Cardiac Critical Care 2011

Lance Cohen, MD MBBCh FCCP

Open Heart Surgery Program

Lance Cohen, MD MBBCh FCCP
Medical Director - HSU

Open Heart Surgery Program Team

- Cardiac Surgeons
  - Richard Perryman, MD
  - Michael Cortelli, MD
  - Juan Plate, MD

Open Heart Surgery Program Team

- Intensivists
- PA's
- NP's
- HSU nurses
- 6 North Nurses and team
- Dieticians
- PT
- Case Manager
- OR Team – Anesthesiologists, Nurses, PA's
- Data team
- Pharmacy

Open Heart Surgery Program Services

- Aorta surgery
- Endovascular and open procedures.
- Cardiac Surgery :
  - Valve (including minimally invasive)
  - CABG
  - Adult Congenital
  - Mini Maze

Open Heart Surgery Program Services

- Team approach
- Daily team rounds / multidisciplinary
- Dedicated HSU Intensivist
- 3 star center – top 13% in nation

Society Of Thoracic Surgeons (STS)

STS

Founded in 1989, the Adult Cardiac Surgery Database is the largest cardiothoracic surgery outcomes and quality improvement program in the world. This database component contains more than 4.1 million surgical records, representing approximately 90 percent of all adult cardiac surgery centers throughout the U.S. More than 1,000 surgical groups, representing more than 3,000 surgeons, add new patient data four times each year.

STS

- **Measures of CABG surgical quality, in four quality domains**
- 1. Patient survival: Risk-adjusted 30-day operative mortality.
- 2. Optimal surgical technique: Use of at least one internal mammary artery graft.

STS

- 3. Absence of complications: Risk adjusted morbidity. Patients must avoid all 5:
- a. Kidney failure
- b. Deep sternal wound infection
- c. Re-operation for any cause
- d. Stroke
- e. Prolonged breathing support

STS

4. Recommended medications: Patient must receive all 4:

- a. Preoperative beta-blocker
- b. Discharge aspirin
- c. Discharge beta-blocker
- d. Discharge antilipid therapy

STS

Other data looked at:

1. LOS
2. Intraop and Postop use of blood products
3. Cardiac rehab referal
4. Smoking cessation counceling

STS

Other data looked at:

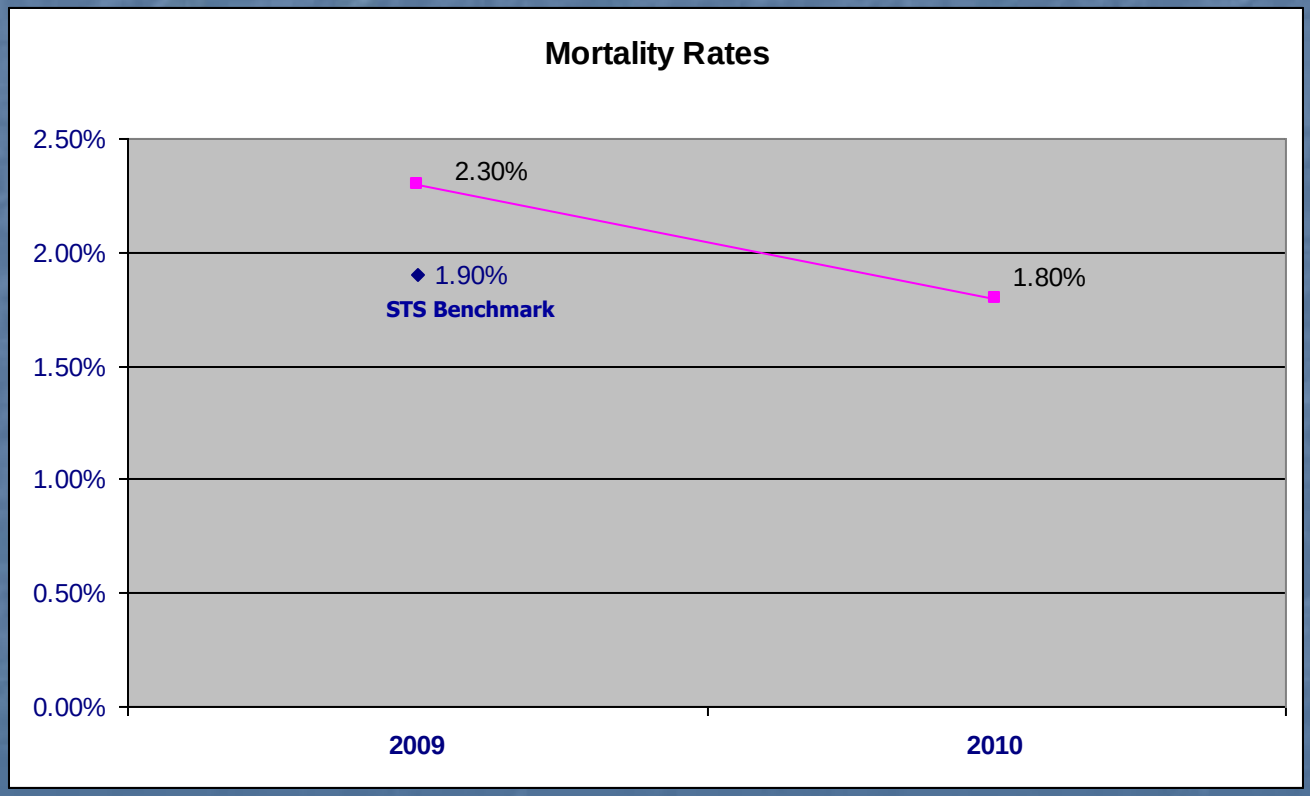
1. 30 day re-admission
2. Glucose control

Memorial Regional Hospital

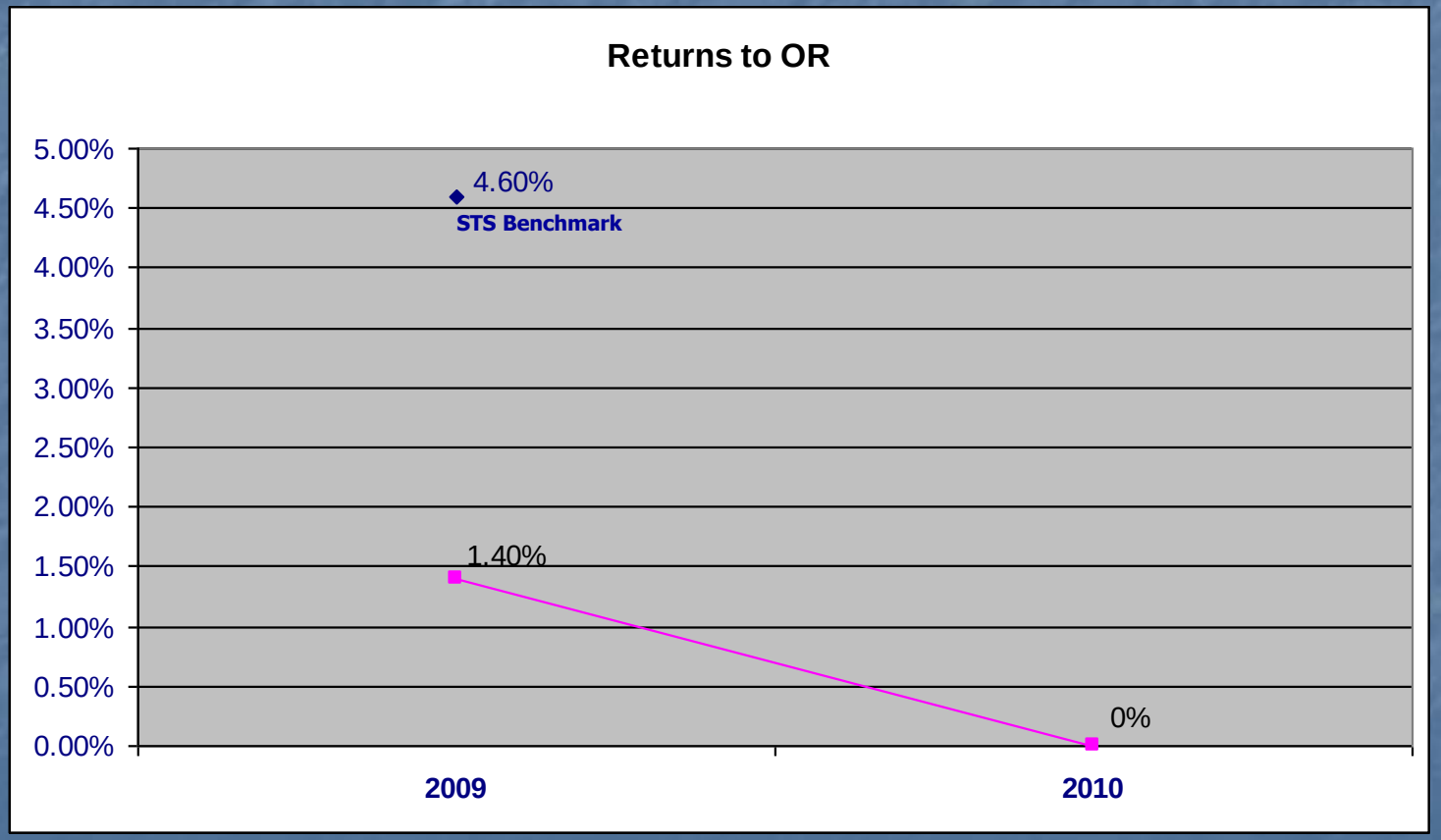
HSU CABG Data 2010

The Society of Thoracic Surgeons

HSU CABG DATA



HSU CABG DATA



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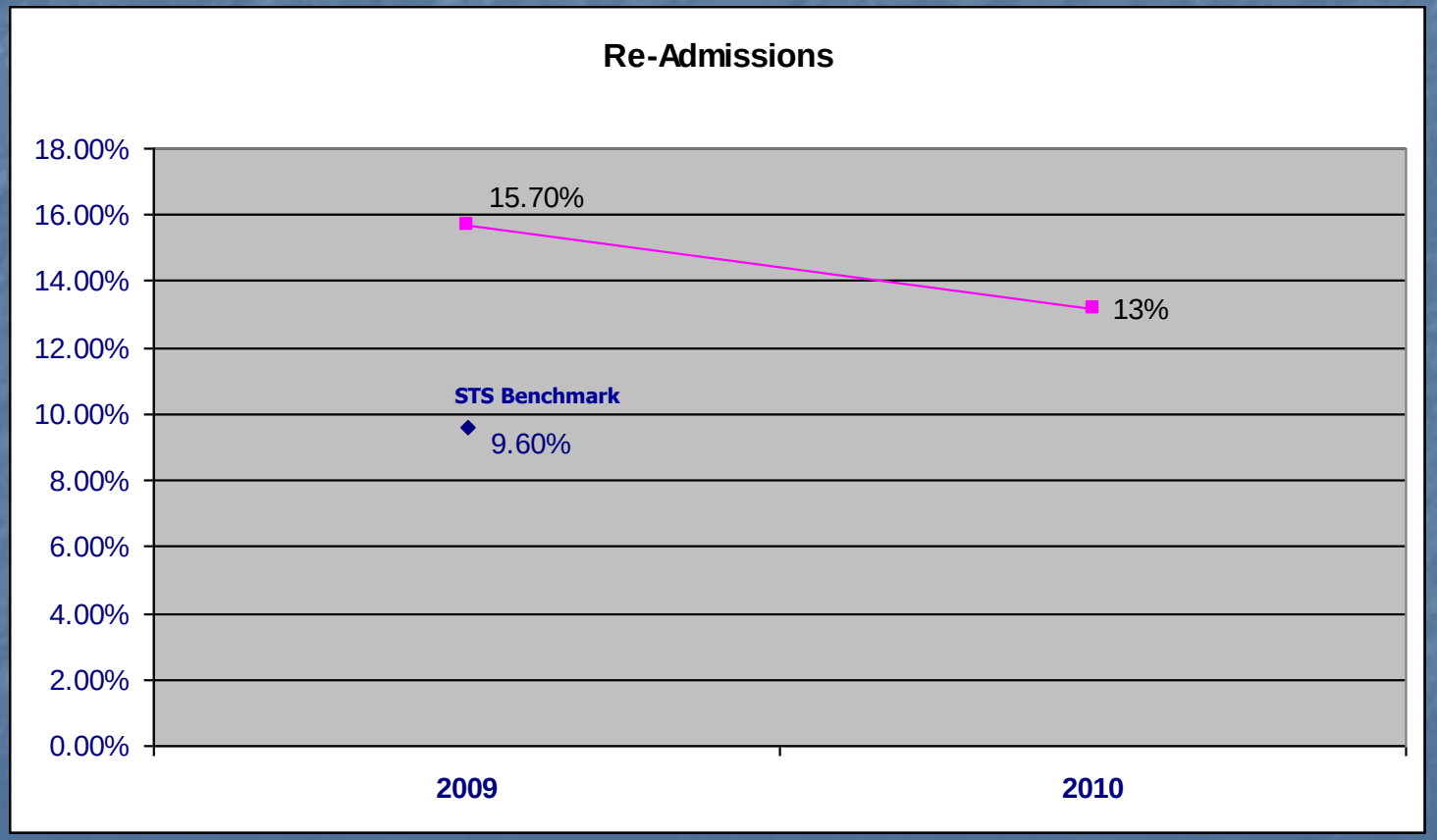
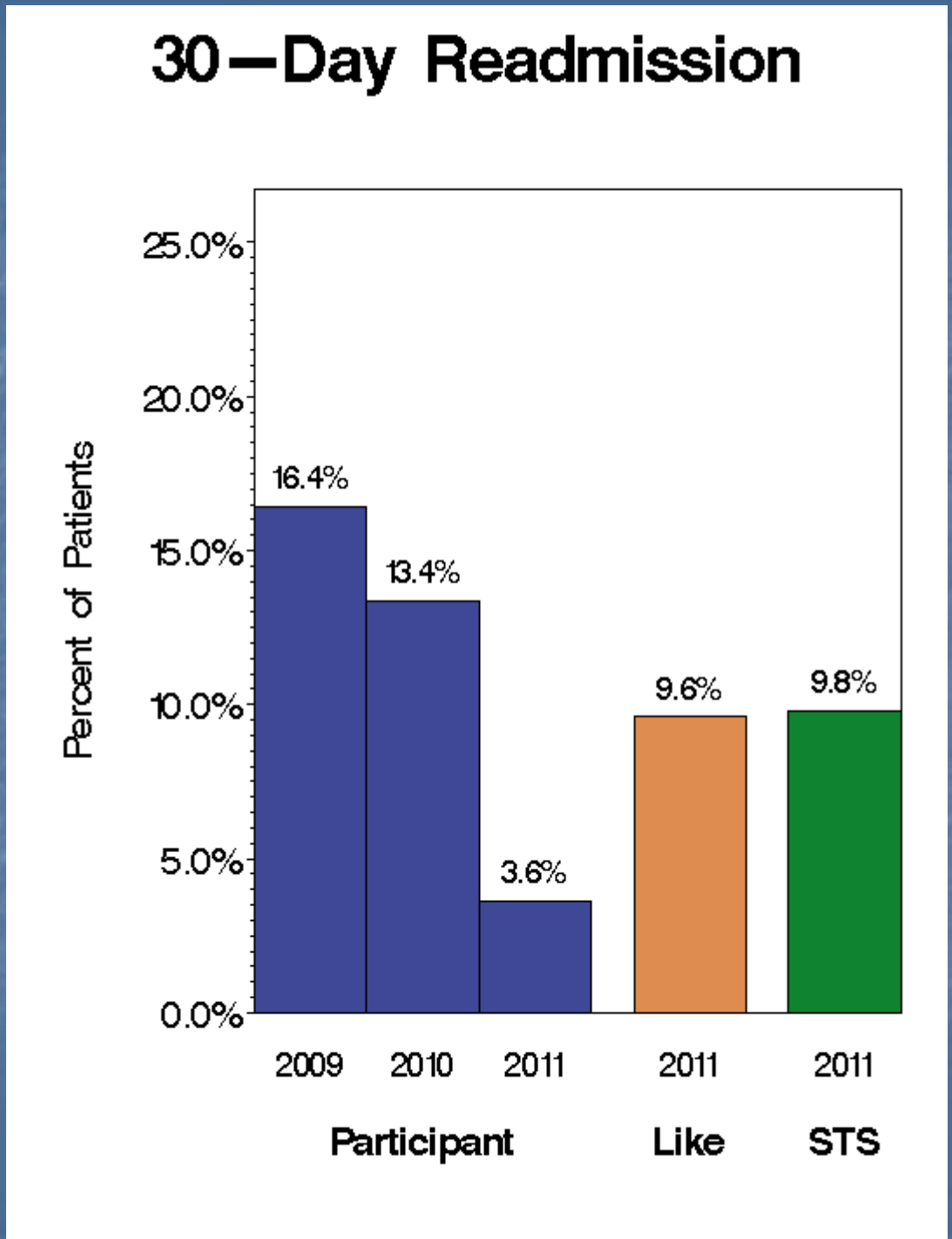


