While you are waiting…
Send a nice note to a loved one

Stanford MEDICINE

Systems-based Care
Baby-MONITOR – A composite measure of NICU quality

NICHD R01 - HD084679 (Co-PI)
NICHD R01 - HD083368 (PI)
NICHD R01 - HD084667 (PI)

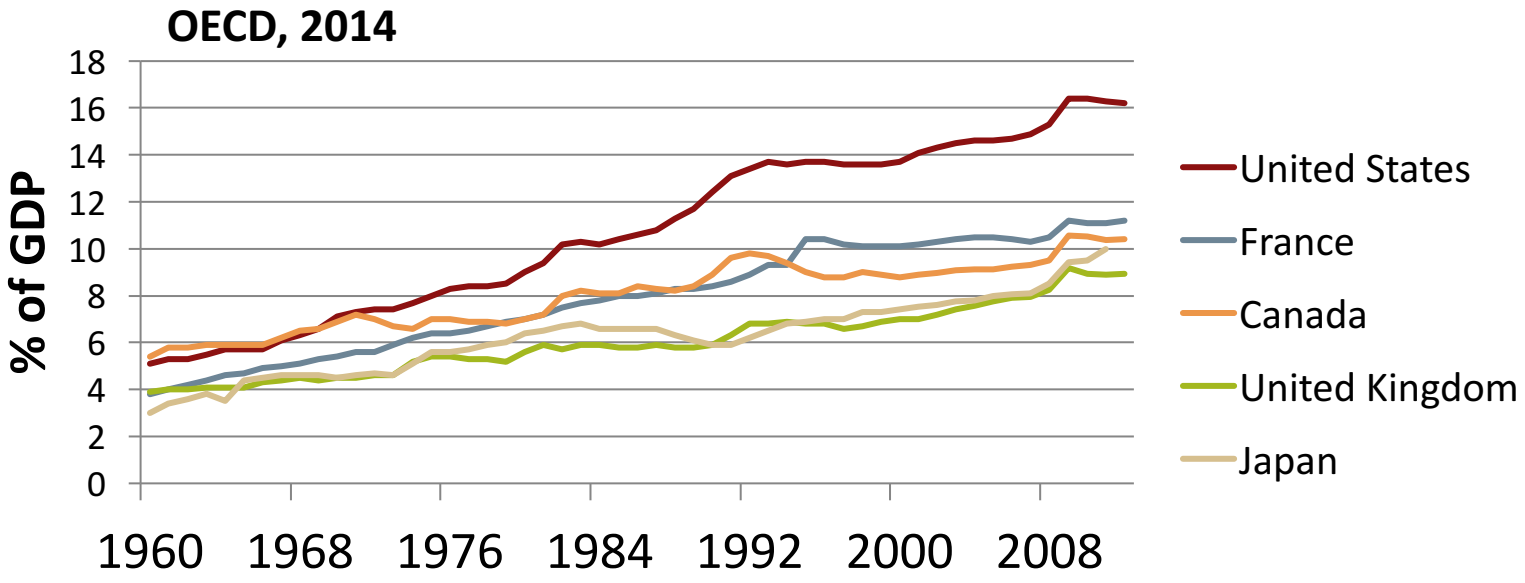
Stanford Children's Health | Lucile Packard Children's Hospital Stanford

cpqcc california perinatal quality care collaborative

The New York Times
August 5, 2011
S.& P. Downgrades Debt Rating of U.S. for the First Time

Stanford MEDICINE

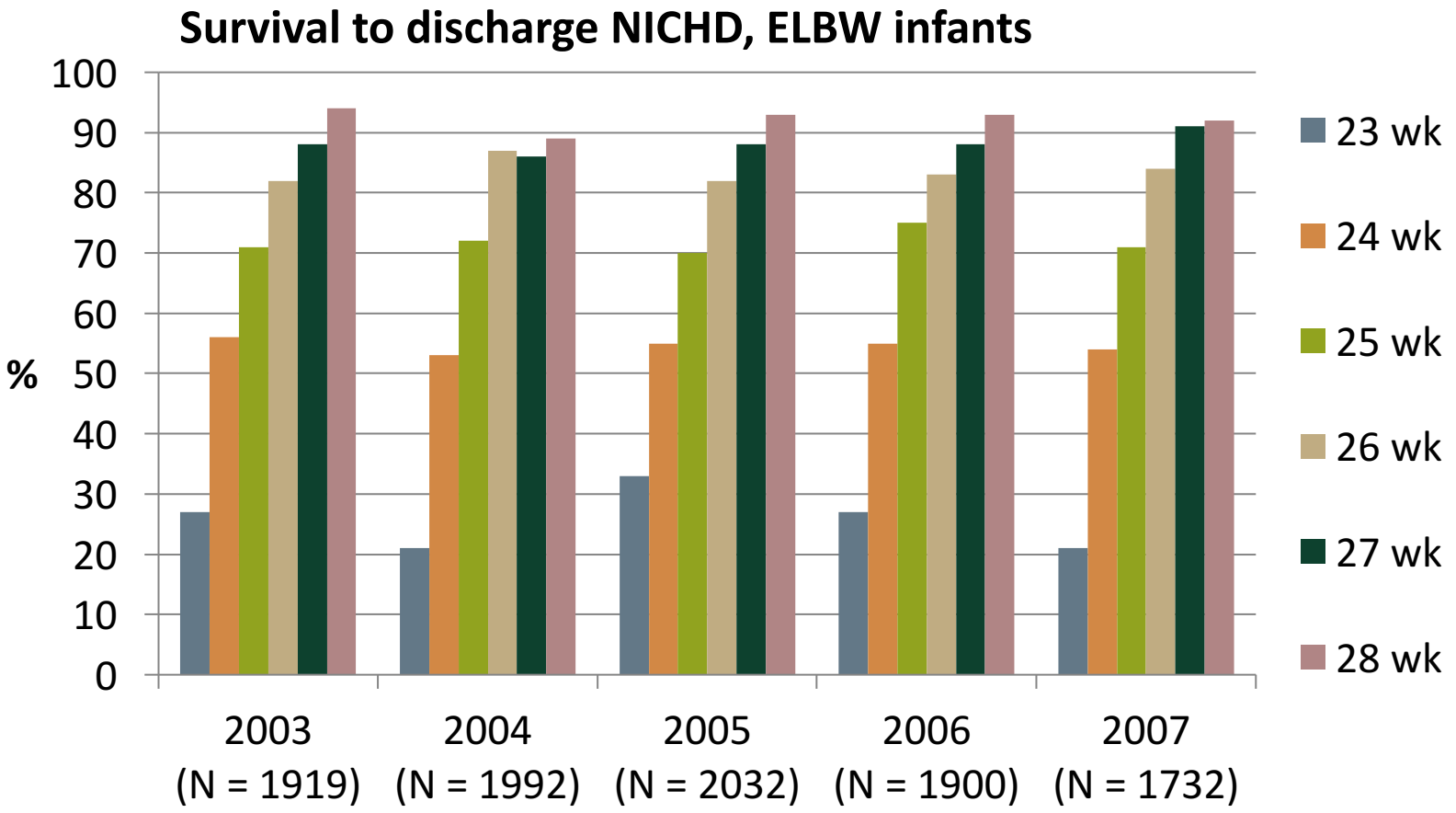
- U.S. National debt nearly $60 trillion
  - –>$200,000 for every adult and child



Stanford Children's Health | Lucile Packard Children's Hospital Stanford

cpqcc california perinatal quality care collaborative

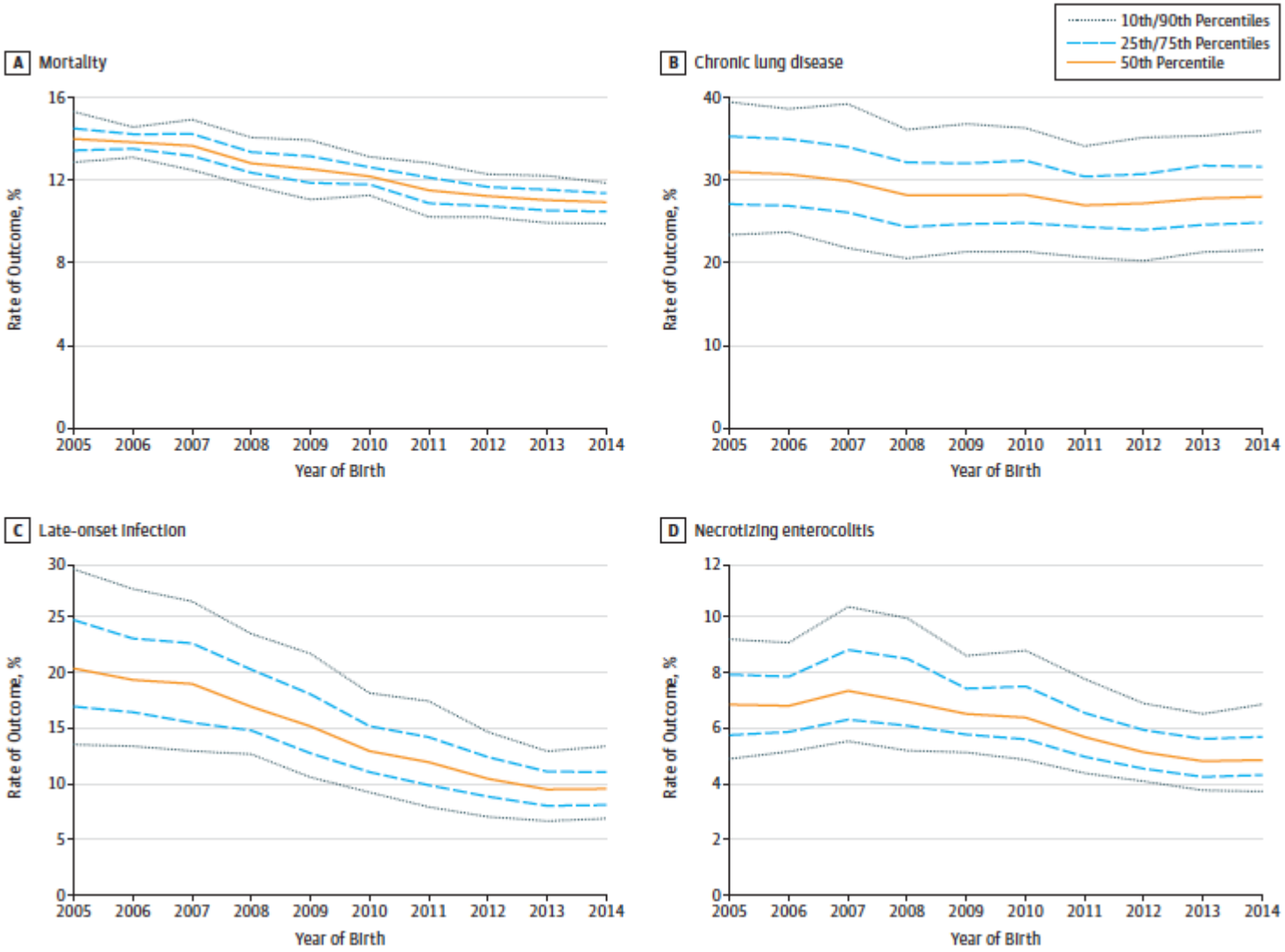
10 Years after "To Err is Human" there has been little progress – Wachter, Haff 2010



