educational or training uses – increased by 44%
- Develop a framework for improving team collaboration and individual skills utilizing interactive debriefing, assessment, and constructive feedback skills – increased by 24%

### **Simulation Instructor Program (neonatal/maternal) (2013)**

Utilizes a variety of modalities and provides each learner individual opportunities to practice and receive feedback on scenario design, scenario conduct and debriefing techniques.

#### **Learning objectives**

- Design and execute highly realistic multidisciplinary simulated clinical scenarios during the course.
- Develop strategies to incorporate simulation skills into professional practice.
- Acquire and refine the skills necessary to effectively debrief simulated clinical scenarios and real clinical events.
- Develop a sustainable simulation-based learning program.

#### **Competence changes**

At the conclusion of the event, learners reported an increase in competence for all course objectives (average based, used 1-5 Likert Scale 1 – never use strategy, 5 – always use strategy).

- Design and execute highly realistic multidisciplinary simulated clinical scenarios during the course – increased by 167% (4/10/13), 63% (5/21/13), 70% (7/31/13)
- Develop strategies to incorporate simulation skills into professional practice – increased by 146% (4/10/13), 106% (5/21/13), 86% (7/31/13)
- Effectively debrief simulated clinical scenarios and real clinical events – increased by 106% (4/10/13), 113% (5/21/13), 167% (7/31/13)
- Create and sustain a successful simulation-based learning program – increased by 230% (4/10/13), 121% (5/21/13), 129% (7/21/13)

#### **Performance changes**

Based on the post 3 months survey responses.

**4/10/13**

100% learners indicated that they implemented changes into their practice. The changes included debriefing and new teaching techniques.

Likert scale 1-5 (1-never, 5 – always) was used to measure application of course objectives into practice. The mean response to implementation of all objectives is 4.00-4.75

**5/21/13**

100% indicated that they implemented changes to their practice. The changes included debriefing simulations, delineating roles in resuscitations, give feedback.

Likert scale 1-5 (1-never, 5 – always) was used to measure the application of course objectives into practice. The mean response to implementation of all objectives is 4.0-4.75

**7/31/13**

100% indicated that they implemented changes in their practice. The changes included debriefing and improving communication skills.

Likert scale 1-5 (1-never, 5 – always) was used to measure the application of course objectives into practice. The mean response to implementation of all objectives is 3.00-3.50.



## Appendices

### **Appendix A - Pfizer Final Report: CISL CME Activities**

November 2013

Prepared by David Gaba, MD; Candace Pau, MD; Sandi Feaster, RN, MS, MBA;

and Susan Eller, RN, MSN

Over the three-year funding period spanning January 2010 to December 2012, Pfizer grant funds have supported the development and implementation of a wide variety of continuing medical education (CME) simulation programs at the Center for Immersive and Simulation-based Learning (CISL).

CISL's primary immersive learning facility within Stanford School of Medicine, the Goodman Immersive Learning Center (ILC), has supported a large number of simulation activities in alignment with the goals of the Pfizer Grant proposal: to develop a self-sustaining, integrated CME curriculum using simulation methodologies to improve care at Stanford, and to share the model of simulation-based education with other institutions to improve physician practice and ultimately patient outcomes.

To carry out these objectives, CISL created an Education Development Specialist position to oversee ongoing CME simulation programs, as well as to coordinate the creation of new CME curricula. The job functions of the Education Development Specialist included collaborating with Stanford School of Medicine faculty to develop and implement educational activities, evaluating and improving the effectiveness of teaching methodologies, and developing strategies for distribution of educational content beyond Stanford. In Years 1 and 2 of the funding period, this position was filled by Kim Yeager, RN, MEd, who was succeeded by Candace Pau, MD beginning in July 2012.

The CME simulation programs produced and conducted at the ILC have been designed to meet the highest level of ACCME accreditation standards, including interactive learning and evaluation. From conception to implementation, each CISL course undergoes an iterative process of review and revision. Feedback and evaluations of completed courses is solicited from both participants and instructors; this data is carefully analyzed and taken into consideration to make improvements to ongoing programs. A summary of CME simulation courses at CISL in various stages of development, accreditation, course conduct, evaluation, and redesign are detailed below.