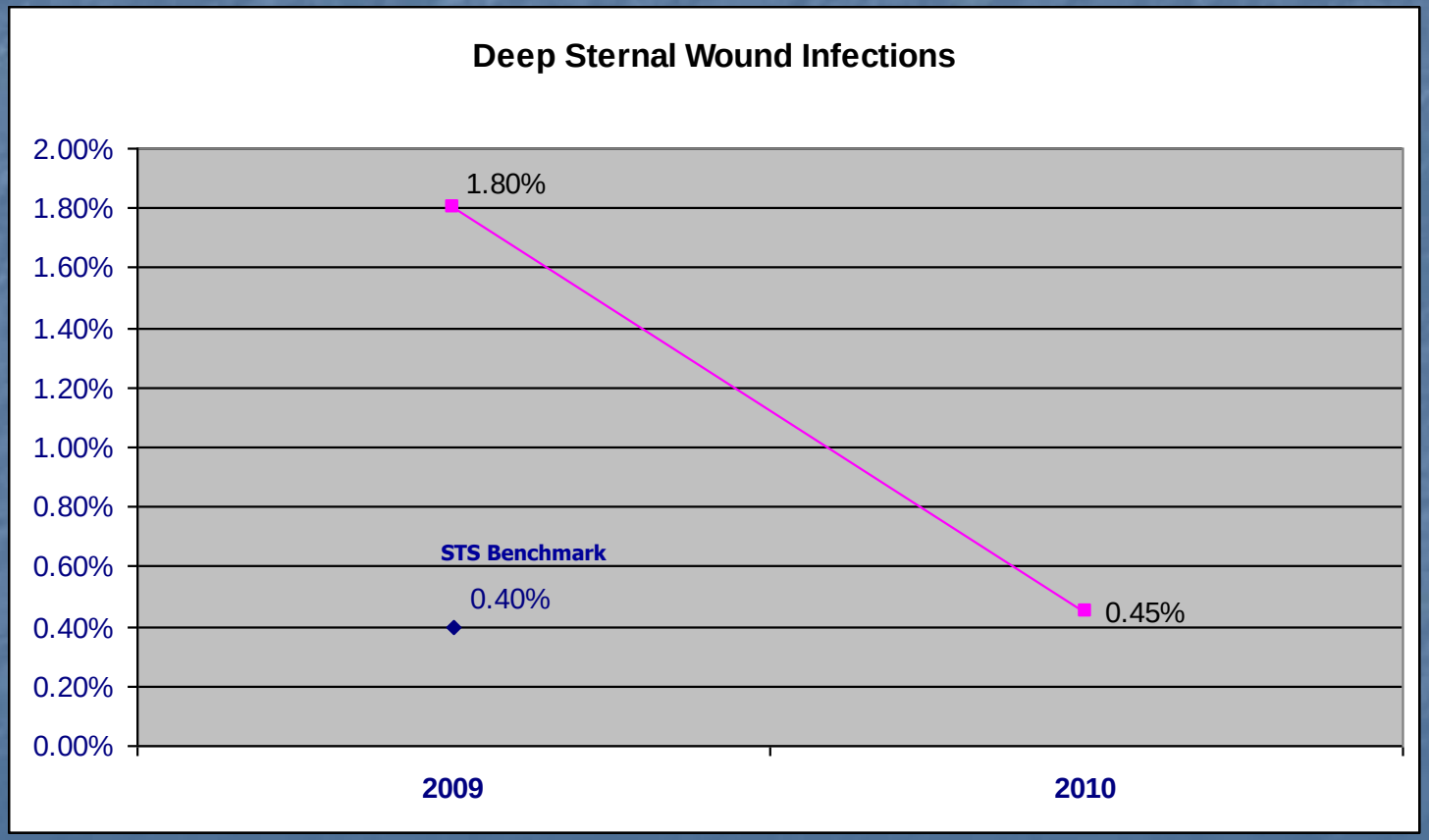
30 Day Readmission Rate

- Discharge education lectures
- Discharge process by cardiac surgery team
- Follow up visit within 1 week of discharge by CTS team
- Phone call to patients by Medical Director and nursing staff within 72 hrs.

CAB


30—Day Readmission
Percent of Patients
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
16.4%
13.4%
3.6%
9.6%
9.8%
2009
2010
2011
2011
2011
Participant
Like
STS

HSU CABG DATA



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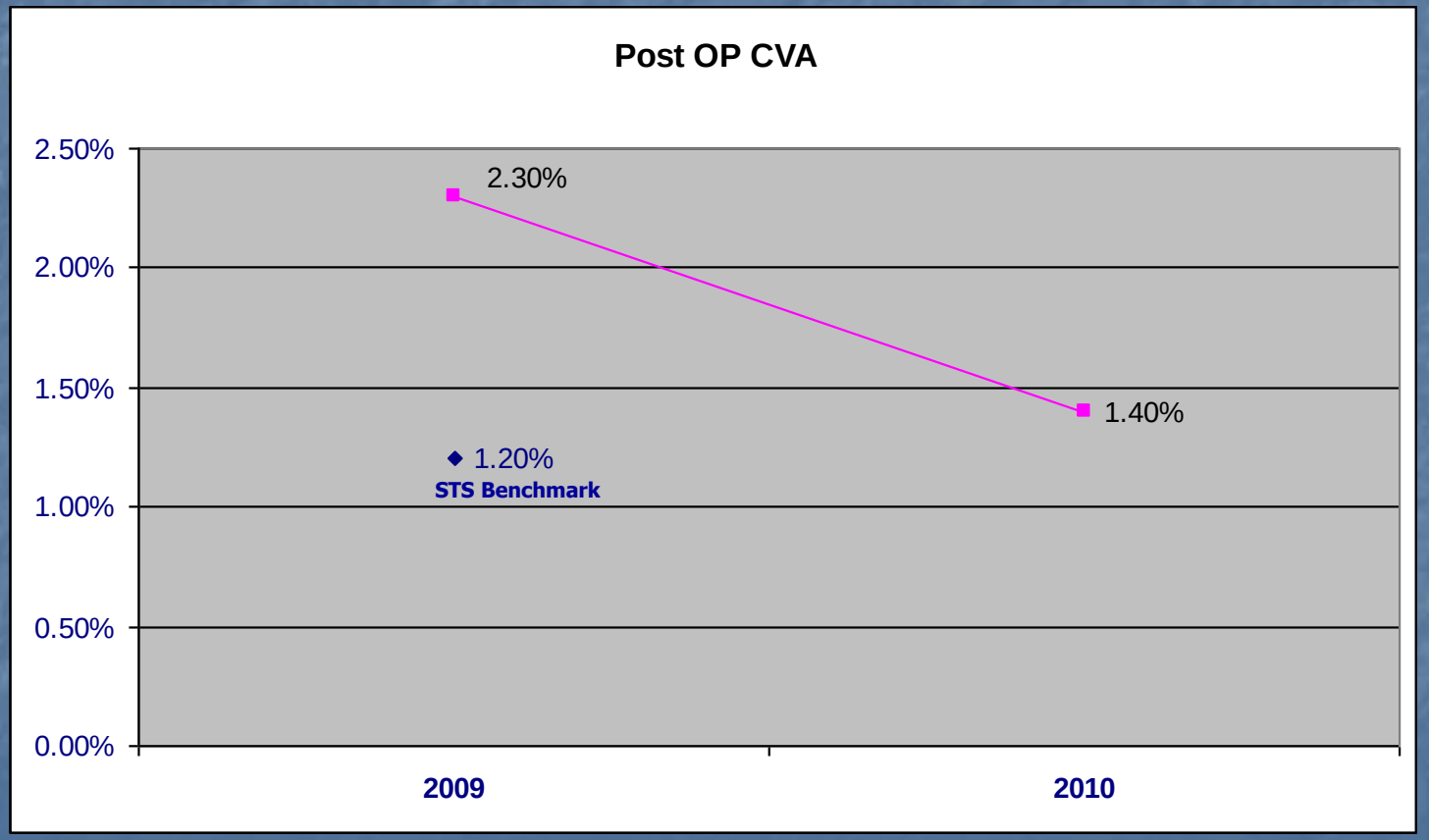

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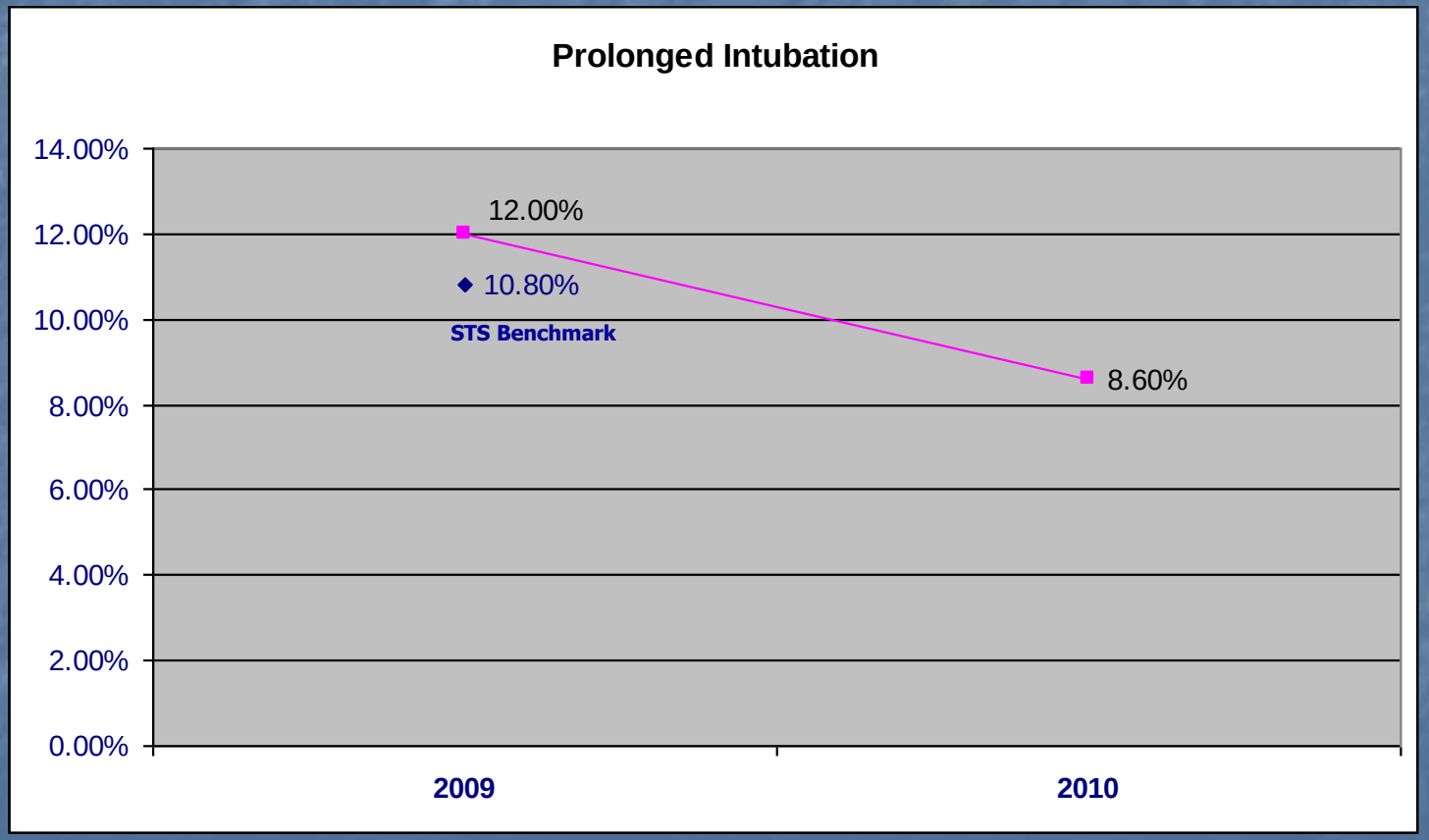

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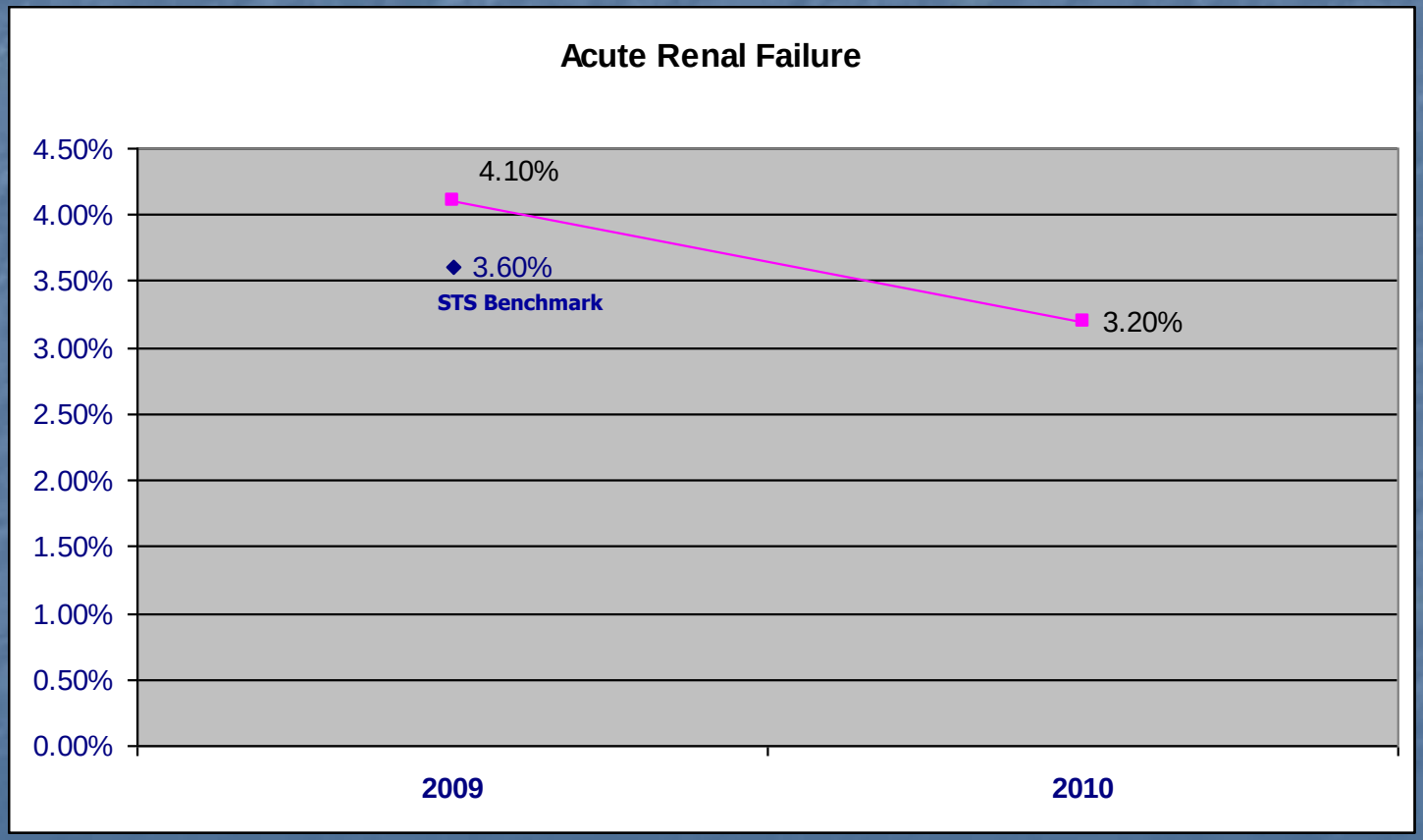