Stoll et al. Pediatrics, 2010

Actually, some good news

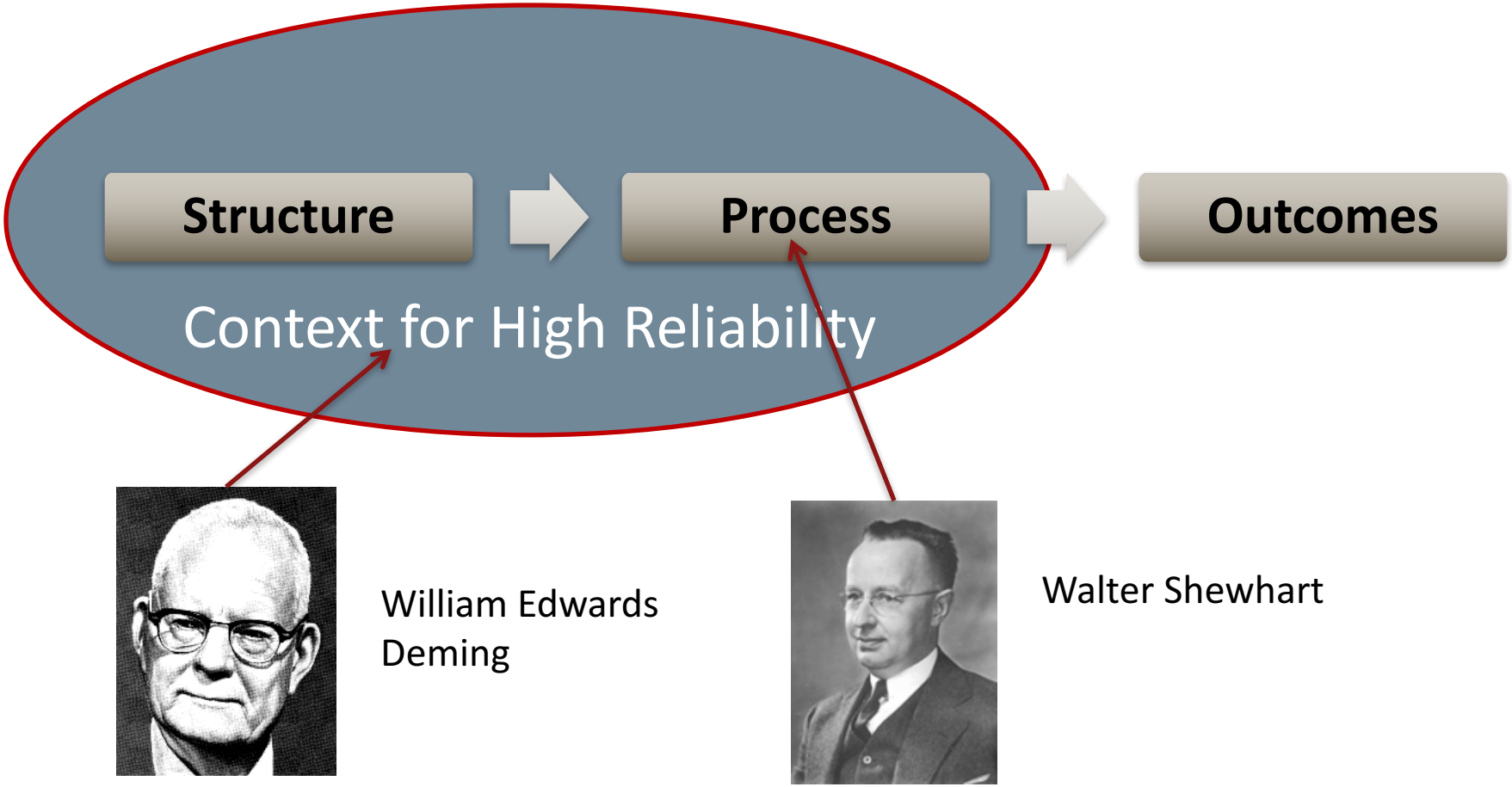
Stanford MEDICINE



Horbar, Jama Peds 2017

To Improve Quality & Safety Address Both Context and Processes

Stanford MEDICINE



High Reliability Industries

Attributes of High Reliability Organizations

1. Preoccupation with failure	Monitor, anticipate, report, learn
2. Reluctance to simplify	Standardize, crowd source, seek out system causes of errors
3. Sensitivity to operations	Aware of operations and purpose Culture of safety and teamwork
4. Commitment to resilience	Anticipate new failures, contingency planing, staff support
5. Deference to expertise	Pool talent, trust, respect, experience

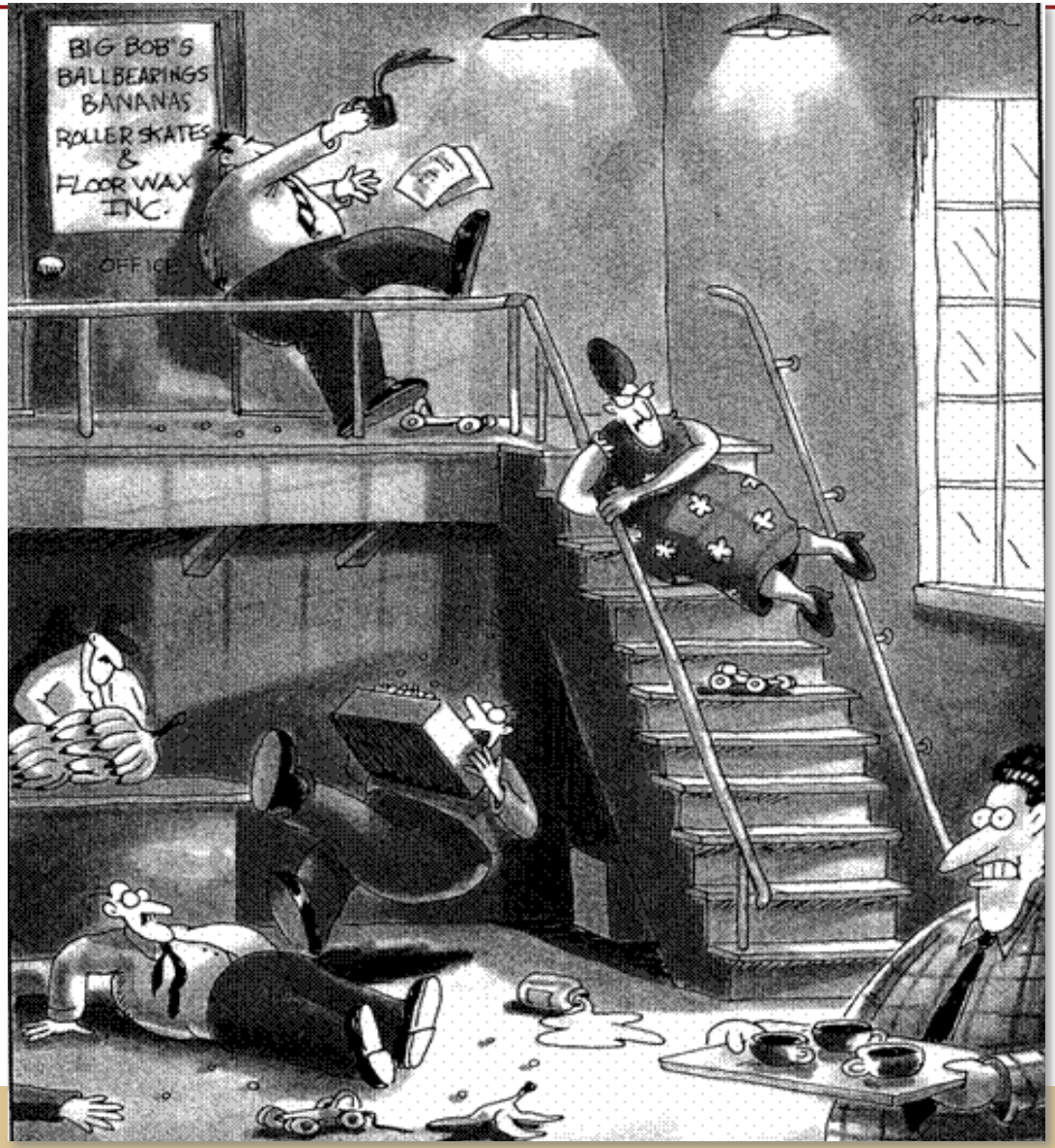
Weick, et al. Research in Organizational Behavior. 1999;21:81-123
Weick, Managing the Unexpected: Assuring High Performance in an Age of Complexity, Jossey Bass 2001

High Reliability Example 1

Stanford MEDICINE

Sensitivity to Operations

"Culture of Safety"



Stanford Children's Health | Lucile Packard Children's Hospital Stanford

Safety Culture

Definition: "individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of, a[illegible] management"[1]

"The way we do things around here"

1. Organising for Safety: Third Report of the ACSNI (Advisory Committee on the Safety of Nuclear Installations) Study Group on Human Factors. Health and Safety Commission (of Great Britain). Sudbury, England: HSE Books, 1993.