## **COURSES DIRECTED BY CISL**

### **Crisis Resource Management Instructor Workshop**

The CISL Crisis Resource Management (CRM) Instructor Workshop is a 2.5-day, fully immersive course offered to teams of 8-10 individuals. The objective of the workshop is to prepare learners to create and deliver simulation-based programs at their home institution via a comprehensive, hands on curriculum covering all aspects of simulation course development. Led by renowned simulation pioneer and expert Dr. David Gaba, the workshop addresses experiential learning theory, curriculum development, simulation scenario design and implementation, and debriefing skills. Participants in the course have the opportunity to create, run, and evaluate their own simulation scenarios, from development of learning objectives to program execution. During the workshop, they receive invaluable personalized and timely feedback regarding their scenario design and debriefing technique, made possible by the high instructor-to-participant ratio in the course. The team-based nature of the course encourages community building and group cohesiveness among the participants, facilitating the transfer and continued application of acquired skills at the participants' own institution after the conclusion of the course. The CRM Instructor Workshop has consistently received extremely positive evaluations from participants. A participant in the April 2013 course remarked, "The mix of hands-on training and active discussion and participation was perfect. This course has somehow, unbelievably, generated a great deal of excitement and enthusiasm in the participating faculty in simulation and developing/increasing its use at our institution. Very seldom have I been this inspired!" During the three-year Pfizer grant period, a total of three CRM Instructor Workshop courses were offered.

Based on the positive reception of the team-based CRM Instructor Workshop and numerous inquiries regarding a course for individuals, CISL has begun piloting a modified version of the workshop aimed at individual registrants. This 2-day Simulation Instructor Course, designed for novice and intermediate clinical instructors, incorporates many of the elements of the CRM Instructor Workshop, while increasing the focus on individual debriefing practice and coaching. Many Stanford faculty and staff have expressed a strong interest in formal simulation instructor training via a CISL course, and it is CISL's goal to ensure all SUMC instructors using immersive and simulation-based learning techniques have taken an instructor course. The Simulation Instructor Course curriculum continues to be refined based on feedback from pilot session participants; application for CME accreditation is planned for 2014.

Additionally, CISL has also begun to develop several interactive web-based e-learning modules based on the CRM Instructor Workshop curriculum. Initially conceived as a supplement to the live workshop activity (to increase hands-on time by moving some of the didactic content to an online format), these modules may eventually be expanded to function as stand-alone enduring materials that can be accessed by learners, regardless of whether they are attending a live session. The first module in the series, covering the first steps in the scenario design process, was recently completed and will be piloted with participants in upcoming Simulation Instructor Courses.

### **Debriefing Course**

The CISL Debriefing Course is an intensive 1-day course designed for learners who have little to no experience in the art of debriefing or those who need to refresh their skills. Debriefing allows physicians and other allied healthcare professionals the rare opportunity to review a critical event or near miss and ascertain what worked well, what needed improvement and the key insight into *why* things went the way that they did. Debriefing is useful both after a simulation *and* after actual patient care events, yet the majority of physicians have little to no training or special experience in facilitating debriefings. The skills taught in this course are transferrable to a number of challenging discussions that clinicians face regularly. Based on feedback from participants in both this course as well as CISL instructor courses, CISL is developing an Advanced Debriefing Skills Workshop for more experienced instructors (e.g., those who have already taken an introductory CISL instructor course). This course will cover advanced techniques, such as video-assisted debriefing, and offer participants additional personalized coaching.

### **Maintenance of Certification in Anesthesia Course**

The Maintenance of Certification in Anesthesia (MOCA) course is a mandatory component of recertification by the American Board of Anesthesiology. Diplomates of the Board obtaining their initial certification after the mid-2000s must undergo a repeating 10 year cycle of MOCA activities. One of the activities in Part IV of MOCA is a simulation course—offered by a program endorsed by the American Society of Anesthesiologists Simulation Editorial Board—in which participants must declare, and later complete, a practice improvement plan based on their experience in the course.