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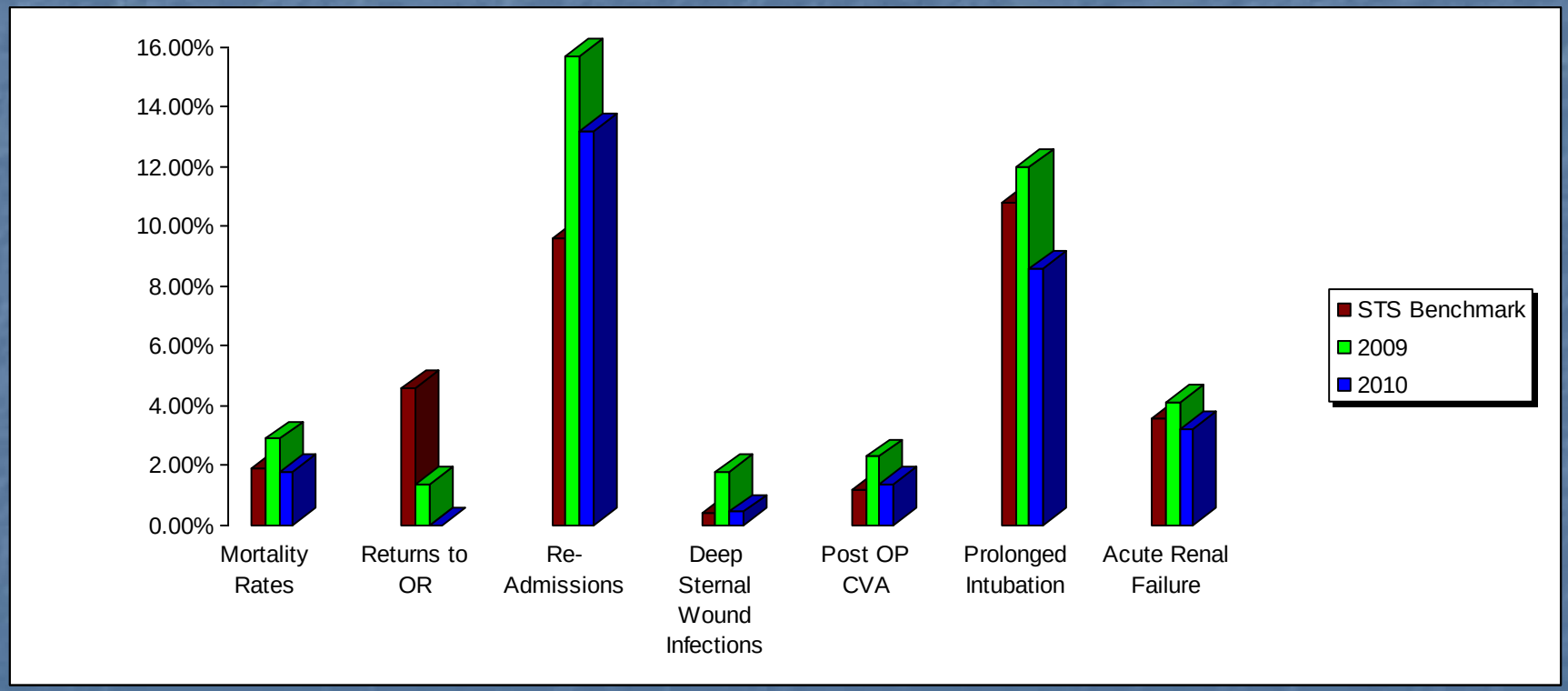
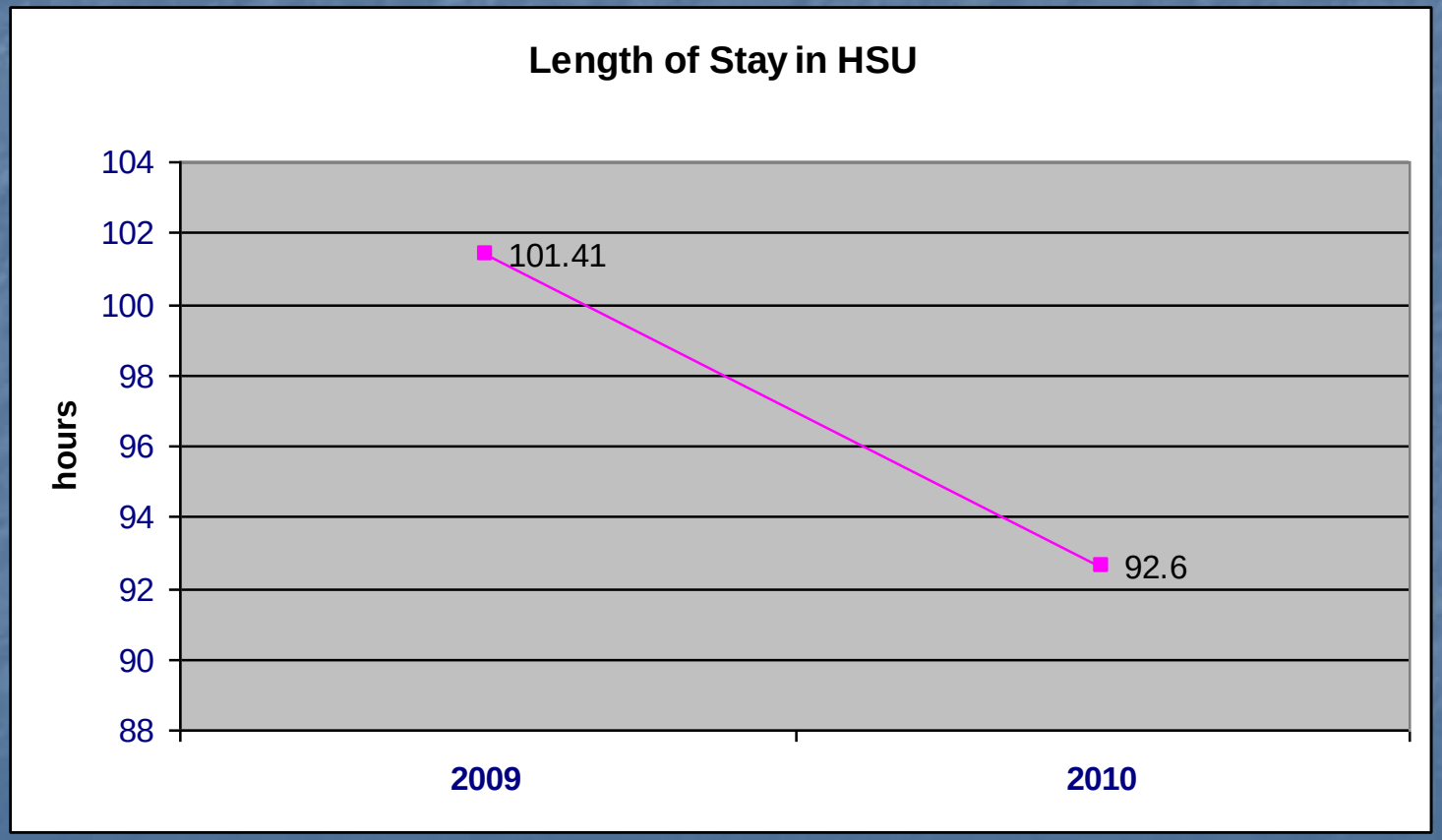
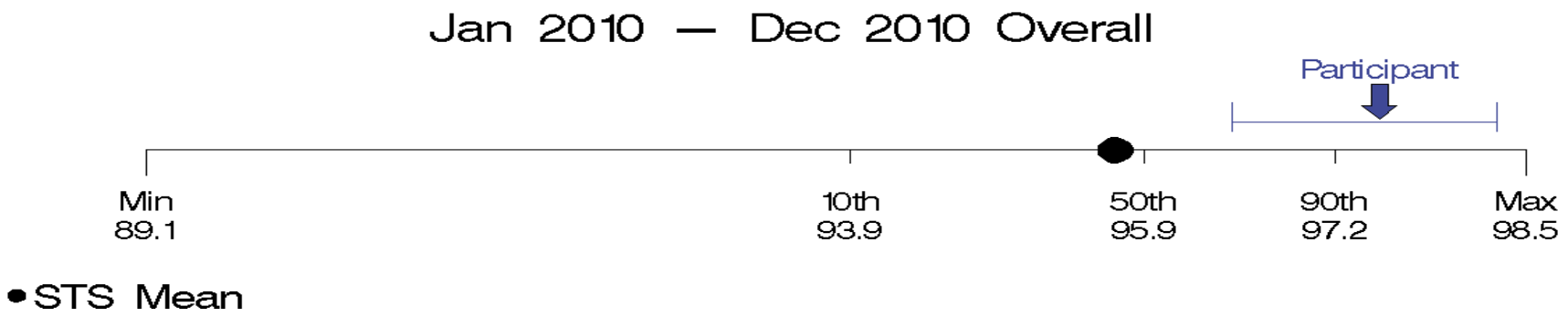


Reduction in LOS



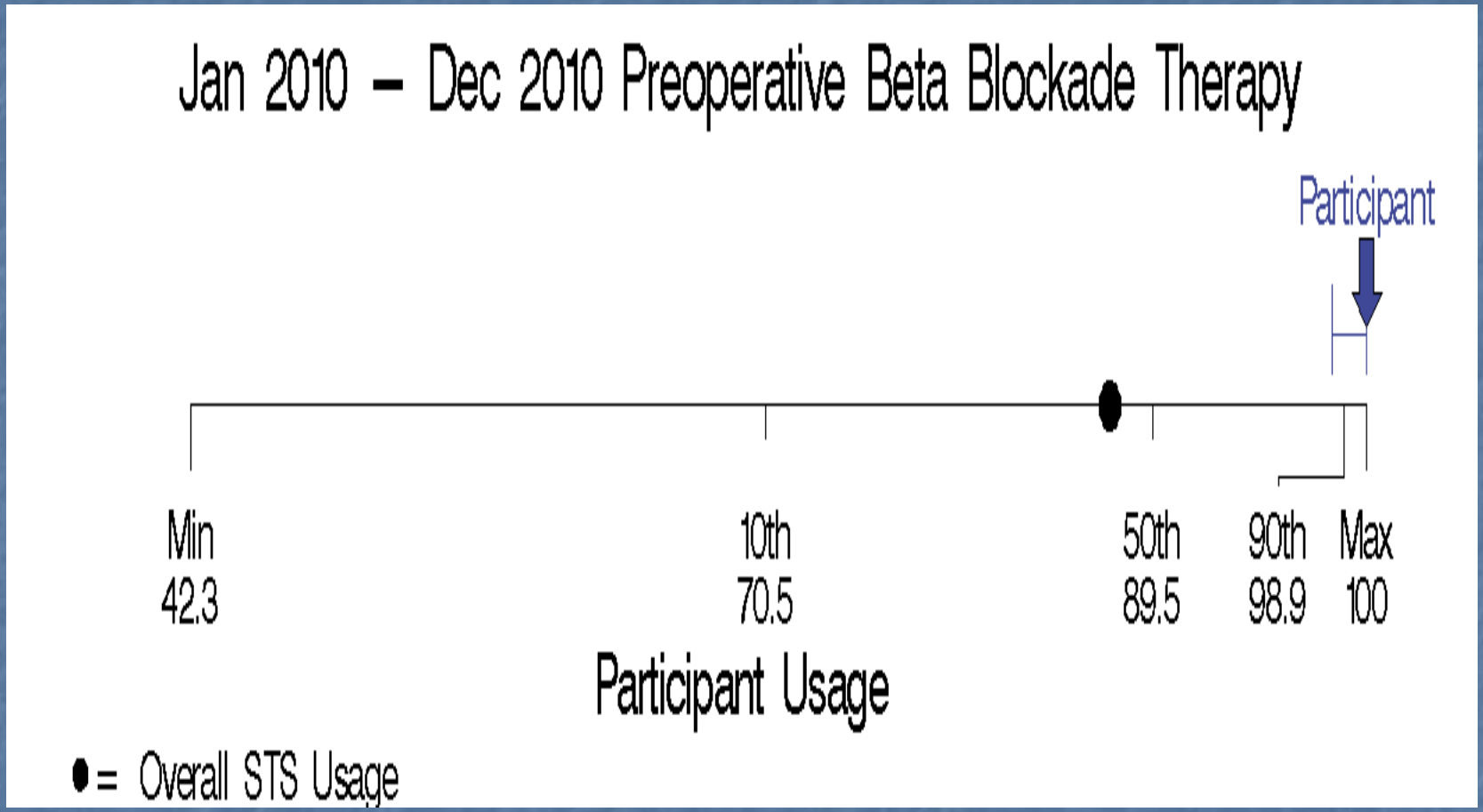
STS Composite Quality Ratings



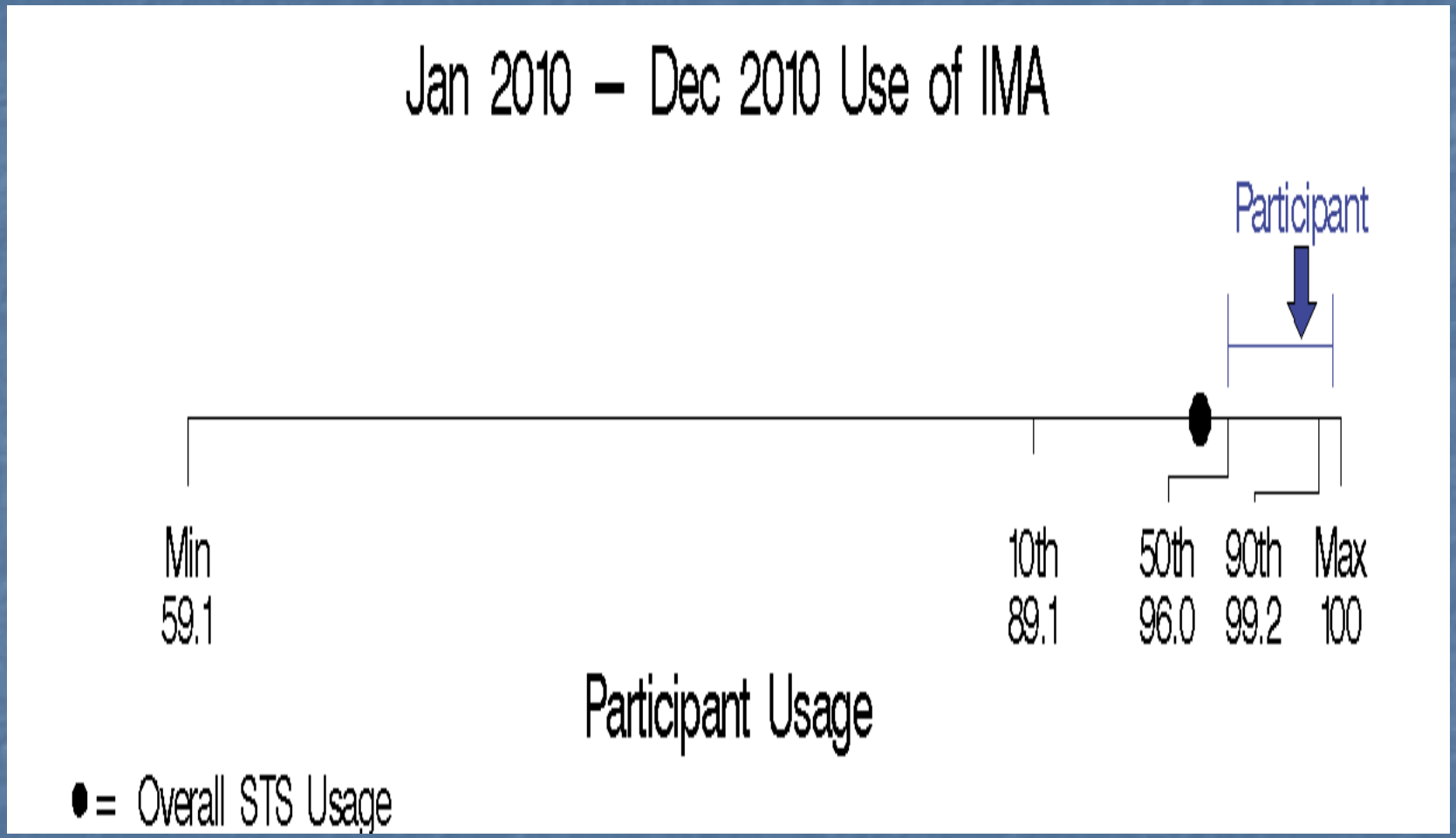
Participant Rating ★★★

* = Participant performance is significantly lower than the STS mean based on 99% Bayesian probability
* * = Participant performance is not significantly different than the STS mean based on 99% Bayesian probability
* * * = Participant performance is significantly higher than the STS mean based on 99% Bayesian probability