Safety Culture and Clinical Outcomes

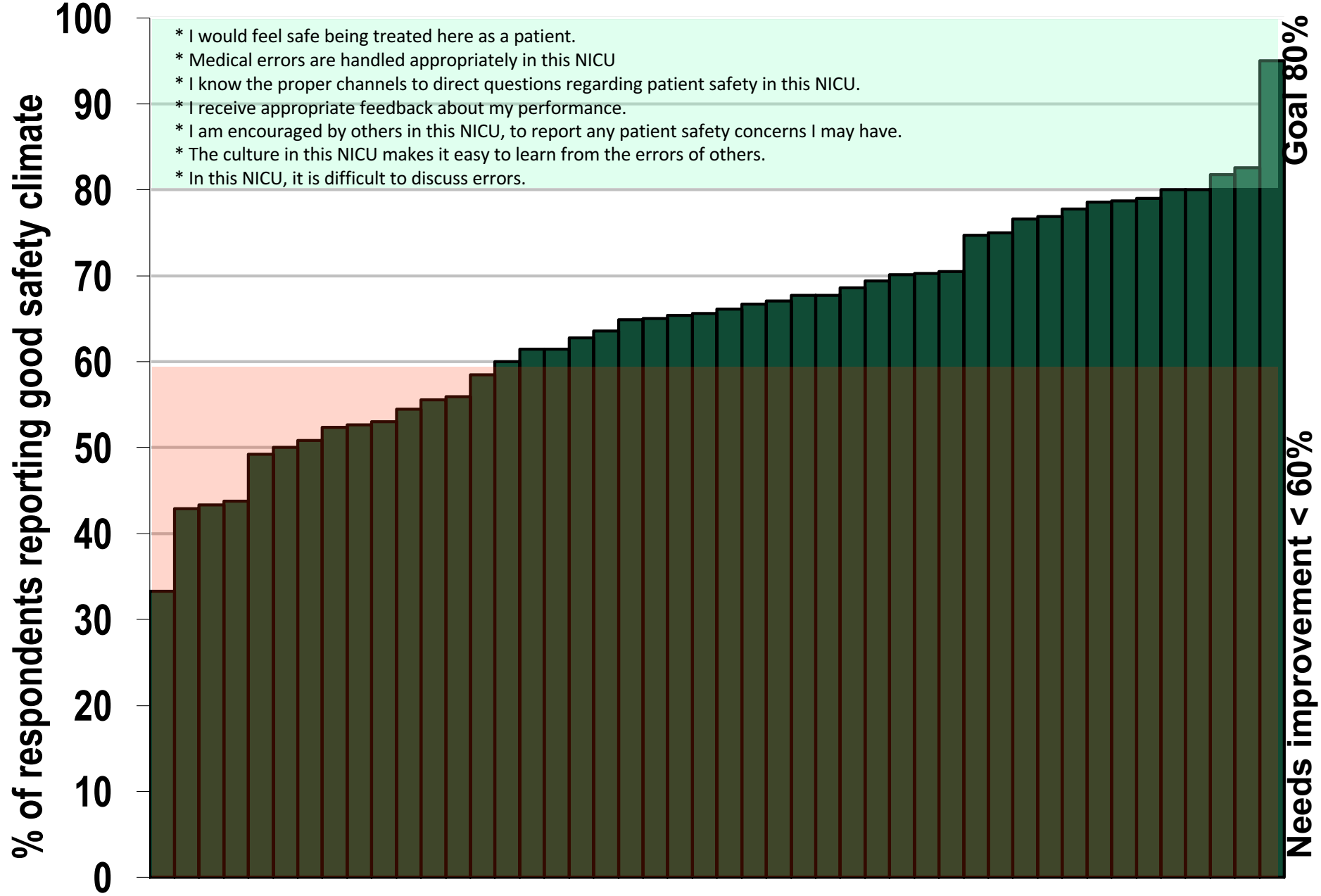
Patient Outcomes

- Adverse Events
- Medication errors
- Readmissions for MI and CHF
- Length of Stay
- ICU mortality
- BSI in the ICU/NICU
- CLD in NICU
- VAP in the ICU
- Post-Op Infections
- Ulcers in Med/Surg Units
- Delays in OR and ICU
- Surgical PE/DVT
- Wrong Site Surgeries

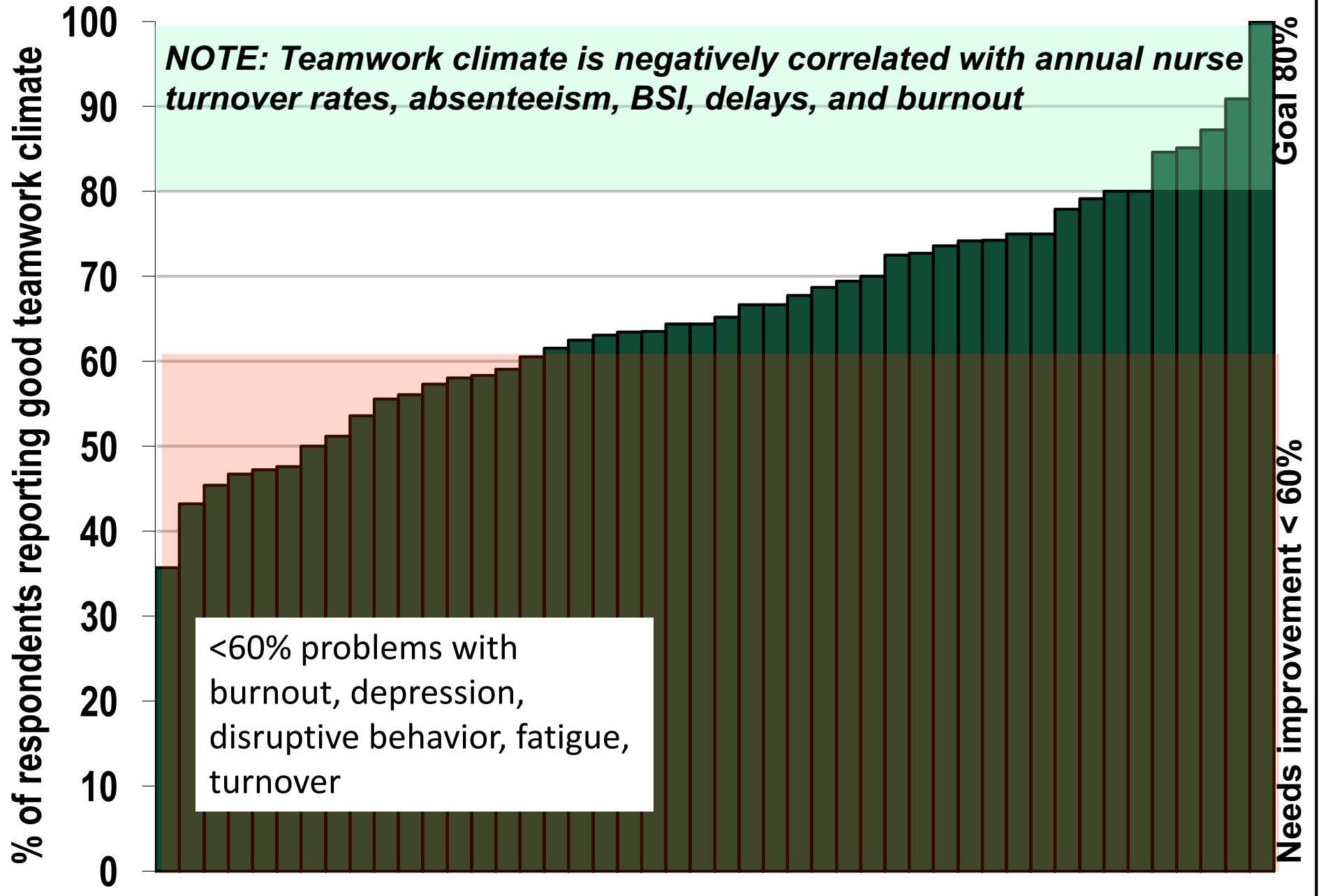
Staff Outcomes

- Safety behaviors
- Incident Reporting Rates
- Reduced staff injuries
- RN Turnover
- Absenteeism
- Burnout