Stanford's MOCA Simulation Course has been offered multiple times yearly since 2010 (on average, 6 times per year) and features a 3:5 or higher faculty-to-participant ratio. MOCA instructors at Stanford are all CISL core faculty members with extensive training and experience in simulation-based teaching. The 1-day MOCA course is predominantly hands-on, offering each participant the opportunity to be the primary anesthesiologist in a simulation scenario, as well as the first responder in another. All participants take part in the debriefing session for each scenario, which includes reflection on ways to improve their practice at their home institutions, as well as how to overcome systems barriers to implementing their practice improvement plans. The simulation scenarios offer practicing anesthesiologists the chance to review and prepare for low volume, high risk events. In many cases, the simulation course represents the only opportunity for participants to practice the management of these rare diagnoses. The course also strongly emphasizes non-technical skills of crisis resource management, such as leadership, communication, and dynamic decision making.

A unique element of Stanford's MOCA Simulation Course is the incorporation of cognitive aids into the curriculum. The Stanford Emergency Manual is a cognitive aid for the management of perioperative critical events, developed by the Stanford Anesthesia Cognitive Aid Group (see recent article in the November 4, 2013 issue of *Inside Stanford Medicine*; <http://med.stanford.edu/ism/2013/november/checklists-1104.html>). The content and format of the Emergency Manual was tested and refined in an iterative process of the course of many

years of simulation training activities. The finalized manual was made available for public access in 2013 and has been used extensively in the Stanford MOCA course. Participants are introduced to the concept of cognitive aids at the beginning of the course and encouraged to utilize the Emergency Manual throughout the simulation scenarios. Participant response to the course in general has been positive, with many reporting the cognitive aids to be particularly beneficial to practice improvement. Several of Stanford's MOCA course alumni have implemented cognitive aid use at their home institutions as a practice improvement project.

Since 2012, Stanford has been involved in a multi-center AHRQ-funded grant project to graft performance ratings on to the MOCA simulation scenarios. Volunteers in the study have their performance evaluated in real time by a trained faculty rater, as well as have video of their simulation scenario evaluated post-hoc by a blinded rater. The data from this study will inform understanding of performance evaluation and the assessment of clinical competency. Such information may be useful in development of future CME programs that include an evaluative component, either for certification purposes or to provide formative feedback to participants.

## **COURSES HELD IN THE ILC WITH CISL OVERSIGHT AND COLLABORATION**

### **Advanced Pediatric Life Support Simulation Course**

The Advanced Pediatric Life Support (APLS) course is a 2-day workshop that involves both procedural skills training with part-task physical trainers and mannequin-based simulation. Covering a wide range of pediatric emergency situations, APLS provides practitioners in a variety of specialties the opportunity to review relevant medical knowledge and techniques, as well as practice crisis resource management principles, such as dynamic decision making and teamwork. APLS is currently offered biannually, with faculty instructors from numerous departments in the School of Medicine, including Emergency Medicine, Pediatrics, Surgery, Anesthesia, and Critical Care. CISL faculty and staff work closely with the course directors to create and review simulation scenarios and task training stations in preparation for the course, initiating modifications to the curriculum based on their observations of each session as well as participant feedback.

### **Point of Care Ultrasound Course**

The course "21<sup>st</sup> Century Medicine: Utilizing Point-of-Care Ultrasound to Optimize Patient Care, Safety, and Satisfaction" is a procedural workshop offered at the ILC by the Division of Emergency Medicine. The 1-day course is targeted at a wide range of practitioners from various specialties and was held twice in 2012. The course curriculum was designed in consultation with CISL faculty and staff, and included hands-on practice for participants with ultrasound equipment, including the EchoSim echocardiography trainer in the ILC.

### **Difficult Airway Course**

The Stanford Advanced Airway Management and Fiberoptic Course is a 2-day intensive workshop designed for practitioners from Anesthesia, Emergency Medicine, and Critical Care. Held in the ILC, the program utilizes state of the art equipment, such as advanced airway trainers, to teach airway management techniques. The course includes a hands-on component that focuses on fiberoptic intubation, as well as a difficult airway skills workshop, in which participants rotate through 10 different skills stations, each featuring task training practice. The course was first offered in 2012 and continues to be held on an annual basis.