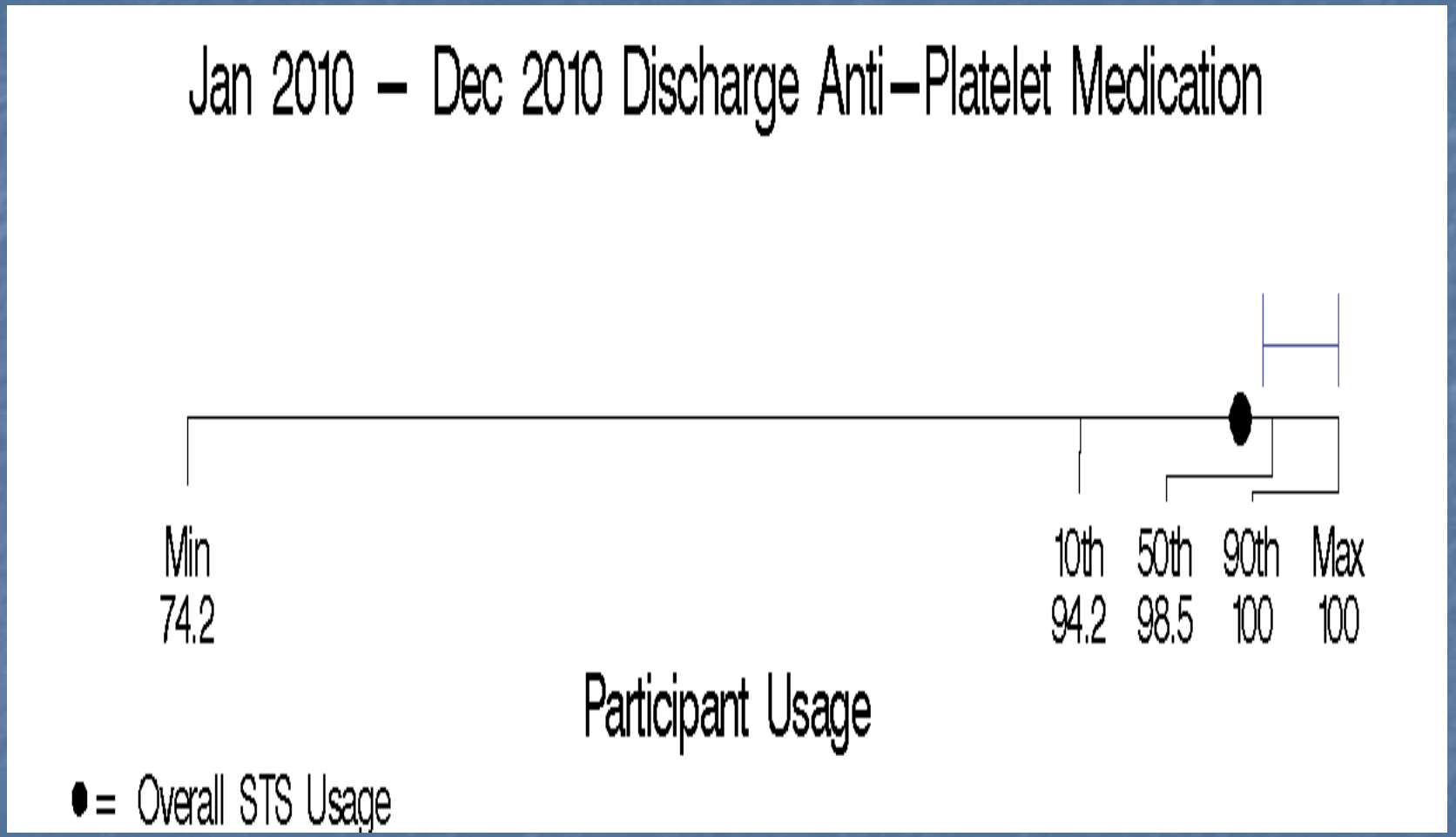
NQF Measures



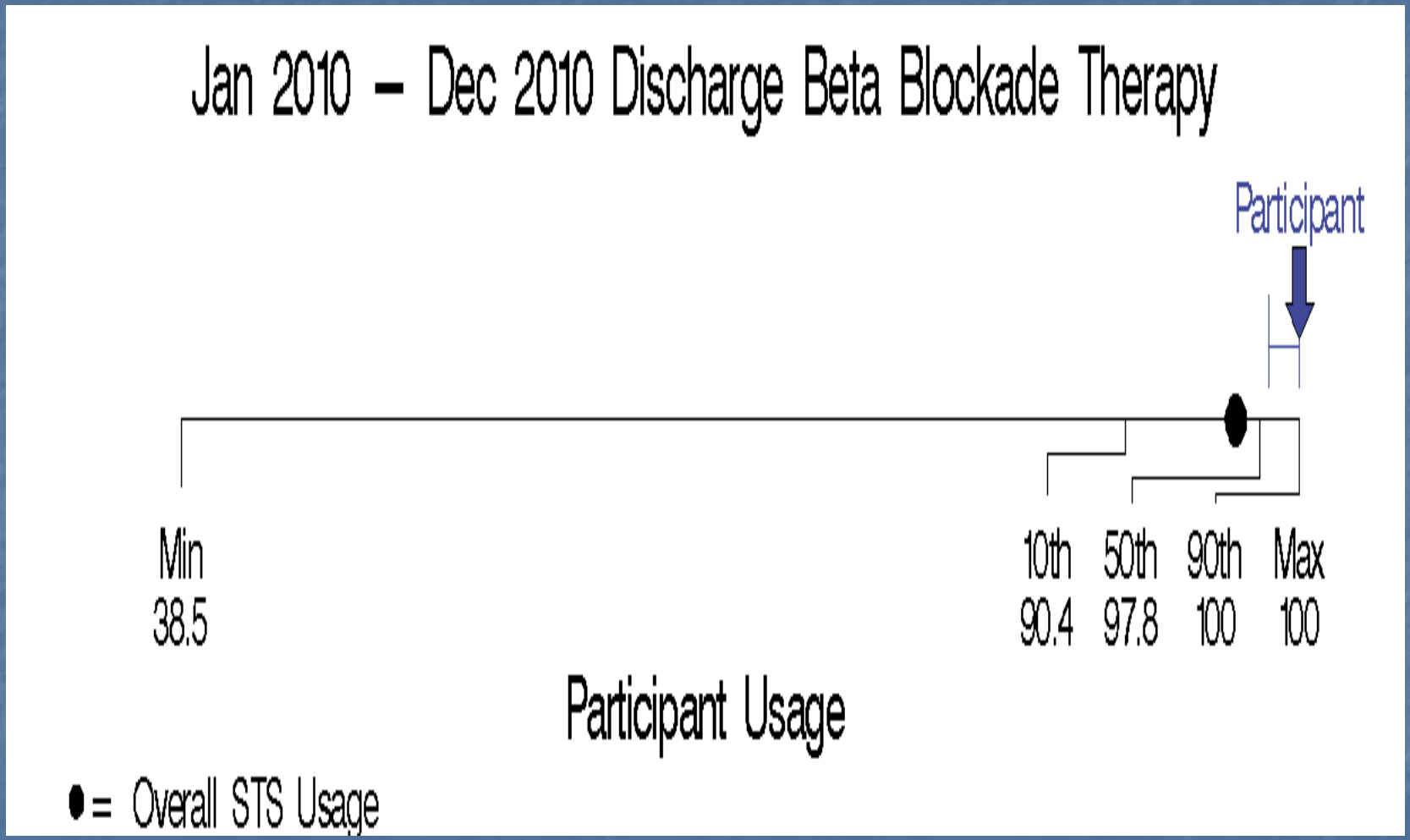
NQF Measures



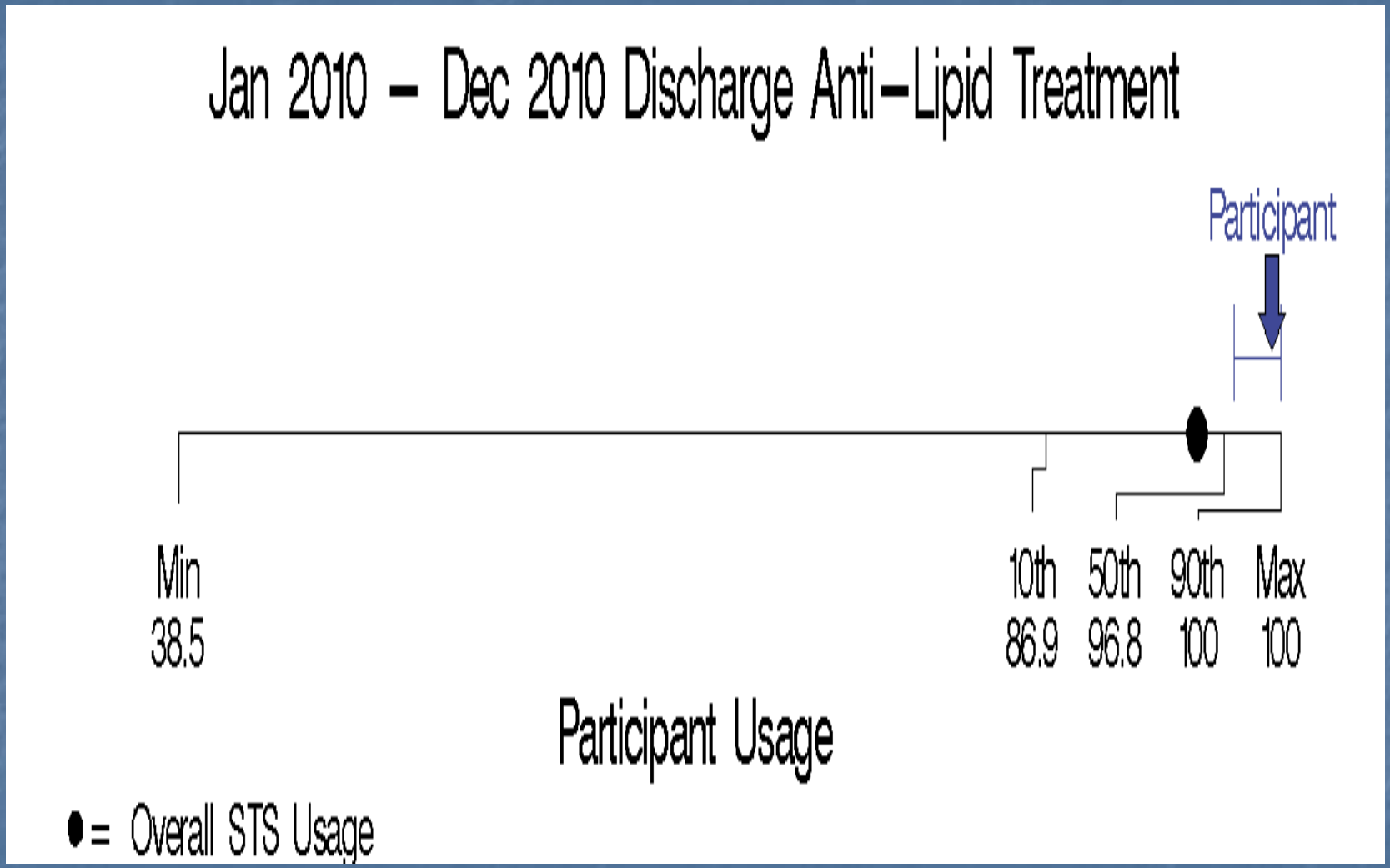
NQF Measures



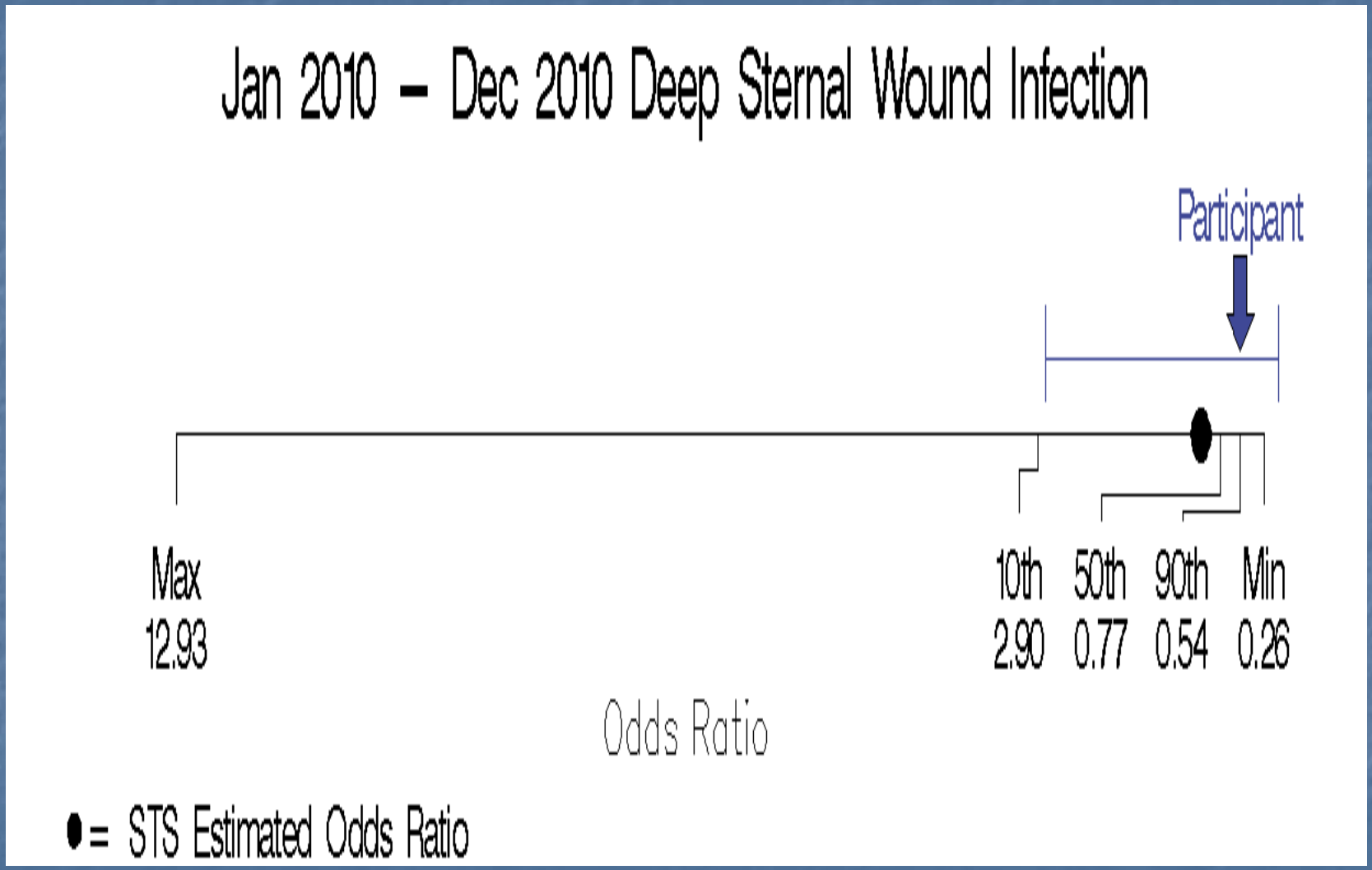
NQF Measures



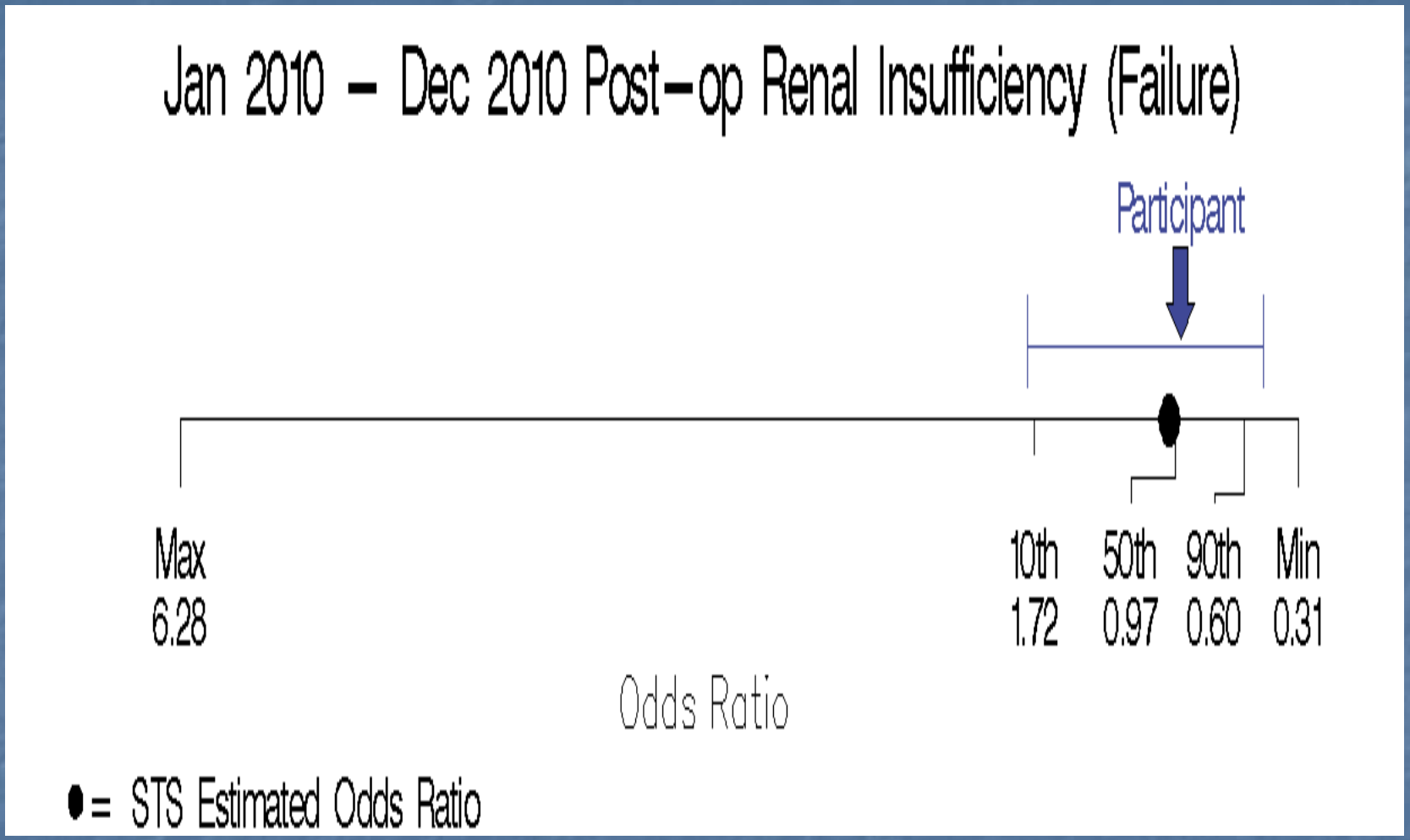
NQF Measures



NQF Measures