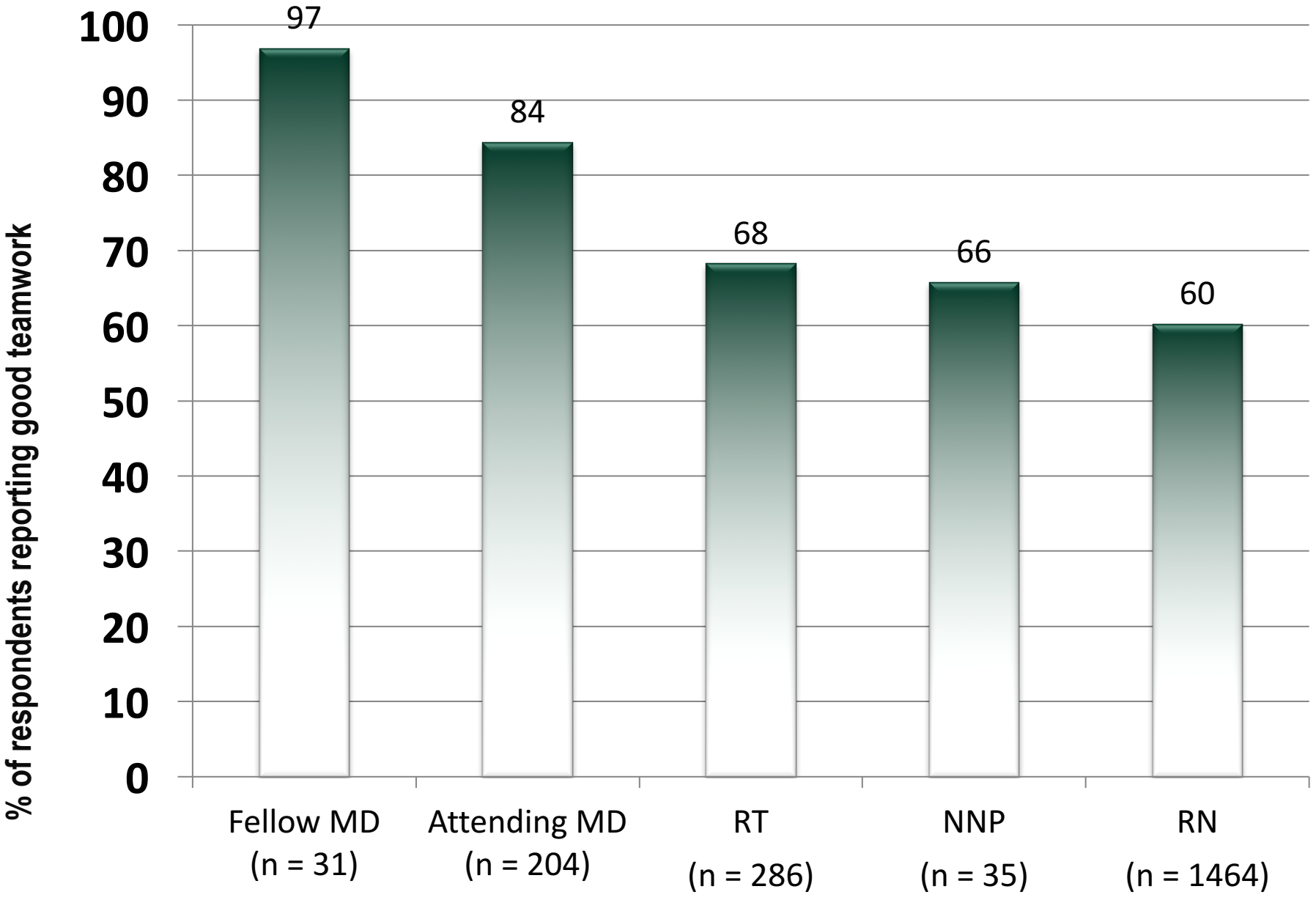
Safety Climate In This NICU



Teamwork Climate In 44 CA NICUs



NICU Teamwork Climate by Role



BMJ Quality & Safety Online First, published on 13 May 2014 as 10.1136/bmjqs-2013-002042

ORIGINAL RESEARCH

Exposure to Leadership WalkRounds in neonatal intensive care units is associated with a better patient safety culture and less caregiver burnout

J Bryan Sexton,[1,2] Paul J Sharek,[3,4,5] Eric J Thomas,[6] Jeffrey B Gould,[3,4,7] Courtney C Nisbet,[3,4] Amber B Amspoker,[8,9] Mark A Kowalkowski,[8,9] René Schwendimann,[2,10] Jochen Profit[3,4,7]

For numbered affiliations see end of article.

Correspondence to
Dr Jochen Profit, Department of Pediatrics, Section of Neonatology, Stanford

conducted his research at the Houston Veterans Affairs (VA) Health Services Research and Development Center of Excellence, Health Policy and Quality Program, Michael E DeBakey VA Medical Center

ABSTRACT

Background *Leadership WalkRounds* (*WR*) are widely used in healthcare organisations to improve patient safety. The relationship between WR and caregiver assessments of patient safety

s) actively participating in a structured delivery room management quality improvement initiative.

Results Of 3294 administered surveys, 2073 were returned for an overall response rate of

as a tool to enhance patient safety in perinatal care.[2]

WR have enabled hospital leadership to sustain good relations with frontline caregivers, promote conversations to

indicate that WR help educate leadership and frontline clinicians in patient safety concepts and lead to cultural changes such as increased transparency in discussions of adverse events and an improved

More WR feedback was associated with better safety culture and less caregiver burnout.

Stanford MEDICINE

In Michigan about 20% of ICUs did not improve

(those with lowest teamwork AND safety climate ratings but highest burnout ratings)

Stanford Children's Health | Lucile Packard Children's Hospital Stanford

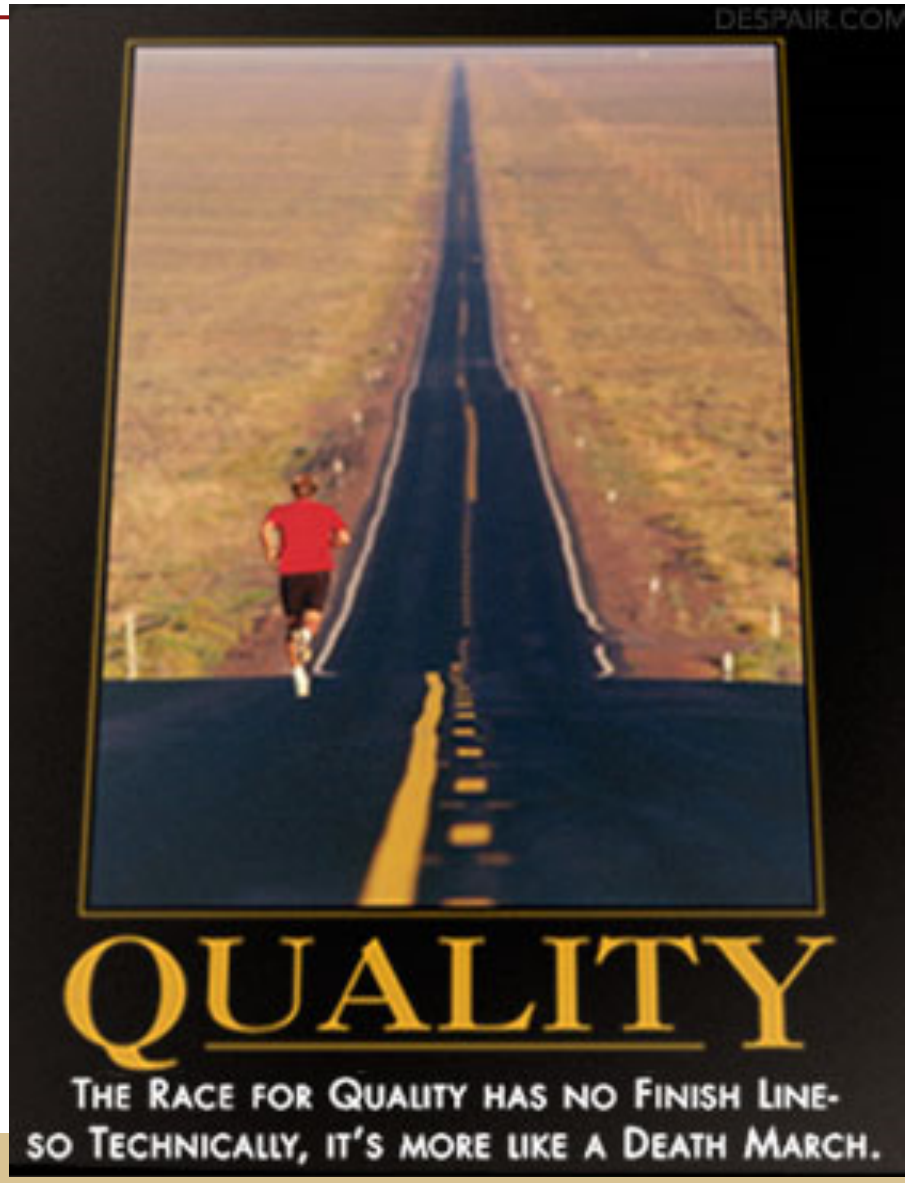
cpqcc california perinatal quality care collaborative

High Reliability Example 2

Stanford MEDICINE

Resilience

"Reduce Caregiver Burnout"