Many additional new courses have been piloted at the ILC for various learner groups. These include standardized patient programs for difficult communication scenarios, mannequin-based simulations addressing diagnosis and management of stroke, and others. These courses could potentially be expanded, space and resource permitting, to be offered to external participants as CME activities. In addition, the ILC facility and resources have been utilized for the creation of enduring materials and online learning programs. For instance, the ILC was used to create trigger videos for the online CME course “Teaching Basic Bedside Transthoracic Echocardiography and Ultrasonography Examination to Evaluate Hypotension and Hypoxemia” The use of the ILC as a “film studio” has been critical for the creation of a variety of materials for other CME and non-CME curricula. Such enduring materials would be very hard or expensive to create in actual patient care environments. All of these activities are carefully reviewed and overseen by CISL faculty and staff, who provide guidance and mentorship to instructors from various departments interested in using immersive and simulation-based modalities in their curricula.

Building on the programs that have been established with the assistance of the Pfizer grant funds, CISL will continue to explore new and innovative methods of using immersive and simulation-based techniques to enhance continuing clinical education for experienced practitioners. As courses are piloted and refined, they will become part of the CISL core CME curriculum. Based on participant feedback from current CISL CME offerings, course registrants find the experiential learning and interactive nature of simulation-based activities to be highly impactful and worthwhile. However, the intensive nature of immersive learning programs necessitates considerably more personnel and resources in both the planning and execution phases than traditional didactic activities (e.g., lectures). Sustainability of simulation-based programs remains a fundamental concern; continued support for an CISL Education Specialist, such as was provided by the Pfizer grant, will be essential to the longevity and success of CISL CME courses in the future.

## **Appendix B - Center for Advanced Pediatric and Perinatal Education**

October 14, 2013

Prepared by Louis Halamek, MD

### **Summary**

CAPE received a \$100,000 grant in 2010 to develop and pilot a simulation-based continuing medical education (CME) program for multidisciplinary team training (drills) in the delivery room. This series of drills was extremely successful and generated tremendous momentum for improving human performance and reducing system inefficiency and risk during maternal cardiac arrest in the delivery room (please refer to the 2010 progress report for details). In 2011, CAPE received a second \$100,000 grant to continue development of CME for simulation-based learning to improve performance and outcomes in neonatal resuscitation. This phase of work focused on the CME accreditation of NeoSim, CAPE's simulation-based neonatal resuscitation program. The funds were used to support the salary and benefits of CAPE staff to cover their time spent working with the CME office on the application, conducting the CME programs and participating in the follow-up assessment of program quality. Overall, the projects funded in 2010 and 2011 have successfully facilitated skill acquisition in practicing health care professionals and translated into substantial improvements in patient safety. In 2012, CAPE received a final award of \$75,000 to support the creation and delivery of three programs: NeoSim (piloted in 2011), the CAPE Simulation Instructor Training Program and the Maternal and Neonatal Arrest Simulation Program.

### **NeoSim: Simulation-based Neonatal Resuscitation Program**

#### **Program Specifics**

The CME program NeoSim, initially accredited in 2011 and reaccredited in 2012, has been a cornerstone program for CAPE since its inception in 2002. NeoSim emphasizes three important skill sets (cognitive, technical and behavioral) necessary to successfully resuscitate critically ill newborns. The program is intensive, hands-on and engaging, allowing trainees the rare opportunity to experience in a single day a variety of low-volume, high-risk clinical situations that may take months to years to encounter in the real clinical environment. NeoSim highlights and reinforces the most recent changes in the 2010 Neonatal Resuscitation Program (NRP) practice guidelines and resuscitation algorithm set forth by the American Academy of Pediatrics and the American Heart Association. Targeted scenarios provide trainees the ability to assimilate and apply these new recommendations during simulated real-life resuscitation situations such as managing neonates with perinatal depression, meconium-stained amniotic fluid, congenital anomalies and hypovolemia. This program was extremely well received by the multiple healthcare disciplines in attendance.

## **Achievements**

A total of four CME-accredited NeoSim programs were held during this year's grant funding cycle. The trainees included 19 physicians, 6 respiratory therapists and 5 nurses. The interdisciplinary nature of this program allows for a high fidelity experience that allows the team to improve their ability to communicate effectively, demonstrate strong leadership skills and delegate critical tasks while actively performing life-saving procedures. The written feedback from the trainees coupled with their verbal commentary reflects the power of the program and its ability to impact daily practice.