NQF Measures



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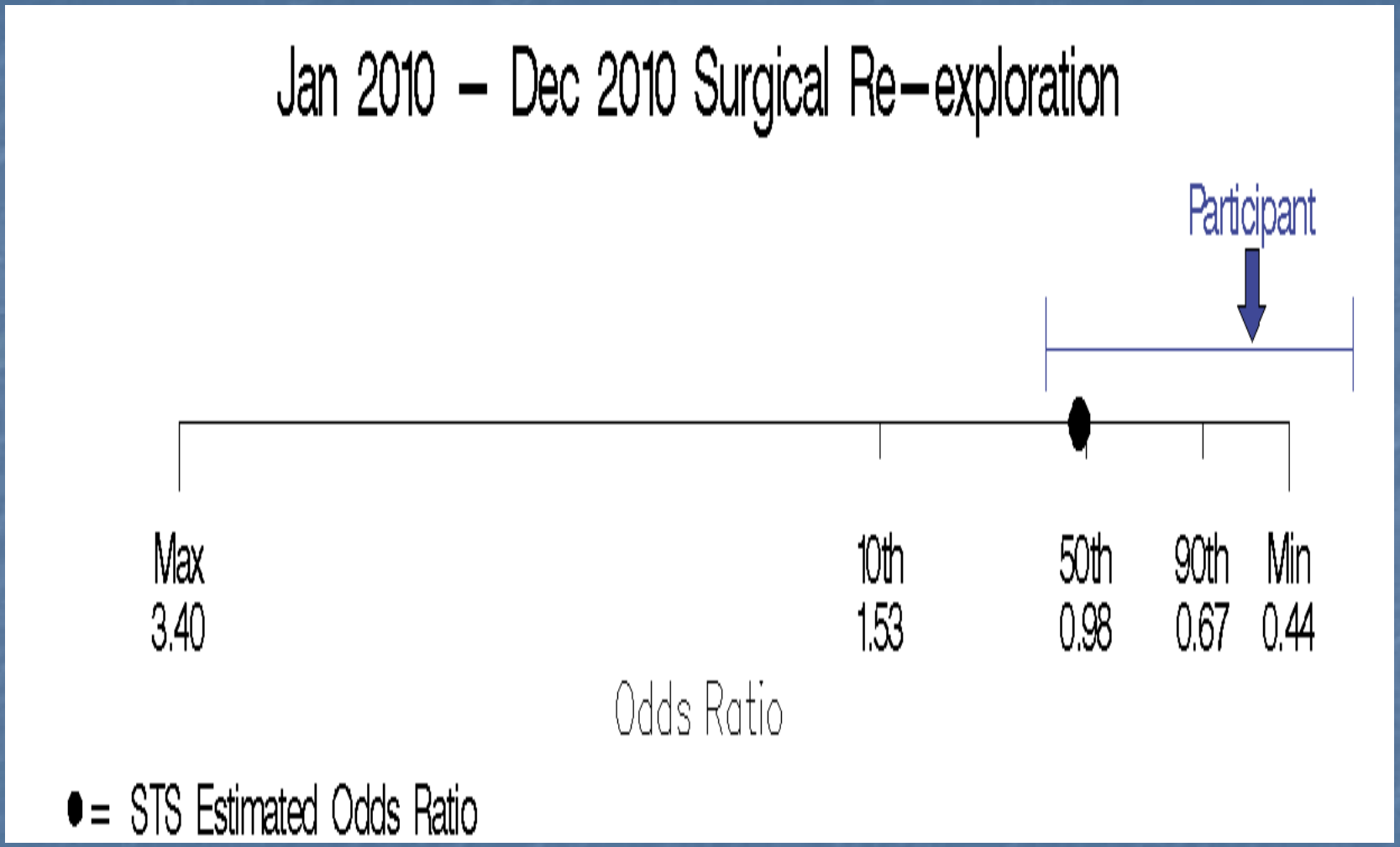

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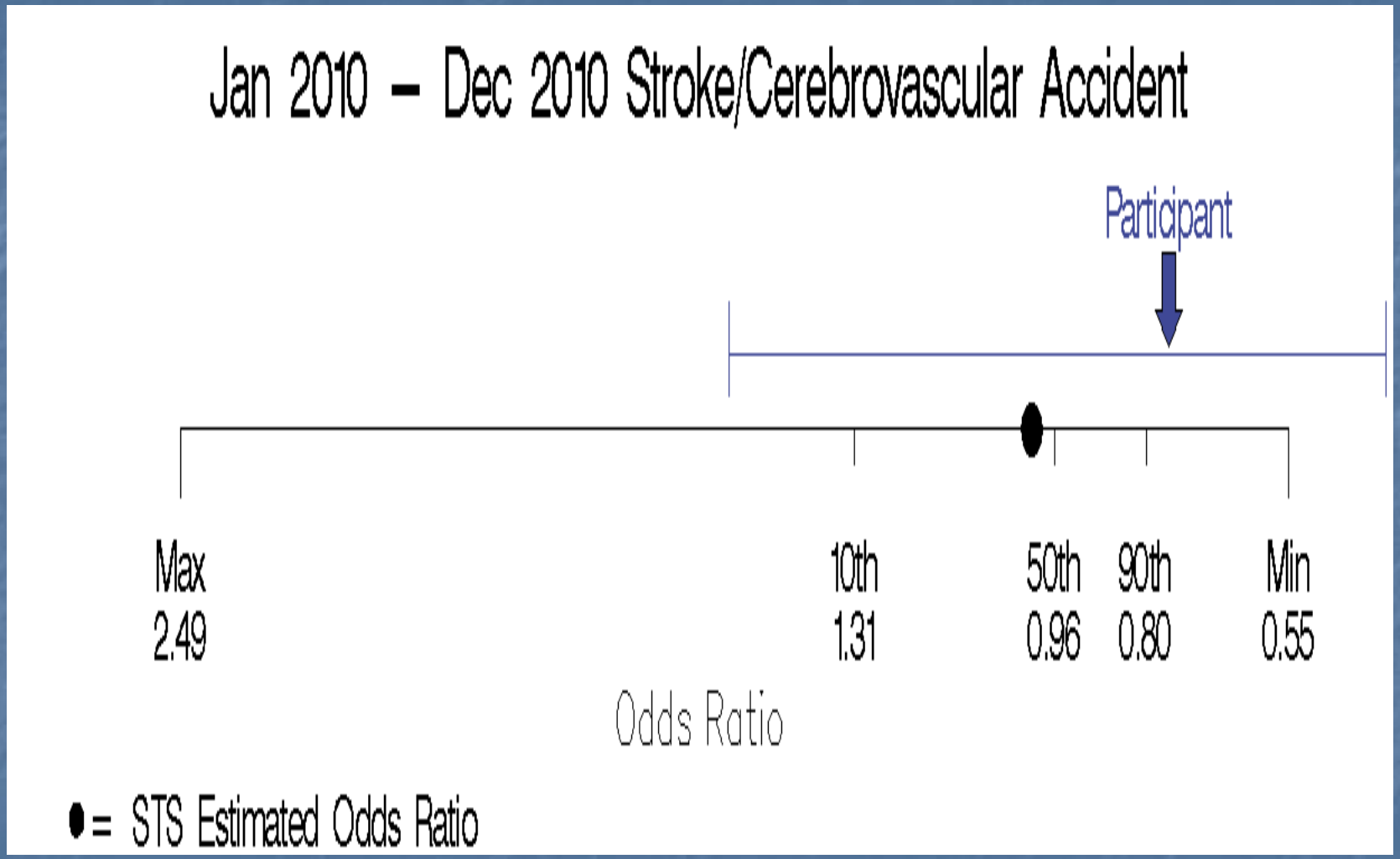
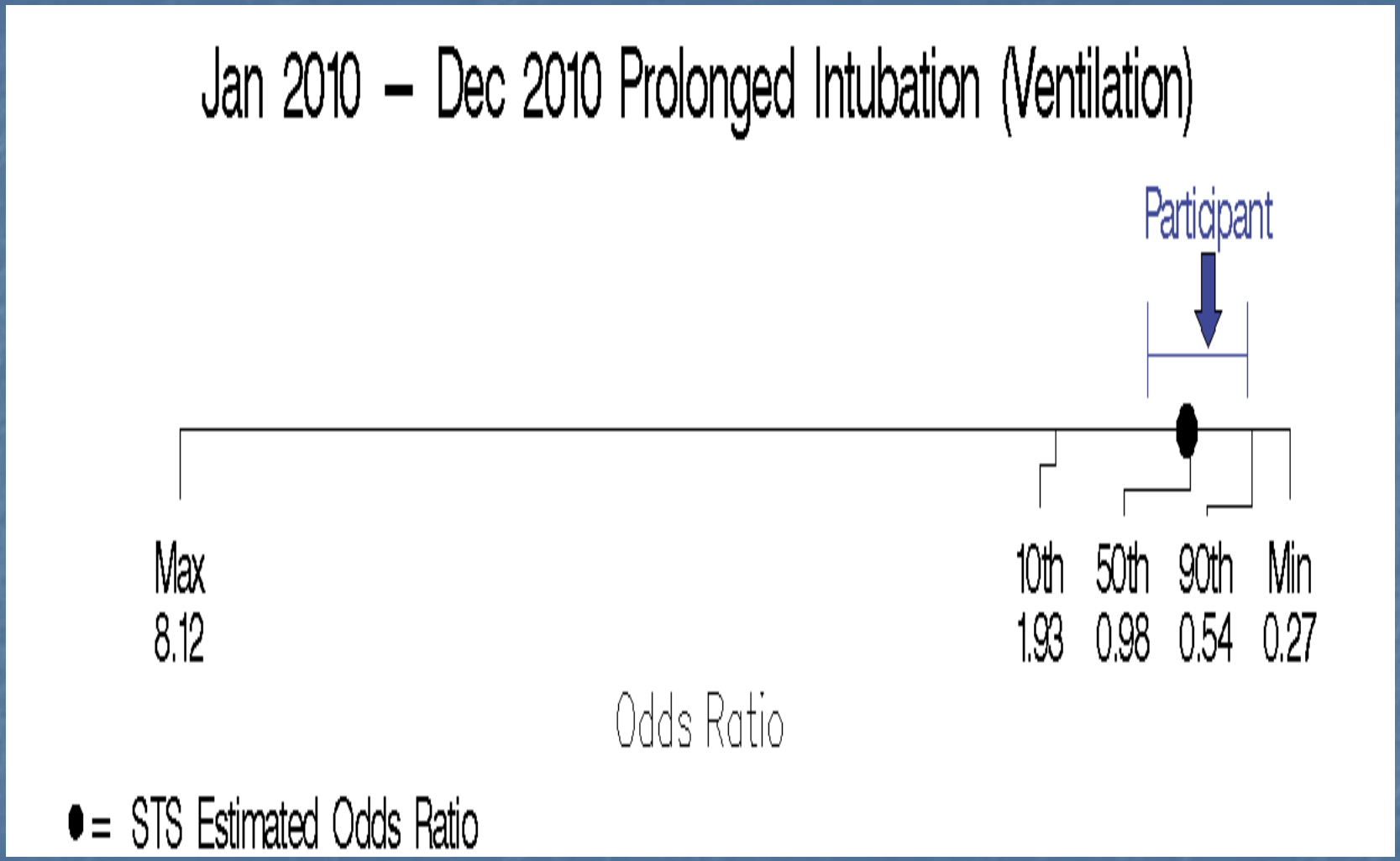
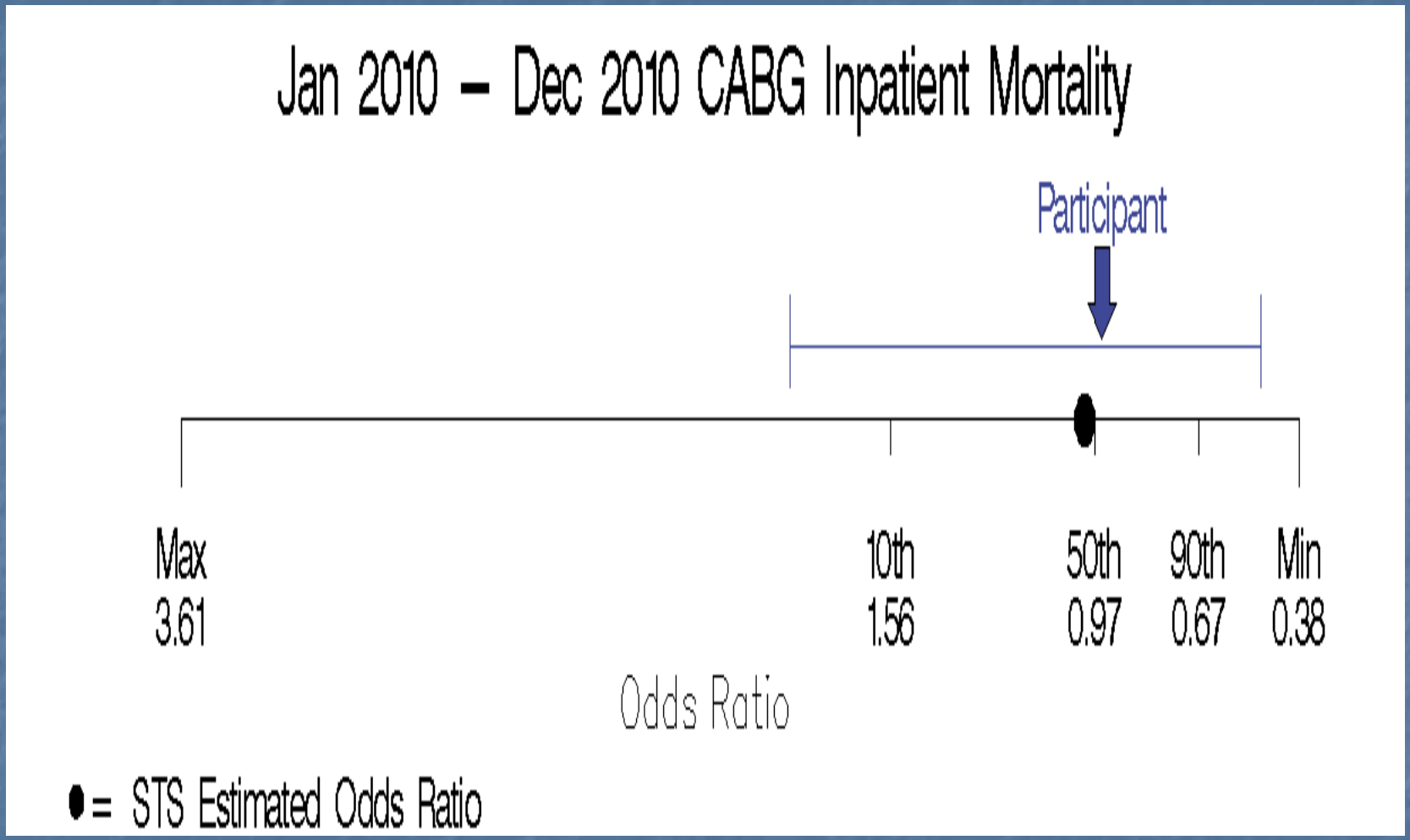