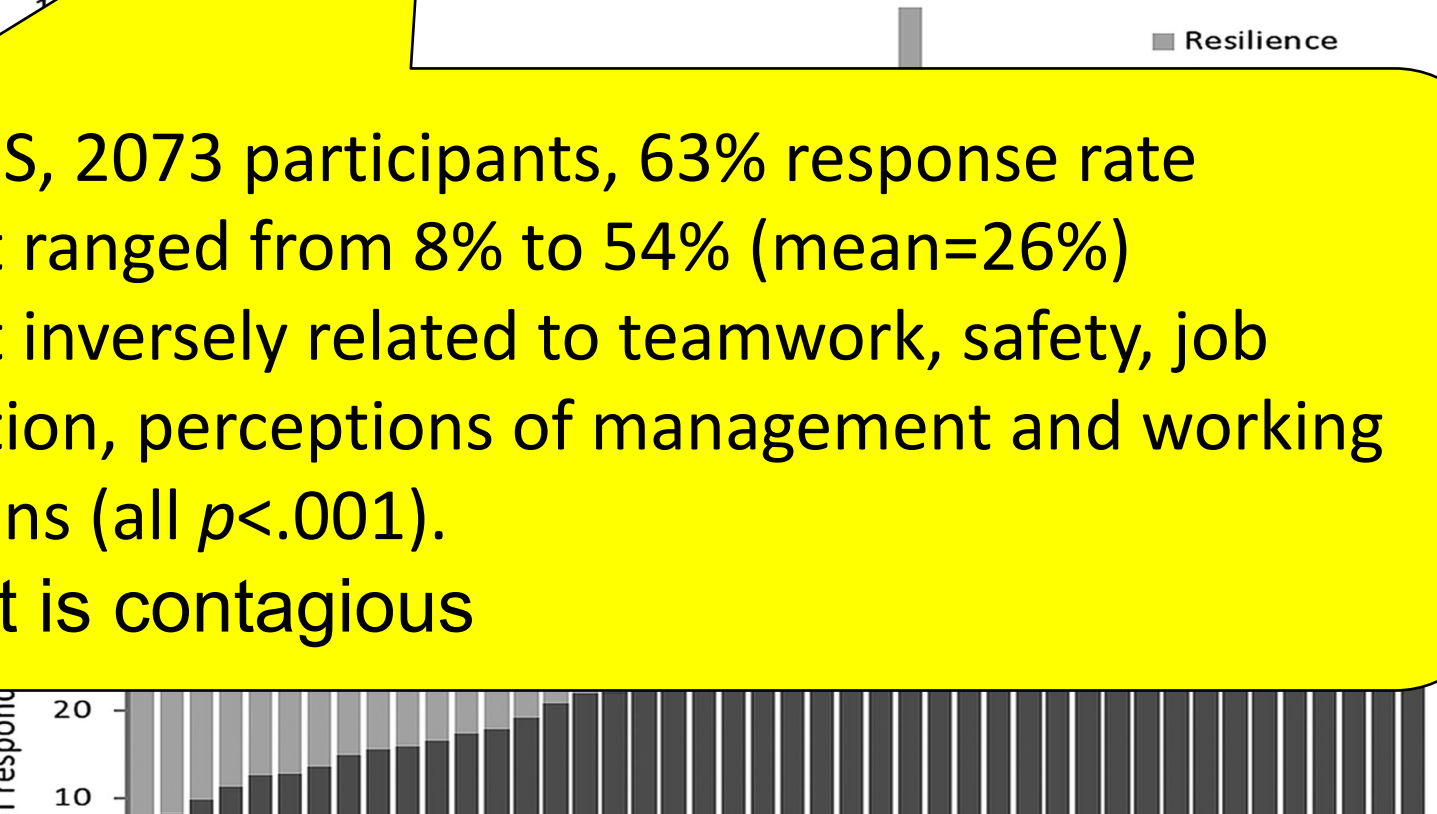


Stanford Children's Health | Lucile Packard Children's Hospital Stanford

Downloaded from qualitysafety.bmj.com on April 23, 2014 - Published by group.bmj.com
BMJ Quality & Safety Online First, published on 17 April 2014 as 10.1136/bmjqs-2014-002831

Burnout in the NICU setting and its relation to safety culture

Jochen Profit [1,2] J Sharek,[2,3,4] Amber B Amspoker,[5,6]
Mark A K[illegible],[7] Courtney C Nisbet,[2,4] Eric J Thomas,[8]
Whitn[illegible],[9] J Bryan Sexton[10,11]



- 44 NICUS, 2073 participants, 63% response rate
- Burnout ranged from 8% to 54% (mean=26%)
- Burnout inversely related to teamwork, safety, job satisfaction, perceptions of management and working conditions (all $p<.001$).
- Burnout is contagious

Medicine, MSOB Rm x115, 1265 Welch Road, Stanford, CA 94305, USA;

DEPRESSION AND ANXIETY 26:1118–1126 (2009)

Research Article

THE PREVALENCE AND IMPACT OF POST TRAUMATIC STRESS DISORDER AND BURNOUT SYNDROME IN NURSES

Meredith [illegible] N. M.S.,[1]* Ellen L. Burnham, M.D.,[1] Colleen J. Goode, R.N. Ph.D.,[2]
Barbara Rothbaum, Ph.D.,[3] and Marc Moss, M.D.[1]

[illegible] of Medicine, University of Colorado
Mealer@UCDenver.edu

18% (61/332)
met diagnostic criteria for PTSD

[illegible] disorder (PTSD) and burnout syndrome (BOS) are common in nurses, and whether the co-existence of

Burnout and patient care

Lower Patient Satisfaction

Aiken et al. BMJ 2012
Vahey, Aiken et al. Med Care. 2004

Infections

Cimiotti, et al.
Am J Infect Control. 2012.
Tawfik, Sexton, Profit et al.
J Perinatol. 2016.