Trainees reported changes in competence from 25-67% for behavioral skills. Behavioral skills have been cited as problematic in root cause analysis of perinatal morbidity and mortality cases. These skills, although not covered in traditional training programs, are a focus of NeoSim. In addition to behavioral skills, trainees have the opportunity to practice technical skills in a time-pressured environment.

Comments from trainees include:

- "It was a great day of practice and learning."
- "Excellent. All instructors very approachable."
- "Terrifying but very helpful."

## **CAPE Simulation-based Instructor Program**

### **Program Specifics**

The CAPE Simulation-based Instructor Training Program is an intensive three-day offering that prepares medical educators to integrate the methodology of simulation into their current and future educational programs. Content includes scenario design including how to write effective learning objectives, the art of debriefing and building a sustainable program. Trainees come from around the world to attend this program and we continue to receive referrals from alumni. They leave this program with the skills and ability (at a novice level) to begin using this methodology at their home institution. Given the increasing acceptance of simulation-based training by healthcare and educational institutes alike, we anticipate continued interest in and success with this program.

### **Achievements**

Since approval was received in April, CAPE has hosted three Instructor Programs. These programs consisted of multidisciplinary trainees including ten physicians, one registered nurse transport specialist, one respiratory therapist and ten registered nurses. The evaluations from the program reflect an overwhelmingly positive response to participation including comments such as:

- "I thought it was exceptional. I honestly don't have anything critical to say. I learned so much, much more than I expected to. It was very well done."
- "This was a very rich course with a variety of learning opportunities. The variety and participation of other trainees added significantly to this course."
- "Cannot wait to put it to use and come back for further training."
- "Great course, great instructors, great opportunity to practice new skills."

In terms of changes in overall competence trainees reported an increase of 167% - 300% in the learning objectives stated for the program. The biggest barriers to implementing these changes were reflective

of the challenges inherent in changing culture within an institution and the financial restrictions that may be present. The content of the program provides tools and strategies to assist with these barriers. In addition, CAPE faculty continue to serve as resources for trainees and act as a lifeline when they return to their home institute and begin to employ their new skills.

### **CAPE Maternal and Neonatal Arrest Simulation Program**

#### **Program Specifics**

The CAPE Maternal and Neonatal Arrest Simulation Program is a groundbreaking educational offering that brings together a challenging clinical situation – how to resuscitate a maternal patient and subsequently resuscitate her newborn after a perimortem cesarean section. Given the complexity of working through two different algorithms (maternal and neonatal) and organizing teams in a confined space, it is essential that teams train together in order to become more efficient and understanding of each other's roles. This program brings together years of simulation expertise, in-depth analysis of resuscitation of the pregnant woman, and world-renowned experts in the field of obstetric anesthesia, obstetrics and neonatology. A variety of methods are employed to engage trainees including small group discussion, skills stations, drills and immersive simulations followed by facilitated debriefings. In addition the program affords trainees the opportunity to complete training in Basic Life Support (BLS) and the Neonatal Resuscitation Program (NRP). The core content also includes topics that are pertinent to Advanced Cardiac Life Support (ACLS) but as it applies to the maternal patient (in whom special considerations must be taken into account during resuscitation). This program is extremely labor intensive. The program provides multiple opportunities to practice cognitive, technical and behavioral skills in the context of a highly realistic simulated clinical scenario.

To date one such program has been conducted. Trainees included four physicians (two of the four were residents), one registered nurse transport specialist, and four registered nurses. The feedback from this program was also complimentary of both faculty and content. Comments included:

- “Material is excellent.”
- “Instructors are very good.”

In addition to the praise for the program, 100% of trainees reported that they intend to make changes to their practice as a result of attending this program. These changes include:

- delegating workload early and clearly
- communicating clearly
- calling for help early enough
- verifying that all important roles are assigned
- practicing and refining assessment techniques.

Future programs are currently being planned. This program will continue to be held (without CME credit) for our internal audience of residents and staff nurses.