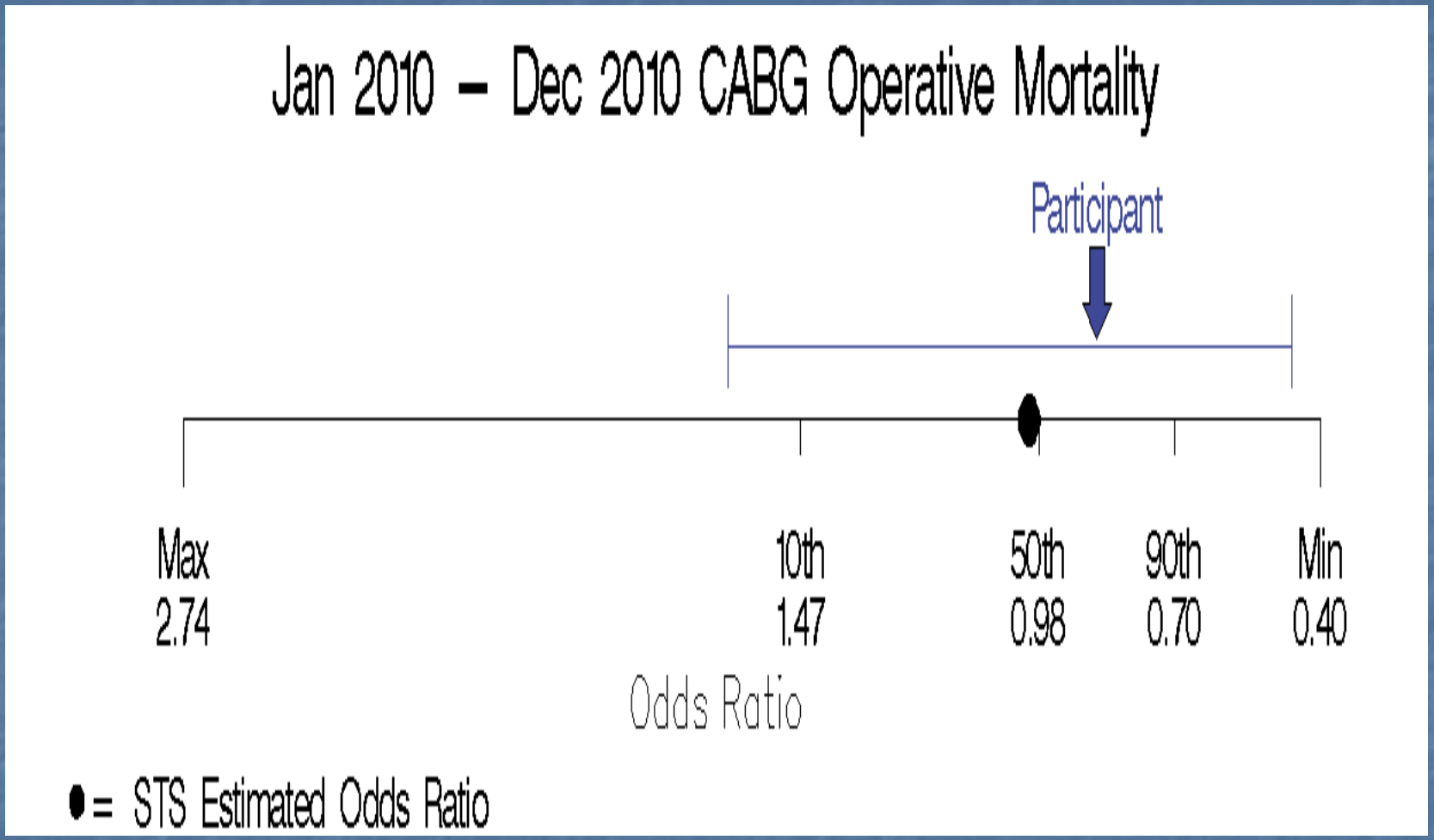
NQF Measures



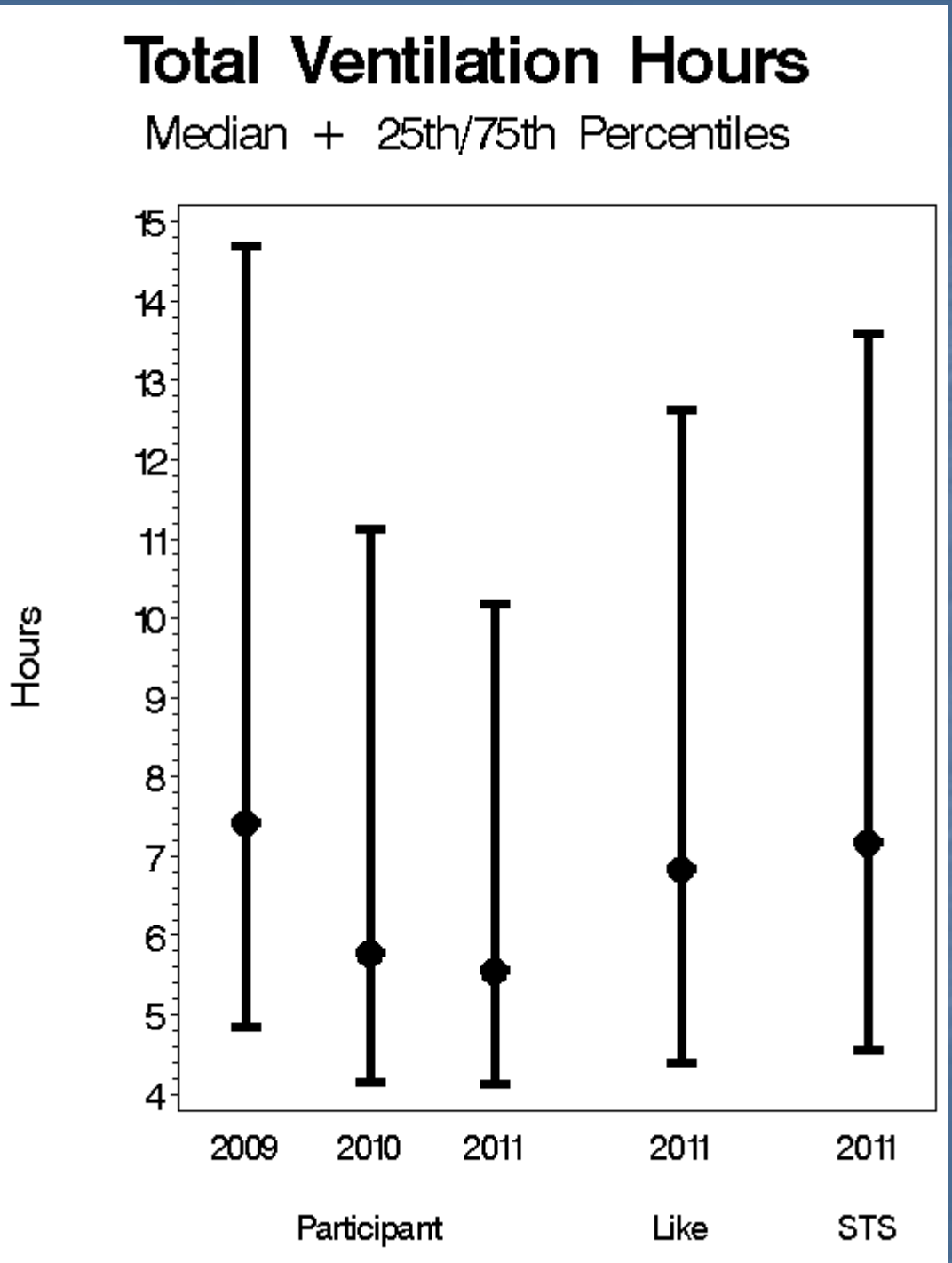
NQF Measures



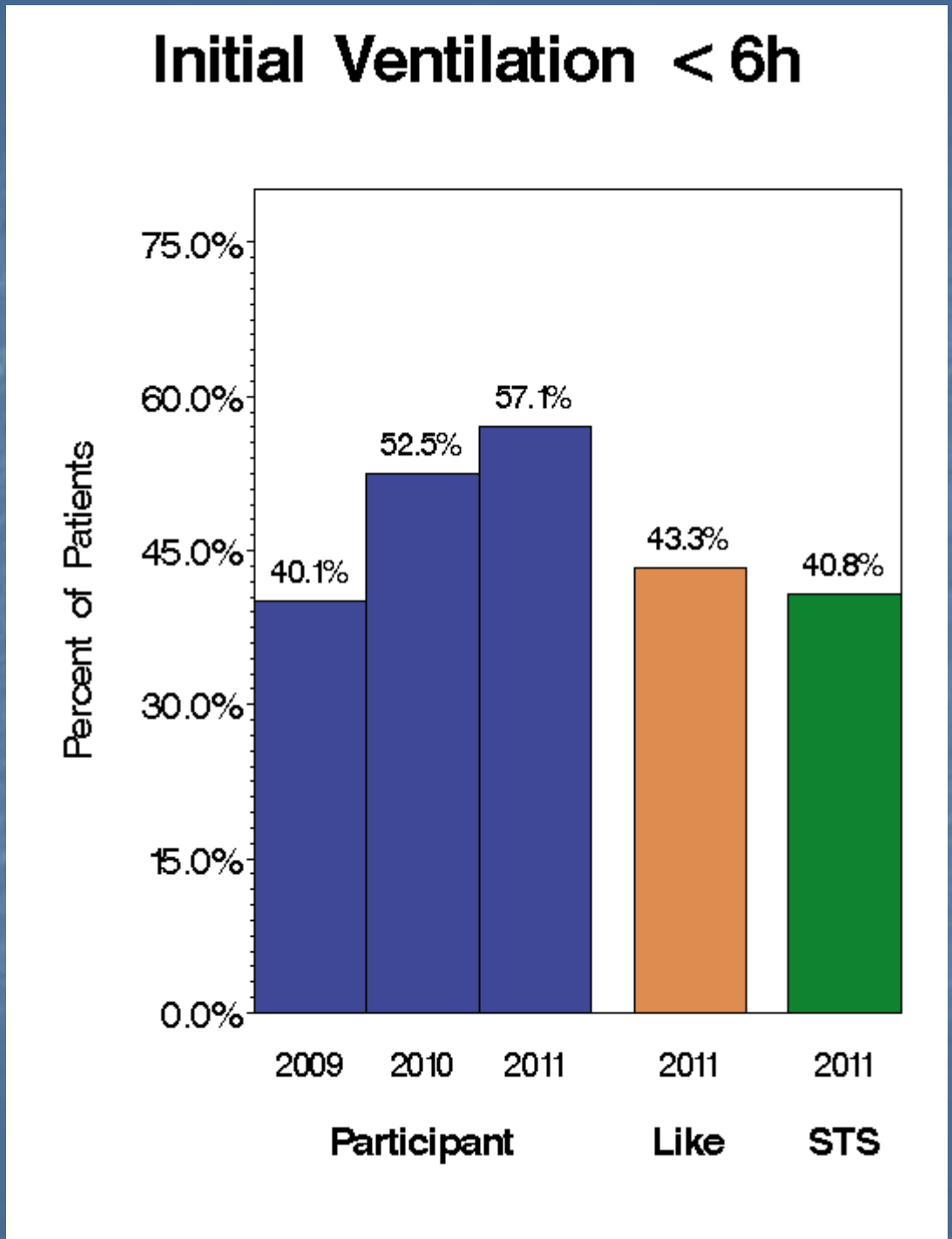
NQF Measures



CAB


Total Ventilation Hours
Median + 25th/75th Percentiles
Hours
15
14
13
12
11
10
9
8
7
6
5
4
2009
2010
2011
2011
2011
Participant
Like
STS

CAB


Initial Ventilation < 6h
Percent of Patients
75.0%
60.0%
45.0%
30.0%
15.0%
0.0%
40.1%
52.5%
57.1%
43.3%
40.8%
2009
2010
2011
2011
2011
Participant
Like
STS

75TH ANNIVERSARY 1936 – 2011

FORD FOCUS BEATS HONDA CIVIC
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TABLETS & E-READERS
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AMERICA'S TOP COFFEES
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ALTERNATIVE THERAPIES
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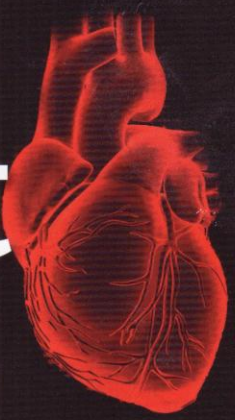
SEPTEMBER 2011 | CONSUMERREPORTS.ORG

ConsumerReports®

Protect Your Heart



How to keep it young

Risky tests to avoid

Angioplasty: What your doctor might not tell you

EXCLUSIVE

Ratings of heart surgeons

$5.99US 09
0 74851 08251 5

FLORIDA

★★★	
Indian River Medical Center-Cardiovascular Surgery, Vero Beach	Indian River Medical Center
Memorial Healthcare System Cardiac and Vascular Institute, Hollywood	Memorial Regional Hospital
Morton Plant Hospital, Clearwater	Morton Plant Hospital
Munroe Heart, Ocala [1]	Munroe Regional Medical Center
Winter Haven Hospital Bostick Heart Center, Winter Haven [1]	Winter Haven Hospital
★★	
Bethesda Cardiovascular and Thoracic Surgeons, Boynton Beach [1]	Bethesda Heart Hospital at Bethesda Memorial Hospital
Cleveland Clinic Florida, Weston	Cleveland Clinic Florida
Leesburg-Ocala Heart Institute, Leesburg	Leesburg Regional Medical Center
Sarasota Memorial Healthcare System, Sarasota	Sarasota Memorial Hospital
University of Florida College of Medicine-Jacksonville, Department of Surgery, Division of Cardiothoracic Surgery, Jacksonville [2]	Shands Jacksonville

Memorial Cardiac and Vascular Institute

Cardiac Surgery Report Card for Patient Outcomes

Memorial
Cardiac and Vascular Institute
MEMORIAL REGIONAL HOSPITAL • MEMORIAL HOSPITAL WEST

Dear Colleague:

In an ongoing effort to improve quality and to be more transparent to our patients and referring physicians, we share with you our outcomes as analyzed by the Society of Thoracic Surgeons National Adult Cardiac Surgery Database. We will continue to share our outcomes as the data becomes available.