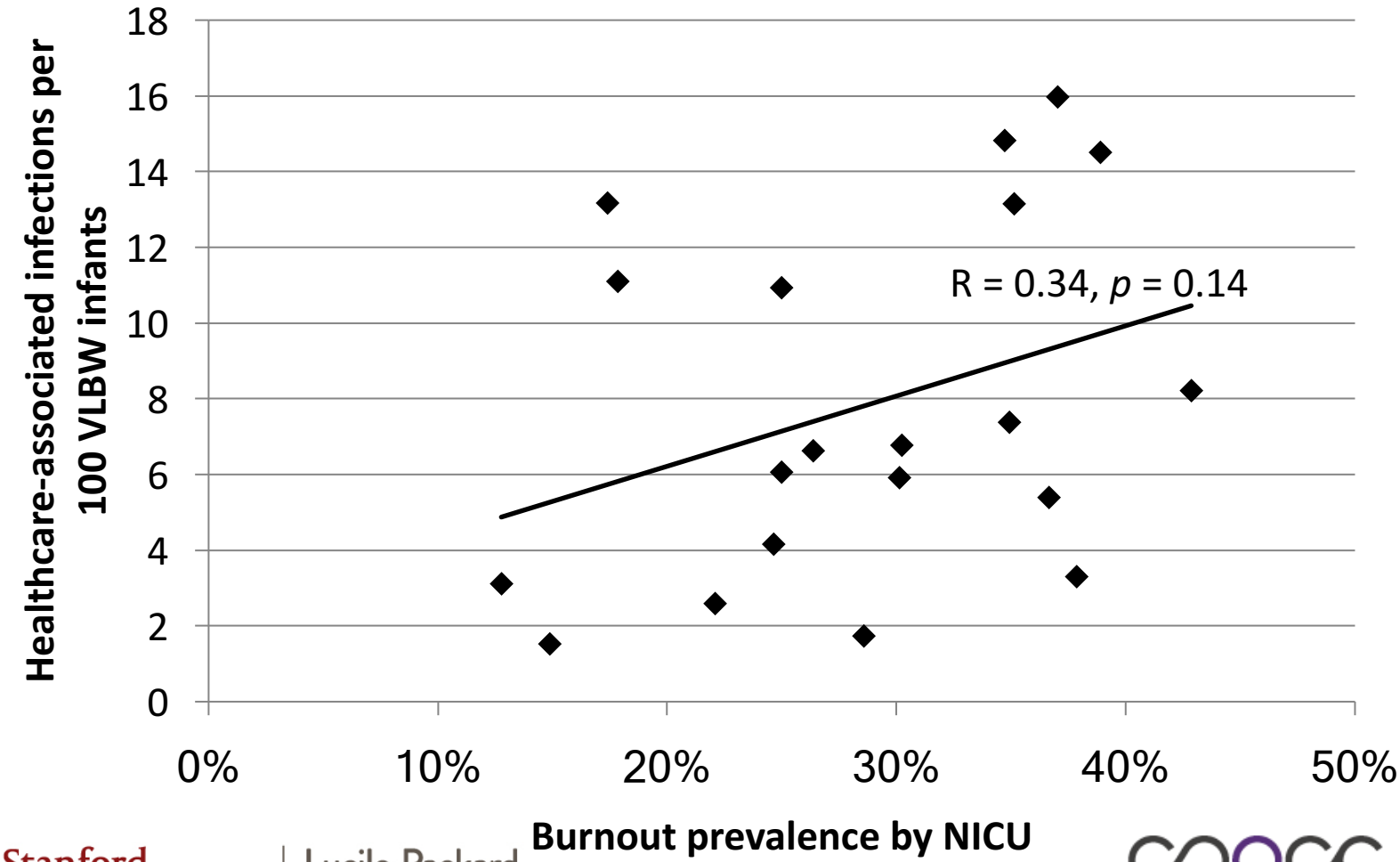
Medication Errors

Fahrenkopf et al.
BMJ. 2008

Higher Standardized Mortality Ratios

Welp, Meier & Manser.
Front Psychol. 2015

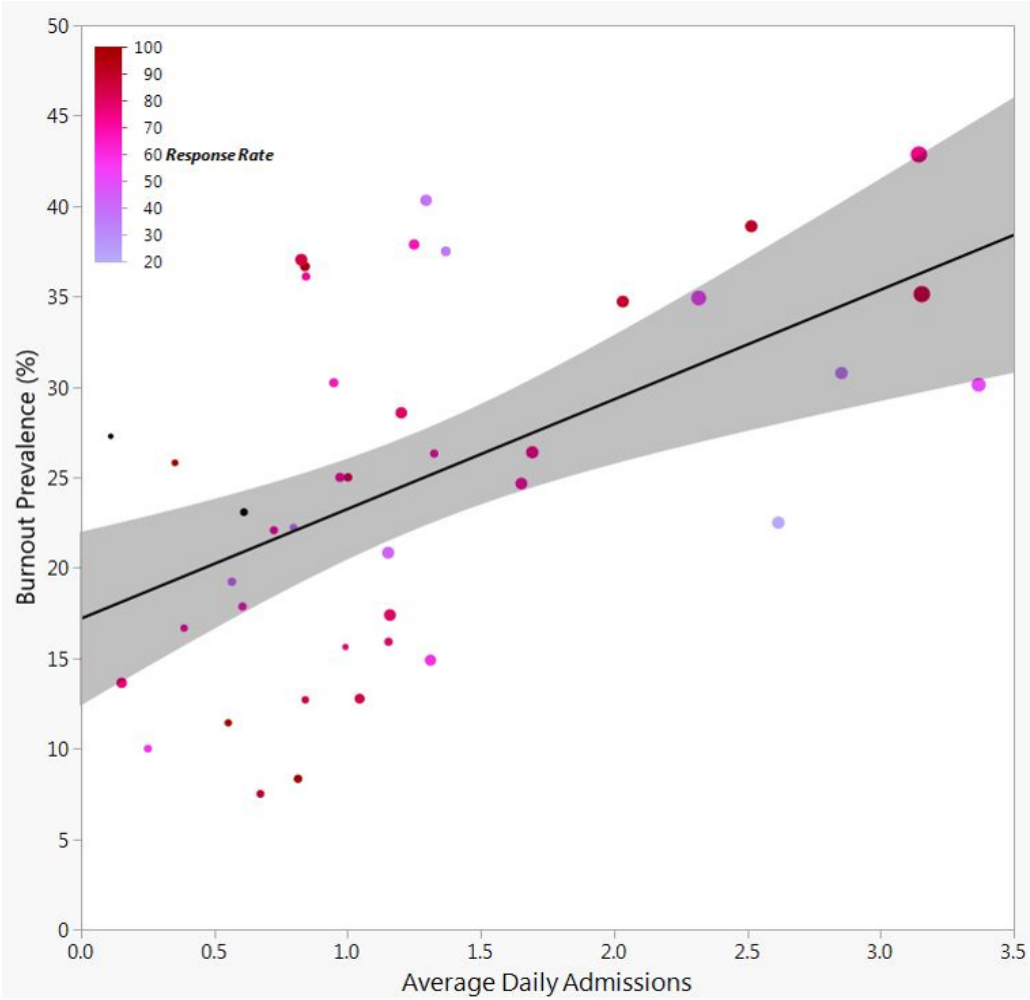
Burnout may associate with HAIs



Tawfik, D. S., et al (2016). J Perinatol

NICU volume associates with burnout

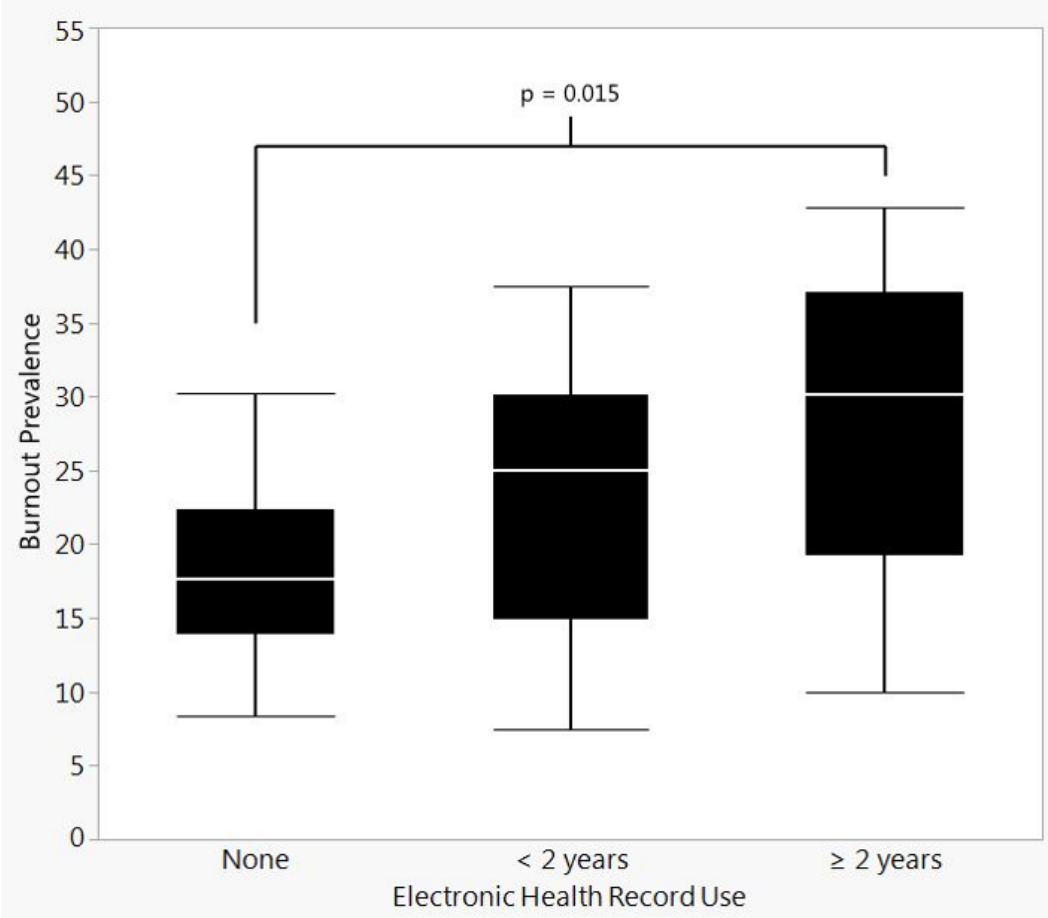
- Positive correlation with admission rates ($r = 0.53$, $p < 0.001$)
- Each daily admission = 5.9% increase in burnout prevalence



Tawfik, DS, Profit J, et al (2017). Pediatrics

EHR use associates with burnout

- ≥ 2 years EHR with higher burnout than non-EHR NICUs
  - 28% vs 18%, *p* = 0.015
- EHR use = 3.4% increase in burnout prevalence



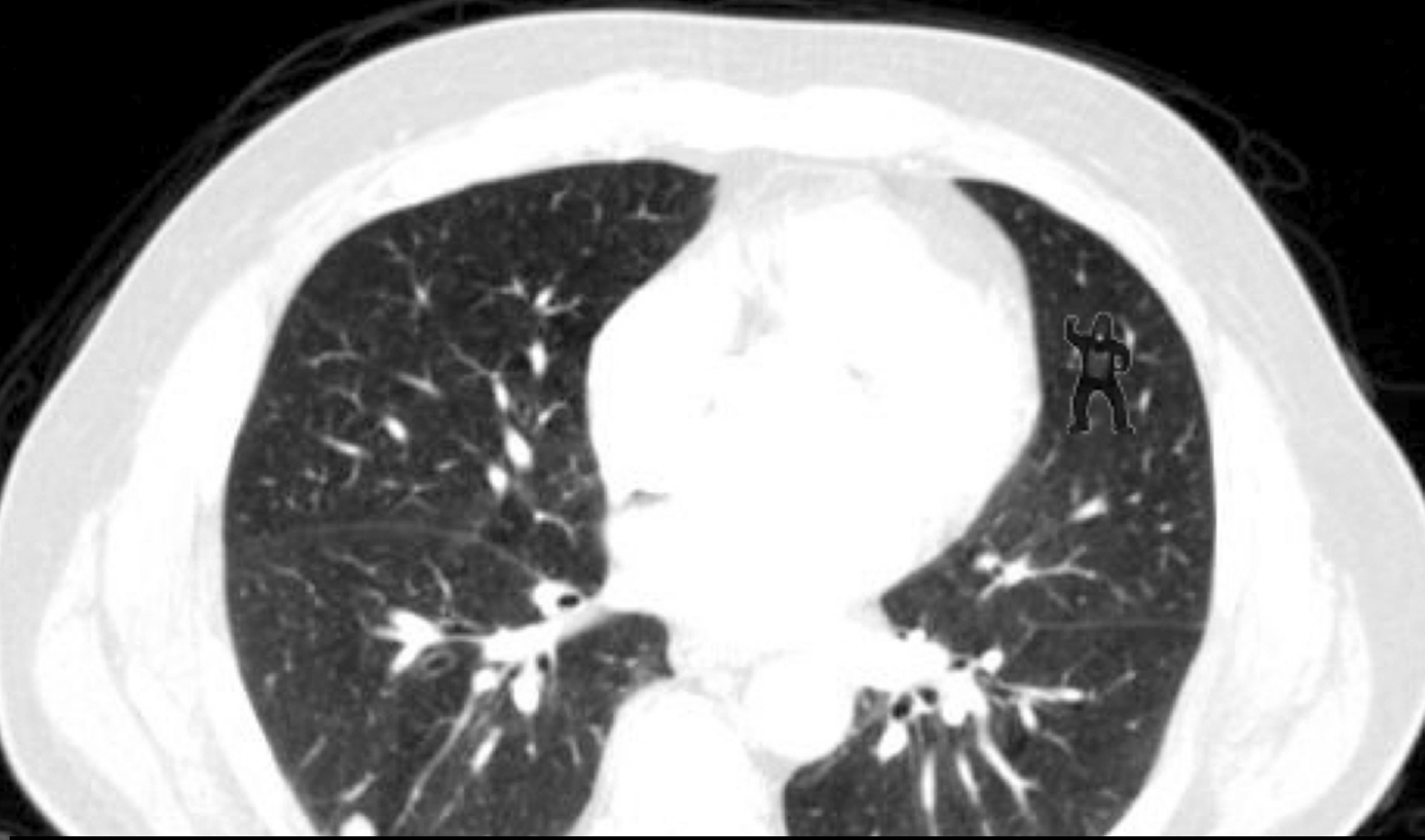
Tawfik, DS, Profit J, et al (2017). Pediatrics