### **Future Plans**

The past three years of funding have significantly contributed to CAPE's ability to deliver simulation-based learning activities that drive critical performance improvements in personnel and practices from Lucile Packard Children's Hospital and hospitals across the country. Through these CME activities, we have examined our current practices, developed strategies to improve both maternal and neonatal resuscitation in the hospital environment and developed methods of incorporating new resuscitation guidelines into training on an ongoing basis. As a leader in simulation-based learning, part of CAPE's mission is to disseminate the knowledge we have gained and inspire others to include behavioral skills in their clinical practice and the methodology of simulation in their education offerings. In doing so we have made a tremendous contribution to healthcare professionals and patients on a local, regional, national and international level.

## **Appendix C - Stanford Faculty Development Center for Medical Teachers**

November 2013

Prepared by Georgette Stratos, PhD & Kelley Skeff, MD, PhD, Co-Directors  
with data analysis assistance from Patricia A. Madden, MPH, Research Assistant

### **Summary Report:**

#### **Faculty Development Support for the Pfizer CME Grant**

In this report, we describe activities undertaken from 2010-2013 by the Stanford Faculty Development Center for Medical Teachers (SFDC) in support of the Pfizer CME grant's faculty development goals. These activities were related to two major goals:

- to develop and conduct faculty development workshops on teaching in order to assist medical professionals to incorporate principles of effective teaching in planned CME activities
- to collect and analyze data to evaluate the effectiveness of the workshops.

### **Training Activities**

#### Workshop Design

To meet the Pfizer grant's objective to enhance the teaching effectiveness and innovativeness of faculty who present CME courses, the SFDC's co-directors, Drs. Kelley Skeff and Georgette Stratos, developed a teaching improvement workshop based on their

"Clinical Teaching" course. The workshop was designed to:

- (1) introduce participants to an educational framework for analyzing teaching that encompasses seven categories: Learning Climate, Control of Session, Communication of Goals, Promotion of Understanding and Retention, Evaluation, Feedback, and Promotion of Self-Directed Learning
- (2) increase their versatility as teachers
- (3) foster a collegial exchange about teaching among faculty.

In addition to introducing a comprehensive framework, participants in the workshop received in-depth mini-workshops on a subset of the seven categories. The workshops were highly interactive, employing a variety of instructional methods including mini-didactics, group discussion, review of video re-enactments of actual teaching encounters, role play, worksheet exercises, and personal goal setting.

#### Workshop Implementation

A total of six workshops were conducted during the course of this project for 85 participants (see Table 1). The workshops ranged from one to 1.5 days in length. All were offered CME credit for their participation. [Note: two staff from the Stanford CME Office attended an additional workshop on principles of effective instruction offered by the SFDC for medical education research and administrative staff in August 2013.]

Workshop faculty included Drs. Skeff and Stratos as well as faculty from Stanford and nearby institutions (University of California, Davis; University of California, San Francisco) who had been trained previously by the SFDC as “Clinical Teaching” facilitators. The first workshop was conducted on August 16-17, 2010 in collaboration with the Stanford CME Office. Participants came from Stanford Hospital, the VA Palo Alto Health Care System, and Lucille Packard Children’s Hospital. The following departments were represented: general internal medicine, general surgery, pediatrics, and otolaryngology.

Four participants from Stanford and the Palo Alto VA attended the second workshop in August 2011. [More participants were expected but were unable to attend.] The following departments participated: anesthesia, emergency medicine, neurosurgery, quality assurance.

Two 1-day workshops were conducted in 2012, on April 5th and 7th. Each was attended by 18 physician faculty from departments: anesthesia, dermatology, ENT, family medicine, hematology, internal medicine, neurology, obstetrics and gynecology, pediatrics, physical medicine, radiology, and surgery (colorectal, general and orthopedic).

Two 1-day workshops were conducted in 2013 – on January 13th and 14th – and were attended by 17 and 13 faculty, respectively. A wide variety of departments were represented: anesthesia, family medicine, hematology, infectious diseases, internal medicine, neurology, neurosurgery, obstetrics and gynecology, pediatrics, pediatric cardiology, pediatric dermatology, and pulmonary critical care. Two additional 1-day workshops are scheduled for January 2014.