Respectfully,

Michael Cortelli, MD

Chief of Adult Cardiac Surgery

Pictured left to right:
Michael Cortelli, MD, *Chief of Adult Cardiac Surgery;*
Juan Plate, MD, FACS, *Cardiac Surgeon;*
Richard Perryman, MD, *Chief of Cardiac Surgical Services.*

Memorial Cardiac and Vascular Institute

Cardiac Surgical Services

Data Analyses of the Society of Thoracic Surgeons (STS)
National Adult Cardiac Surgery Database

	------ Percent of Patients ------		
PROCEDURE CATEGORIES	**2009**	**2010**	**STS**
MAJOR PROCEDURES			
Operative Mortality	2.2	2.5	2.5
CORONARY ARTERY BYPASS GRAFT (CABG)			
Endovascular Vein Harvest Technique	97.5	99.5	77.3
Internal Mammary Artery Used	99.1	98.6	95.0
Radial Artery Used	12.9	10.0	5.3
Deep Sternal Wound Infection	.5	0.0	.3
Operative Mortality	2.3	1.8	1.9
AORTIC VALVE REPLACEMENT			
Operative Mortality	0.0	4.2	3.0
Major Morbidity/Operative Mortality	9.5	8.3	19.0
AORTIC VALVE REPLACEMENT + CABG			
In-Hospital Mortality	0.0	0.0	3.9
Operative Mortality	0.0	0.0	4.4
MITRAL VALVE REPLACEMENT			
In-Hospital Mortality	0.0	0.0	5.1
Operative Mortality	0.0	0.0	5.7
MITRAL VALVE REPAIR			
In-Hospital Mortality	0.0	0.0	1.2
Operative Mortality	0.0	0.0	1.4

Therapeutic Hypothermia

Objectives:

- Scope of the Problem
- History, Current Evidence and AHA Recommendations
- Physiology of Cardiac Arrest
- Complications of Return of Spontaneous Circulation (ROSC)
- Physiology of Hypothermia
- Complications of Hypothermia
- Practical Aspects of Cooling

Scope of Problem

- Sudden cardiac arrest (SCA) is a leading cause of death in the US
- Approximately 330,000 deaths annually in ED and out of hospital from SCA
- 80% or more of initially comatose survivors will then die or suffer debilitating neurologic outcomes

AHA 2005

1961

- Research had not been favorable for temperatures

  28-32° C

- Mechanics not well controlled

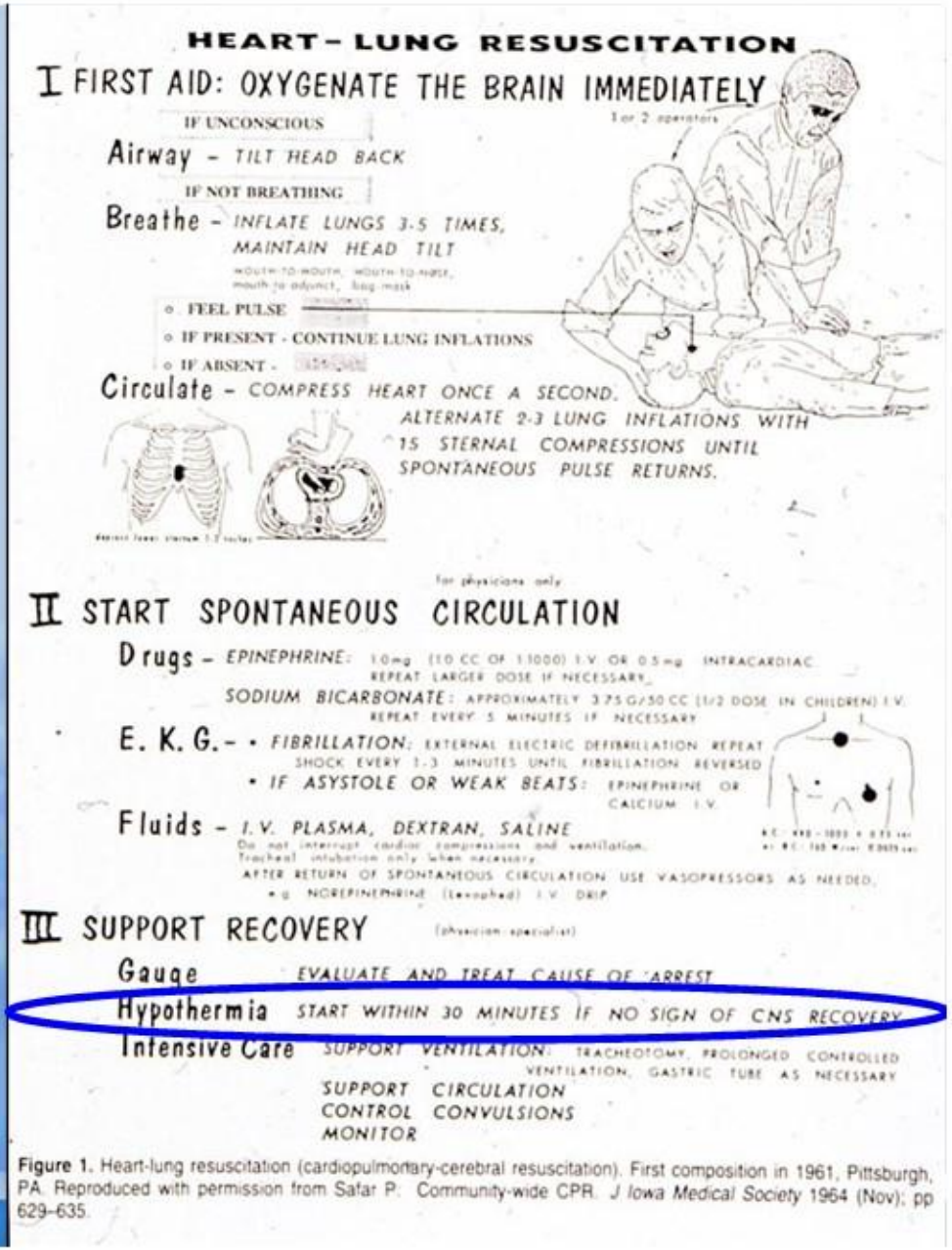


Figure 1. Heart-lung resuscitation (cardiopulmonary-cerebral resuscitation). First composition in 1961, Pittsburgh, PA. Reproduced with permission from Safar P. Community-wide CPR. *J Iowa Medical Society* 1964 (Nov); pp 629–635.

History continued:

- 1980's Cardiac Arrest with Dogs

- 1990's Question?
  - Can we safely cool patients?
  - What is the best method?
  - We are still discovering the answer!

Current Evidence

So what do we mean by Good Outcomes?

Glasgow-Pittsburgh Cerebral Performance Categories

(CPC)

5 Levels

Good

Moderate

Severe

Coma, Vegetative State

Death

The Brain Resuscitation Clinical Trial II Study Group, Control Clin Trials 1991 Aug; 12 (4): 525-545.

CPC Level 1

Good Cerebral Performance

- Conscious
- Alert
- Able to work and lead a normal life
- May have minor psychological or neurological deficits (mild dysphasia, non-incapacitating hemiparesis or minor cranial nerve abnormalities

CPC Level 2

Moderate Cerebral Disability

- Conscious
- Sufficient cerebral function for part-time work in sheltered environment or independent activities of daily life (dressing, traveling by public transportation and preparing food)
- May have hemiplegia, seizures, ataxia, dysarthria, dysphasia, or permanent memory or mental changes.

CPC Level 3

Severe Cerebral Disability

- Conscious
- Dependent on others for daily support
- At least limited cognition
- Includes a wide range of cerebral abnormalities from ambulatory with severe memory disturbance or dementia precluding independent existence to paralytic and able to communicate only with eyes, as in the locked in syndrome.

CPC Level 4 and 5

Level 4: Coma, Vegetative State

- Not conscious
- Unaware of surroundings, no cognition
- No verbal or psychological interactions with environment

Level 5: Death

- Certified brain dead or dead by traditional criteria

Dr. Bernard's Study

- 77 patients
  - 43 hypothermia
  - 34 normothermia
- Results
  - 49% of hypothermia good outcome compared to 26% of normothermia (p=0.046)

Bernard SA, et al. "Treatment of comatose survivors of out-of-hospital cardiac arrest with induced hypothermia." NEJM 2002; 346 (8): 546-556.

European Study

- Multi -Center Trial
- 275 patients
  - 137 Hypothermia
  - 138 Normothermia
- Results
  - 55% Hypothermia group favorable outcome
  - 39% Normothermia group favorable outcome (p=0.009)

The Hypothermia After Cardiac Arrest Study Group. "Mild therapeutic hypothermia to improve the neurologic outcome after cardiac arrest." NEJM 2002; 346 (8): 549-556.

RESUSCITATION

OFFICIAL JOURNAL OF THE EUROPEAN RESUSCITATION COUNCIL

Bernard et al. Resuscitation 2003:

- 22 post cardiac arrest, comatose adults
- 30ml/kg LR at 4° C infused over 30 min via peripheral IV then temp maintained at 33°C
- Median temp decreased 1.6°C after bolus (P=<0.001)
- Median MAP increased 10 mmHg (P=0.012)
- No adverse outcomes

Bernard SA, et al. Induced hypothermia using large volume, ice-cold intravenous fluid in comatose survivors of out-of-hospital cardiac arrest: a priliminary report. Resuscitation 2003: 56: 9-13

Critical Care Medicine

OFFICIAL JOURNAL OF THE SOCIETY OF CRITICAL CARE MEDICINE

Oddo et al. Critical Care Medicine 2006:

Implementation Study

- 109 comatose out of hospital arrests
- Retrospective
- Determined feasibility of Therapeutic Hypothermia (TH) to 33°C in "real life" clinical practice
- VF as initial rhythm
- Good outcomes: TH 56%, standard care 26% (P=0.004)

TH safely applied to patients with initial rhythm of PEA and asystole. Outcomes were poor, though the subset was small (n=23) (P=NS)

Oddo M, et al. from evidence to clinical practice: Effective implementation of therapeutic hypothermia to improve patient outcome after cardiac arrest. Critical Care medicine 2006; 34 (7): 1865-1873

Critical Care Medicine

OFFICIAL JOURNAL OF THE SOCIETY OF CRITICAL CARE MEDICINE

Wolfrum et al. Critical Care Medicine 2008:

- Single center observational study with historical controls
- 33 comatose v-fib arrest patients with STEMI
- Initiated hypothermia with cold saline infusion and cold packs prior to PCI
- Showed that initiating hypothermia before PCI was feasible, safe
- Trend toward lower mortality (25% vs 35%, p=.71) and more CPC 1 or 2 (69% vs 47% p=.30)compared with historical controls

Wolfrum S, et al: Mild therapeutic hypothermia in patients after out-of- hospital cardiac arrest due to acute ST-segment elevation myocardial infarction undergoing immediate percutaneous coronary intervention.
Crit Care Med 2008; 36:1780-1786

What Does This Mean?

- NNT: 4-6

  NNT= statistical calculation of number of patients needed to treat to prevent one additional bad outcome, based on RCT's

VF and pulseless VT patients may have better response to HACA, though PEA and asystole patients have not been adequately studied

HACA Recommendations

American Heart Association 2005

ILCOR 2002

HACA Recommendations: 2005 AHA and 2002 ILCOR

- Unconscious adult patients with return of spontaneous circulation (ROSC) after out of hospital cardiac arrest should be cooled to 32-34°C for 12-24 hours when the initial rhythm is VF
- Such cooling may be beneficial for other rhythms or in-hospital cardiac arrest

Hazinski MF, et al. Postresuscitation support. Circulation 2005: 112 (24): 84-88.

Nolan JP, et al. Therapeutic hypothermia after cardiac arrest: an advisory statement by the Advanced Life Support Task Force of the International Liaison Committee on Reusucitation. Circulation 2003; 108 (1): 118-121

Improving Postresuscitation Outcomes-Initial Goals

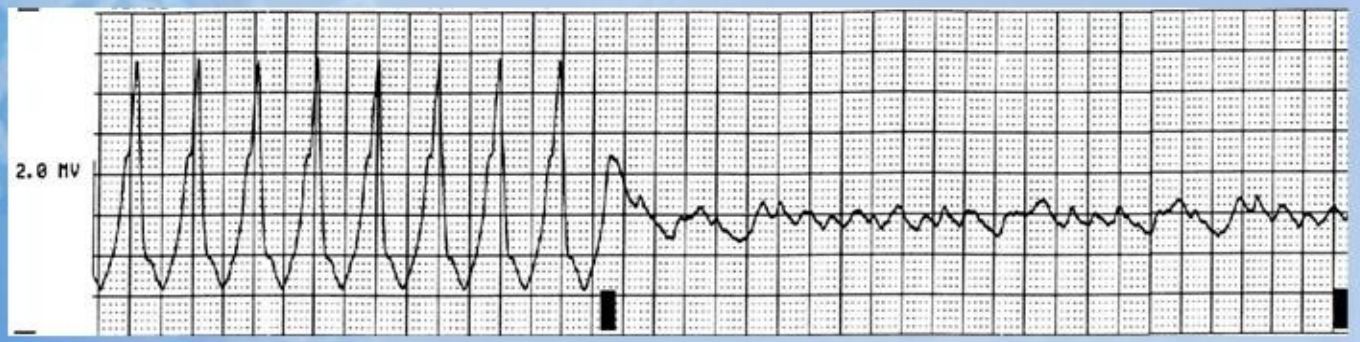
1. Optimize cardiopulmonary function and systemic perfusion especially to the brain
2. Transport victim to ED
3. Identify precipitating causes and institute measures to prevent recurrence
4. Institute measures that may improve long term neurologically intact survival

AHA 2005

The Verdict Please?