Psychology of Burnout

Your focus determines your reality

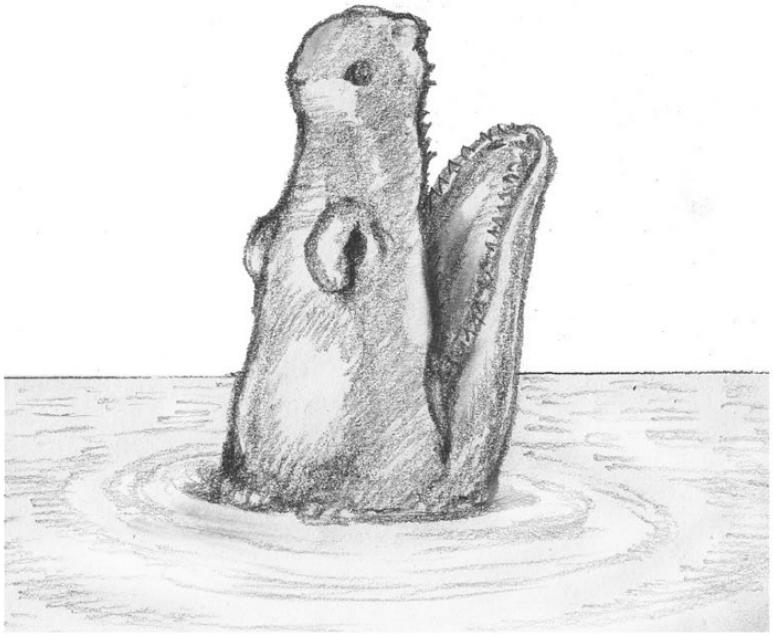
&

Perceptions are influenced by how you feel



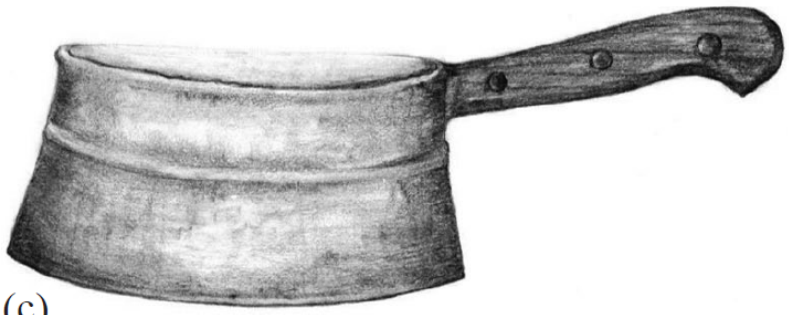
Notice anything unusual about this lung scan? Harvard researchers found that 83 percent of radiologists didn't notice the gorilla in the top right portion of this image.

Blurt test – don’t be shy



(a)

(b)



(c)

Perception, 2012, volume 41, pages 1535–1539

doi:10.1068/p7290

SHORT AND SWEET

Alligator or squirrel: Musically induced fear reveals threat in ambiguous fi

Jesse Prinz[1], Ange
[1] Department of Philo
New York, NY 10016,
of New York
Received 14 May 20

Abstract. Extant evide
visual features or mak
seen. Three newly dev
presented for brief inte
control condition and
majority reported seei
a visually perceived st
so the findings also su

Keywords: ambiguou

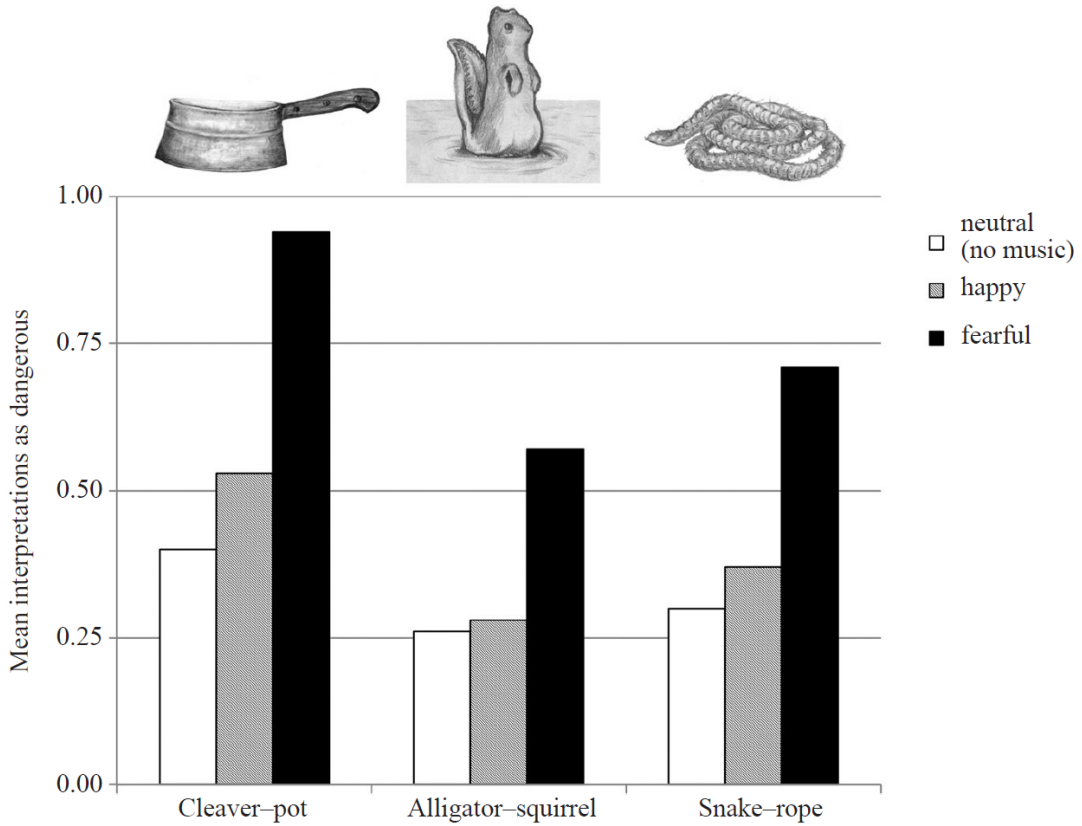
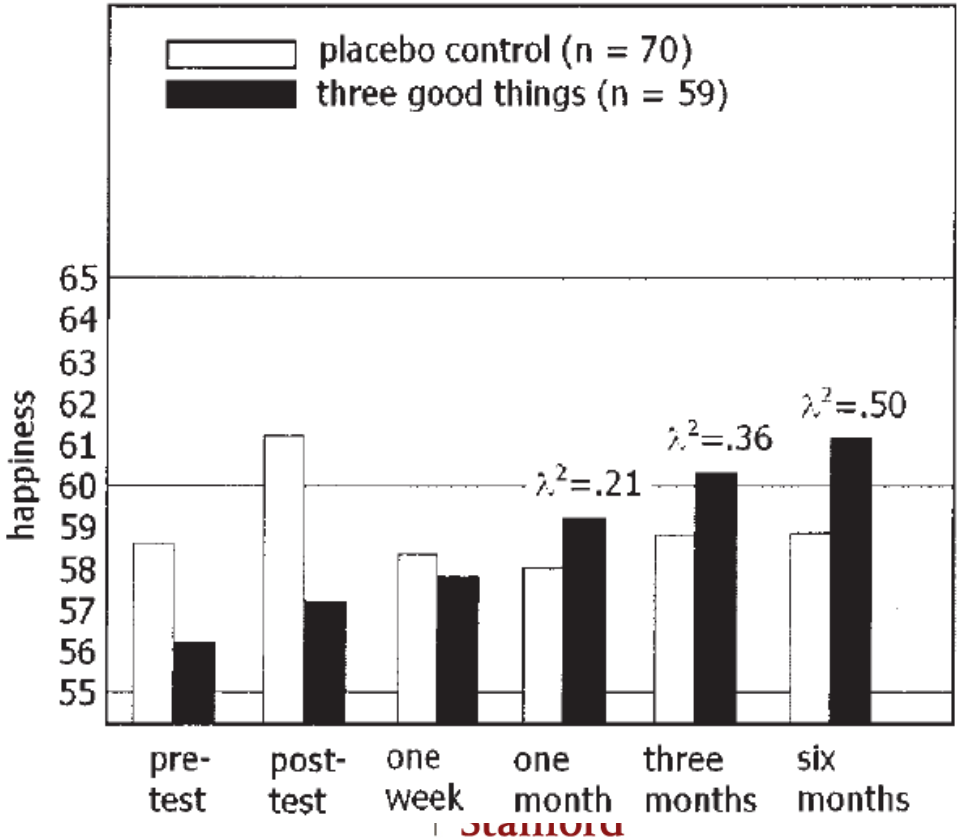


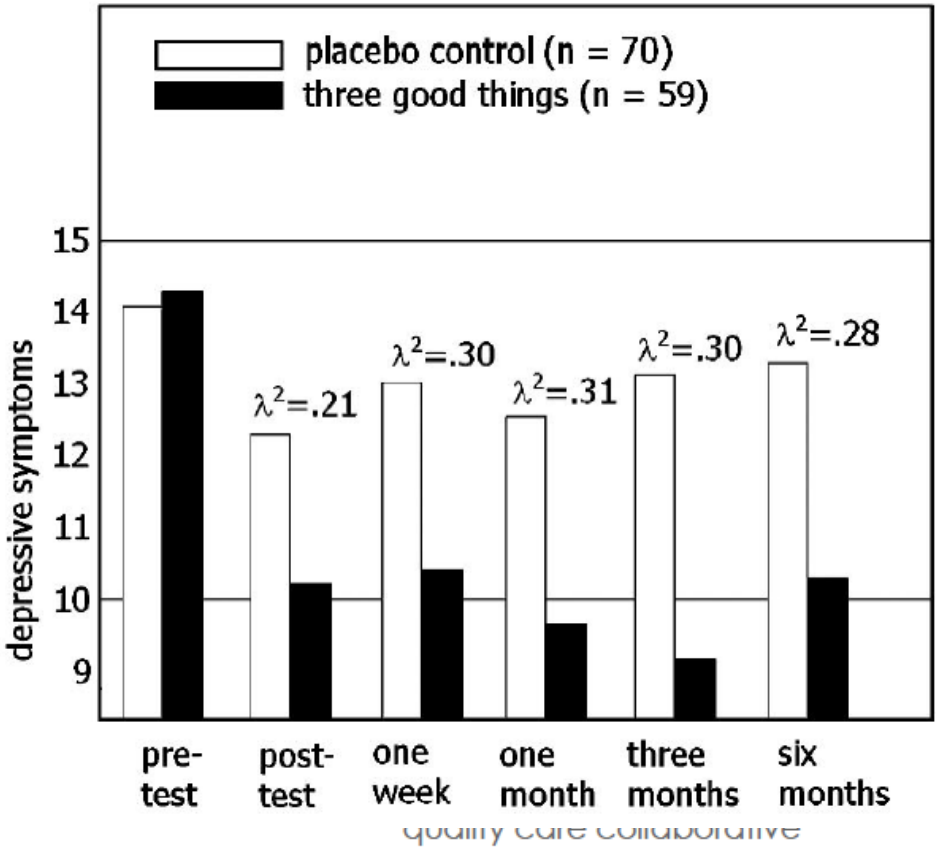
Figure 2. Mean interpretations as benign (= 0) and dangerous (= 1) for ambiguous figures in no music, happy music, and fearful music conditions.