**Table 1 – Teaching Workshops Dates and Participants**

<u>Date</u>	<u>Attendees</u>
August 16-17, 2010	15 physicians, nurses, allied health professionals
August 18-19, 2011	4 physicians, nurse
April 5, 2012	18 physicians
April 12, 2012	18 physicians
January 17, 2013	17 physicians
January 18, 2013	13 physicians
<u>Scheduled workshops:</u>	
January 13, 2014	20-25 physicians
January 14, 2014	20-25 physicians

### **Program Evaluation Highlights**

Program evaluation data were collected immediately after each of the workshops. A brief summary of the major findings from the analyses of the immediate post-workshop data follows. [More detailed information can be found in the annual progress reports submitted to the Pfizer Foundation.] At the end of the workshops, participants were asked to rate their own teaching performance on the seven educational categories taught during the workshops as they perceived it to be "before the workshop" and "currently" (i.e., immediately post-workshop) (Scale: 1=low, 5=high). The results from this "retrospective pre/post" questionnaire showed consistent significant retrospective pre/post differences for all seven categories ( $p < 0.001$ ) (Table 2). These significant differences represented shifts in a positive direction, that is, towards improved teaching performance. It is notable that two of the categories received mean retrospective-pre ratings lower than the mid-point of the scale: Communication of Goals ( $M=2.96$ ,  $SD=0.82$ ) and Feedback ( $M=2.90$ ,  $SD=0.76$ ).

**Table 2. Stanford Faculty Members' Teaching Self-Assessments:**  
Retrospective Pre/Post Means (N=75)

	Retrospective Pretest		Posttest		Retro Pre/Post	
	Mean (SD)		Mean (SD)		t-test*	p value
Learning Climate	3.50	(0.86)	4.30	(0.70)	9.27	0.000
Control of Session	3.01	(0.77)	3.81	(0.79)	9.35	0.000
Communication of Goals	2.96	(0.82)	4.05	(0.77)	10.72	0.000
Understanding & Retention	3.05	(0.72)	3.89	(0.70)	9.35	0.000
Evaluation	3.06	(0.64)	3.64	(0.66)	7.40	0.000
Feedback	2.90	(0.76)	3.57	(0.83)	6.82	0.000
Self-Directed Learning	2.93	(0.73)	3.93	(0.77)	12.11	0.000

\* *Correlated, two-tailed t-test*

In general, participants' ratings of the usefulness of the teaching workshop were very positive. Mean ratings of the benefits of the workshop (1=definitely not, 5=definitely yes) indicated that it was perceived as highly useful (M=4.84, SD=0.40) and that participants would highly recommend it to others (M=4.82, SD=0.42). Participants' ratings indicated that, prior to attending the workshop, they were less sure that it would be useful (M=4.26, SD=0.74). The difference between their anticipated and final perceptions of workshop usefulness was consistently found to be statistically significant (t-test=6.04, p<0.001). Notably, all participants generated specific action plans for making changes in their teaching practice that were related to the content presented in the workshops.

In addition to the evaluation immediately post-workshop, efforts were made to collect 3-month post-workshop for 2010 and 2011 workshops. The response rates were extremely low, making it difficult to summarize trends from those data. However, qualitative data analysis showed that the contents covered in the workshops continued to have relevance to respondents as they incorporated educational principles and teaching behaviors in their teaching practice.

In order to enhance the effectiveness of the workshops, we made modifications to the workshops each year based on feedback from the participants as well as discussions with Stanford CME Office staff members. We also refined recruitment strategies and timing of the workshops over the course of the project.

We have selected the following comments to highlight the perceived value of the training:

“Excellent! Really helpful in providing practical tips.”

“Outstanding: highly practical, relevant, high yield, great discussion, especially wonderful as small group, wonderful teachers and fellow students.”

“Felt validated. Open learning environment – great feedback. Encouragement for self- assessment and self-directed learning.”

“Excellent workshop with dedicated teachers in a very friendly environment.”

“Excellent, a must for all faculty.”

In conclusion, the participating faculty was highly enthusiastic about the workshops’ value in improving their teaching practice. We look forward to assisting two additional groups of medical faculty early in 2014. We would like to express our sincere appreciation to Stanford’s Continuing Medical Education Office and the Pfizer Foundation for the opportunity to work on this project.