Induce Hypothermia

Life cycle of cardiac arrest



- ATP breakdown/anaerobic glycolysis
- Failure of energy dependent pumps and acidosis
- Excess calcium in cell → oxygen free radical production and lipolysis
- Excess K_{+} and Na_{++} in cell
- Cerebral hypo-perfusion even with a good systemic blood pressure (for 24 hours or longer)

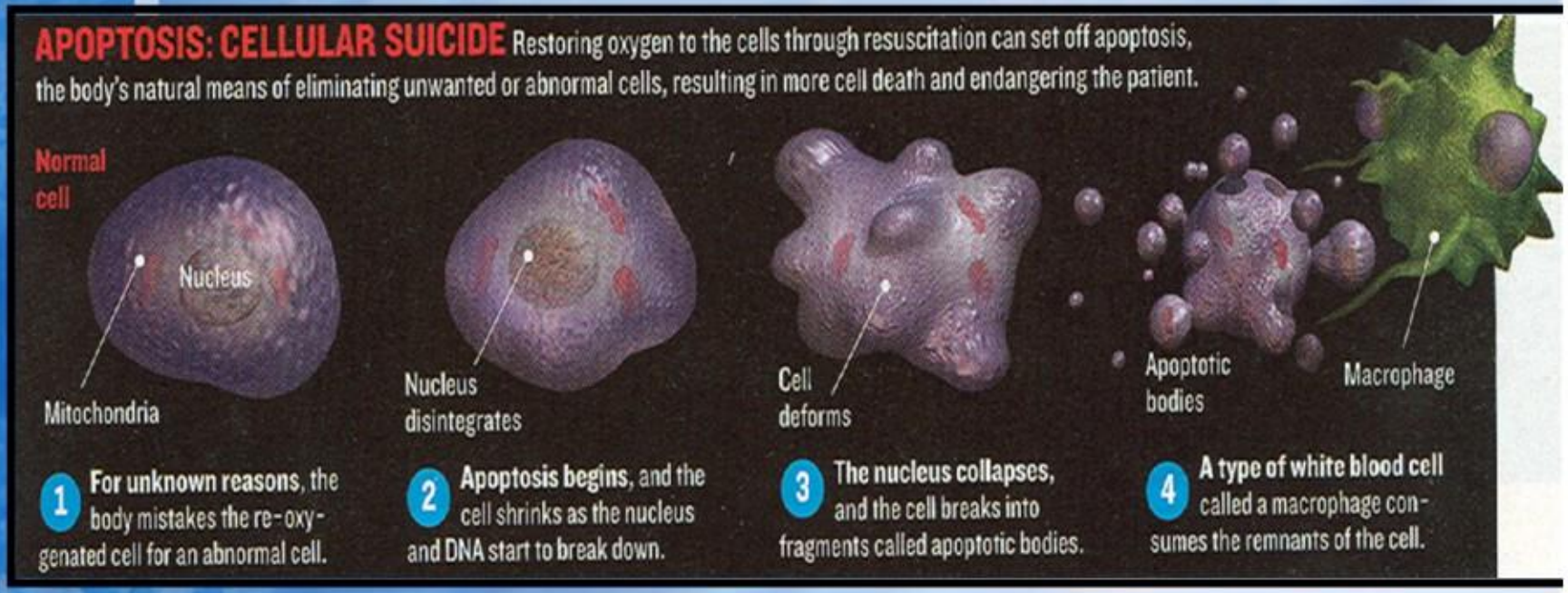
How to fix it?

Decrease cerebral metabolism!!!

Cool ‘em!

Complications of Return of Spontaneous Circulation (ROSC):

1. Reperfusion Injury
    a. Increased oxygen free radical production with the presence of O2 contributes to apoptosis



Complications of ROSC

2. Initiates a Cascade of events
   a. Increased intracellular Ca^{++} continues. This contributes to an increase in glutamate→ increased intracellular Ca^{++} and the circle continues!
3. Inflammatory response
   a. Causes high levels of cytokines (can be elevated for up to 5 days post arrest).
4. Free radical production
   a. Increases after cardiac arrest and stays elevated for days.

Complications of ROSC

5. Coagulation cascade is activated
   a. This is true any time there is cell injury!
6. Ischemia/reperfusion injury → cerebral edema
   a. Increased permeability of the blood brain barrier
   b. Increased permeability of the vasculature
   c. Increased permeability of the cell membranes
7. Hypoxia and reperfusion start all of these biochemical events but they can persist for hours to days

How do you prevent it?

Cool ‘em down

Induce Hypothermia

Benefits of Therapeutic Induced Hypothermia

Even if you start hours after ROSC (Return of Spontaneous Circulation)

Decrease cerebral metabolism therefore decrease need for oxygen

Hypothermia reduces the cellular levels of glutamate

Benefits of Therapeutic Induced Hypothermia (cont.)

Reduces intracellular acidosis

Decreases the inflammatory response and cytokinase release

Protects the blood brain lipomembranes!

Okay - So we will cool them!

Just give me the facts !

Who got cooled in the RCT studies?

- Witnessed Arrest
- Ventricular Tachycardia/Ventricular Fibrillation rhythm only
- Only 5-15 minutes from collapse to ACLS
- No more than 60 minutes from collapse to ROSC

WHO ARE WE COOLING?

Patient is comatose after cardiac arrest

Return of Spontaneous Circulation (ROSC) within 60 minutes of cardiac arrest

Time of initiation of hypothermia less than 6 hours post cardiac arrest

Who Doesn't Get Cooled

- Temperature is already below 30°C
- Comatose before cardiac arrest resulting from drugs that depress the CNS
- Pregnancy
- Preexisting terminal illness
- Preexisting coagulopathy
- Recent major surgery within last 14 days
- Patients with major head trauma

How Can You Cool ?

Many methods

- Ice bags
- Fans
- Intravenous Cooling
- Mechanical Cooling
- Endovascular Cooling

	Pros	Cons
Ice bags	Inexpensive, widely available	Messy, difficult to control temp
Fans	Inexpensive, widely available	Difficult to control temp, limited ability to decrease temp quickly
Intravenous Fluids	Inexpensive, widely available	Need to determine way to keep fluids cold

	Pros	Cons
Mechanical	Fair control of patient temp, easy to use.	Variety of systems/costs, not easily transportable
Endovascular	Reliable control of patient temp Fast No risk of skin lesions	Expensive, large invasive line concern for increase sepsis risk

Combination of methods

1. Intravenous cooling
2. Mechanical or endovascular cooling
3. Ice bags during induction

Keeping Track of Temperature

- Monitor every 15 minutes during induction until stabilized at goal temperature 32-34°C
- Avoid temperature <30°C


MEDIVANCE
ARCTIC
SUN

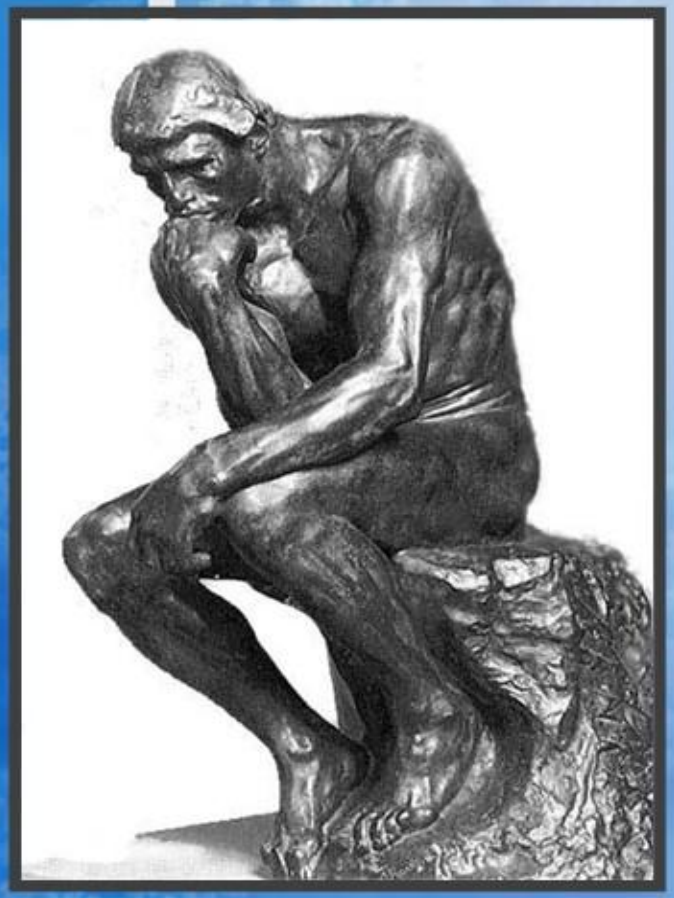
Methods to Monitor Temperature

- Bladder
- Rectal
- PA Catheter
- Esophageal

- Tympanic
- Axilla

Which is best?

Success with Induced Hypothermia Requires:



Awareness of physiological effects hypothermia and pathophysiological mechanisms

Understanding these concepts can prevent over-treatment, and insufficient treatment which could eliminate the protective, beneficial effects of hypothermia!

Physiological changes due to Mild to Moderate Hypothermia

- Temperature specific
- Influenced by age and co-morbidities
  - Especially cardiovascular disease

Physiological attempts to increase temperature

Temperature 30-35°C

- In awake patients:
  - Shivering
  - Peripheral vasoconstriction
  - Increased muscle activity
  - Increased oxygen consumption, increased metabolism

Temperature <30°C

- Hibernation begins:
  - Shivering ceases
  - Decreased metabolic rate

Metabolic changes

Temp 30-35°C

- ↓ Oxygen consumption
- ↓ Carbon dioxide production
- ↓ Metabolism
- ↑ Fat metabolism

Temp ≤ 35°C

- ↓ Insulin sensitivity
- ↓ Insulin secretion

Endocrine changes

Temp 30-35°C

- ↑ Levels of epinephrine and norepinephrine
- ↑ Levels of cortisol

Cardiovascular effects

- <36 >35°C Tachycardia
- <35° C Bradycardia
- <34°C Slight in blood pressure
- <33°C EKG changes: increased PR interval, widening of QRS, increased QT interval
- <32°C Mild arrhythmias in some patients
- <28°C High risk of tachyarrhythmias, beginning with atrial fibrillation
- <35°C CVP, ↓Cardiac output

Renal changes Temp < 35°C

- ↑ Diuresis
- ↑ Tubular dysfunction
- Electrolyte loss
- Electrolyte disorders

Hematological changes

↓ Platelet count < 35°C

↓ WBC, impaired leukocyte function < 33°C

GI Changes < 35°C

- Impaired bowel function
- Impaired intestinal motility
- Potential for ileus
- Mild pancreatitis (occurs frequently!)
- Liver enzymes

Immune suppression < 35°C

- Impaired neutraphil and macrophage function
- Increased risk of infections (Pneumonia and wound infections)

Neurological Changes

- ↓ Consciousness
- Lethargy
- Coma

Pharmacokinetics < 35°C

- Altered Clearance of various medications especially:

  Paralytics, Propofol, Fentanyl, Phenytoin, Verapamil!

- No effect on Gentamycin clearance

Lab Changes

- ↑ Amylase (300-600)
- ↓ Platelet count (100-150k)
- Hyperglycemia
- ↓ K^{+}, Mg^{++}, Phos, Ca^{++}
- Mild Liver enzymes (SGOT, SGPT)
- Metabolic Acidosis
- ↑ Lactate

Pathophysiology of Hypothermia

- High risk of
  - Coagulopathy, increased bleeding time increased PTT, thrombocytopenia,
  - Impaired coagulation cascade
  - Electrolyte disorders
  - Hypovolemia
  - Rise in serum amylase
  - Changes in drug effects and drug metabolism
  - Insulin resistance

Pathophysiology of Hypothermia

- Low Risk
  - Manifest bleeding
  - Severe coagulation disorders
  - Airway infections
  - Wound infections
  - Myocardial ischemia

Pathophysiology of Hypothermia

- Rare risk
  - Manifest pancreatitis
  - Intracerebral bleeding

Phases of Induced Hypothermia

Three Phases of Therapeutic Induced Hypothermia

Induction

Get ‘em cold

Maintenance

Keep ‘em cold

Re-warming Phase

Warm ‘em up slow

Induction

Goal is to decrease temperature to 33°C Quickly

- Intravenous Cold Saline (kept at 1-4°C)
- Infuse rapidly 20-30 mL/kg over a maximum of 30 minutes
- Mechanical cooling device or use of the endovascular cooling device and ice packs on!

Quickly!!

Induction

- Avoid temperature overshoot
- Cold fluids through a peripheral or femoral line
- Expose and dampen the skin
- Cool the room to 62°F.
- Begin paralytics starting with bolus if indicated
- Ice Packs to axilla, groin and sides of neck if needed

Maintenance Phase

- Keep them cool between 32°-34°C for 24 hours!
- Only Minor fluctuations in temp 0.2-0.5°C
- Don’t overshoot the range
- Use the mechanical or endovasular cooling device

Watch for side effects and complications of cooling

Maintenance Phase

- Fluid balance
- Electrolyte balance
- Glucose control
- Signs of infection
- Skin Care - Never Events!
- Central line infection
- Vent settings - frequent ABG's-maintain normocarbia
- Control shivering - using low dose continuous or prn paralytics (pancuronium or vercuronium)
- Control Seizures
- Watch for signs of bleeding

Re-warming Phase

- Goal to re-warm no more than 0.2- 0.5°C per hour
- Take Minimum of 12 hours to re-warm
- Be careful not to warm to fast.

Slow re-warm

Re-warming Phase

- Discontinue any paralytics
- Watch for rises in electrolytes
  - especially K^+ and Mg^{++}
- Watch for fluid shifts
- Maintain temp 36.6-37.5°C

Post re-warming assessment

- Remember hypothermic pharmacokinetic effects
- Complete Neurological assessment at 96 hours post cardiac arrest.

DO

HACA recommendations

Initiated ASAP, at least by 6 hours after ROSC- TIME IS BRAIN!!!

Initiate rapid cooling with a rapid infusion of cold (4°C) IV fluid, then use cooling vest, leg wraps, endovacular device, or ice packs to achieve/maintain 32-34°C for 24 hours

Avoid hypovolemia - cold fluids at induction phase

HACA recommendations (cont)

Closely monitor Mg^{++} and K^{+} at least q 4 hours. Expect HYPOkalemia with cooling and HYPERkalemia with rewarming

Strict Glucose control - Use IV insulin protocol

Avoid infections - Early Goal Directed Therapy for SEPSIS

HACA Recommendations (cont)

Appropriate sedation and analgesia and paralytics. SHIVERING MUST BE PREVENTED!! Paralytic protocol. Goal is no shivering, TOF is secondary and may be unreliable during hypothermia.

Adjust ventilator settings to pCO2 of 40

Consider enteral feeding

HACA Recommendations (cont.)

Skin Care - Never Events.

Gently rotate patient ASAP and skin checks q 4 hours

Basic High Quality ICU Care - Hand washing, turning q2h, aseptic line care, etc.

Use of β-blockers seems prudent for cardioprotection if there are no contraindications - Bradycardia

HACA Recommendations

Maintain a normal or slightly elevated MAP

Decrease ICP if elevated

Treat witnessed seizures

Don't

Don't overshoot the goal temperature

- Stay 32-34°C

Don't overtreat

- Bradycardia
- Mild Acidosis

Don't use paralytics once rewarm is complete

Don’t

Don’t re-warm to quickly

"A healthy brain and a functional patient are the primary goals of cardio-pulmonary-cerebral resuscitation."

AHA 2005

Dive In!

- Evidence (level 1) shows that hypothermia can improve outcomes after cardiac arrest with VT/VF
  - Hypothermia should definitely be applied for these patients (Class IIA recommendation)
- Strong evidence shows that hypothermia can improve outcomes with other presenting arrhythmias (Class IIB Recommendation)
  - Hypothermia should probably be applied for these patients

AHA2005

Take the plunge!

- Follow the studies
- Use Cold Fluid for induction phase

MEMORIAL EXPERIENCE

- "He just collapsed," says Tobin's wife, Angeline. "I didn't know what to do."
- "For about three weeks Tobin was on life support and was critically ill,"
- "They included the family in everything," Angeline says. "At Memorial, they not only took care of my husband, they took care of all of us."

Thank you

Questions?