Three good things

- http://www.youtube.com/watch?v=dwkDEM4gFBA

Seligman, Steen, Park & Petersen, 2005





Nov 2012 NICU - 3 Good Things

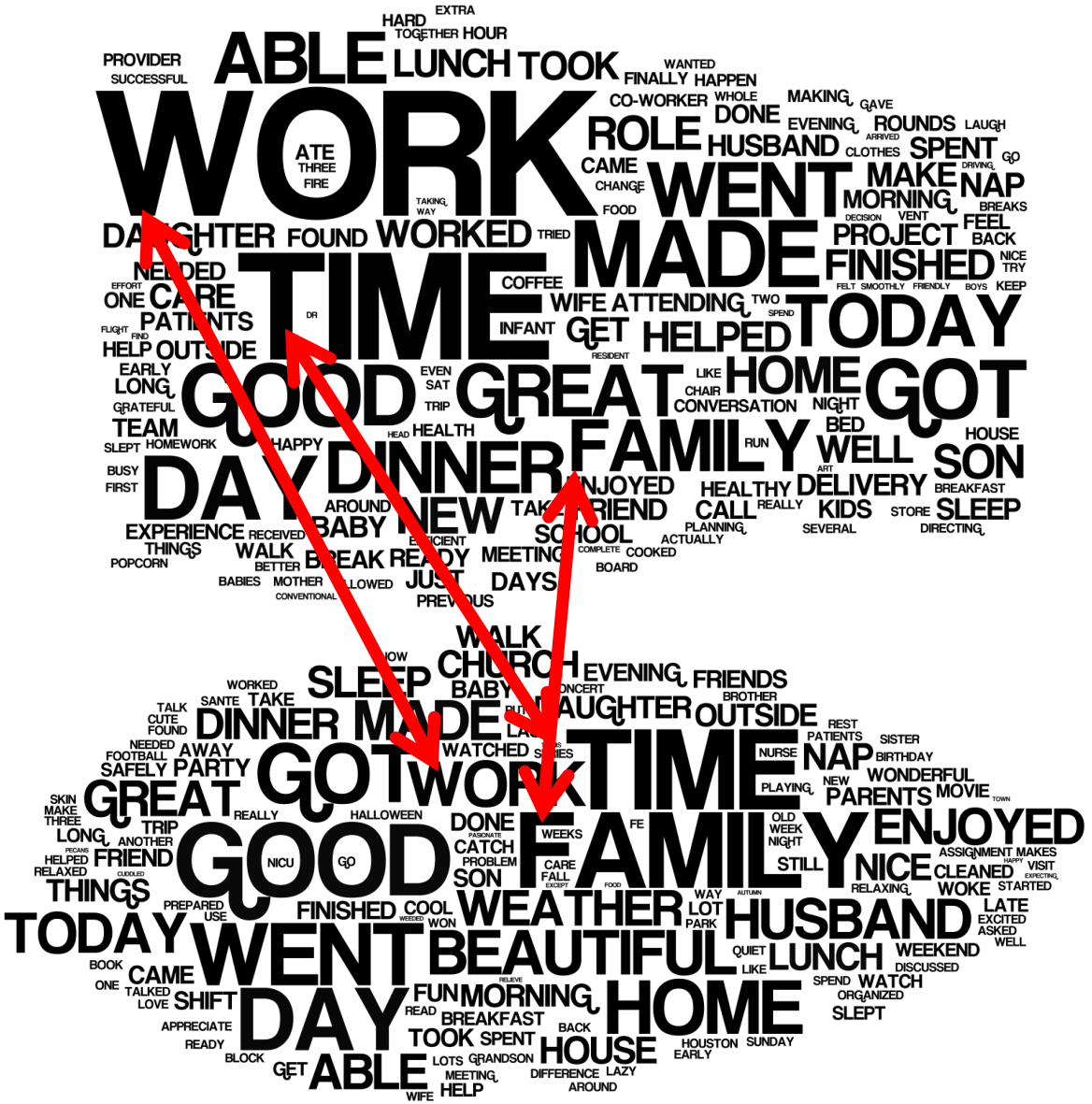
90 initiated exercise
61 completed at least 7 days

Significantly less:

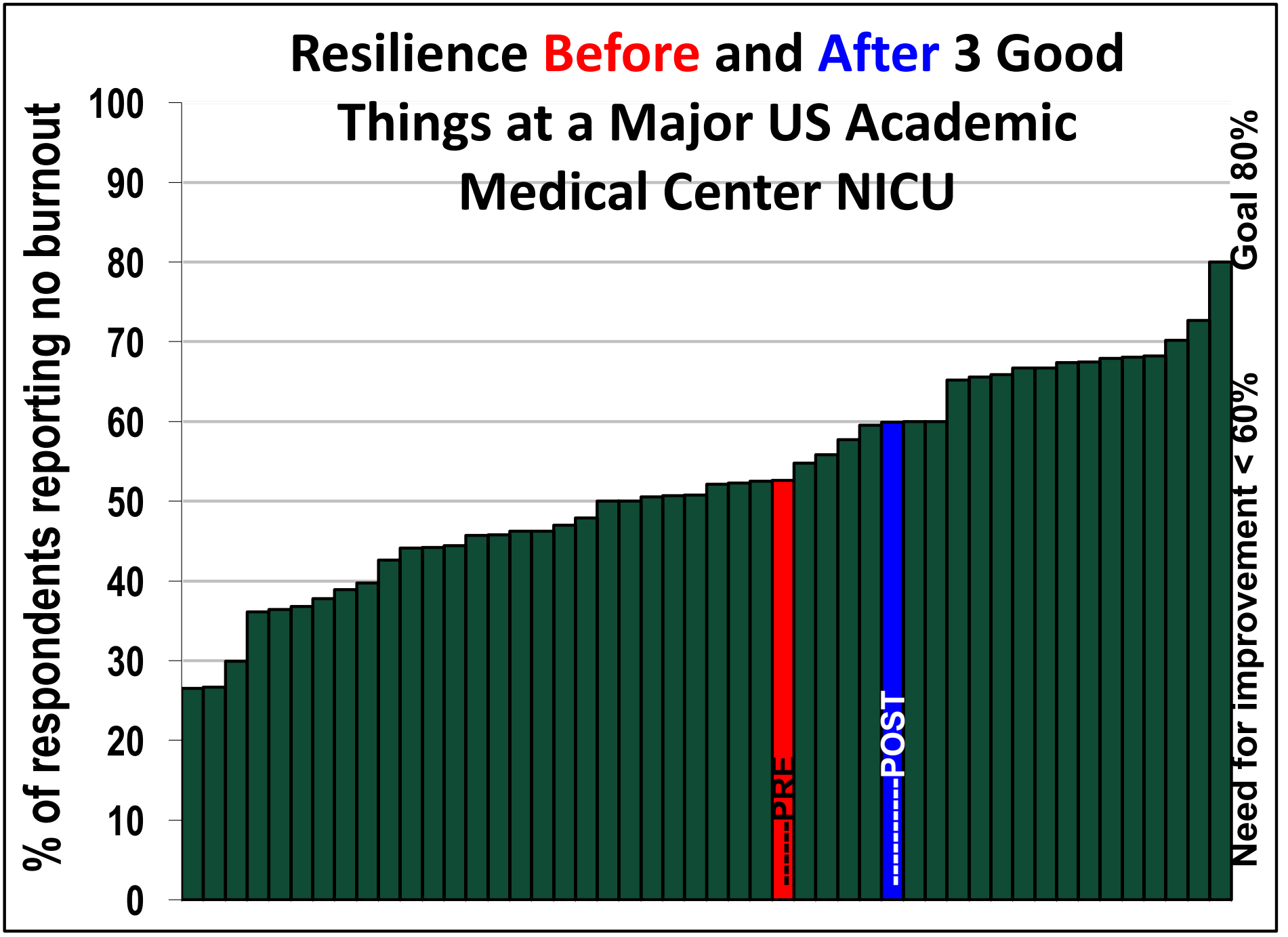
1. Burnout
2. Depression
3. Communication breakdowns resulting in delays
4. Challenged in dealing with difficult colleagues
5. Taking work home to complete after hours

Significantly more:

1. Happiness



Sexton, Chatwick, Profit et al. E-PAS 2013: 4150.7


Resilience Before and After 3 Good Things at a Major US Academic Medical Center NICU
% of respondents reporting no burnout
100
90
80
70
60
50
40
30
20
10
0
PRE
POST
Goal 80%
Need for improvement < 60%

WISER

- Burnout
  - Prevalent
  - Bad for patients
  - Bad for healthcare workers
  - Treatable using evidence based tools

WISER packages the best available evidence for busy healthcare workers

WISER

- Individual Program using evidence-based positive psychology tools
- Cell phone-based, runs over 15 days with 15 text messages
- Brief video learning sessions (8-10 min) followed by behavioral interventions

Interested in WISER?

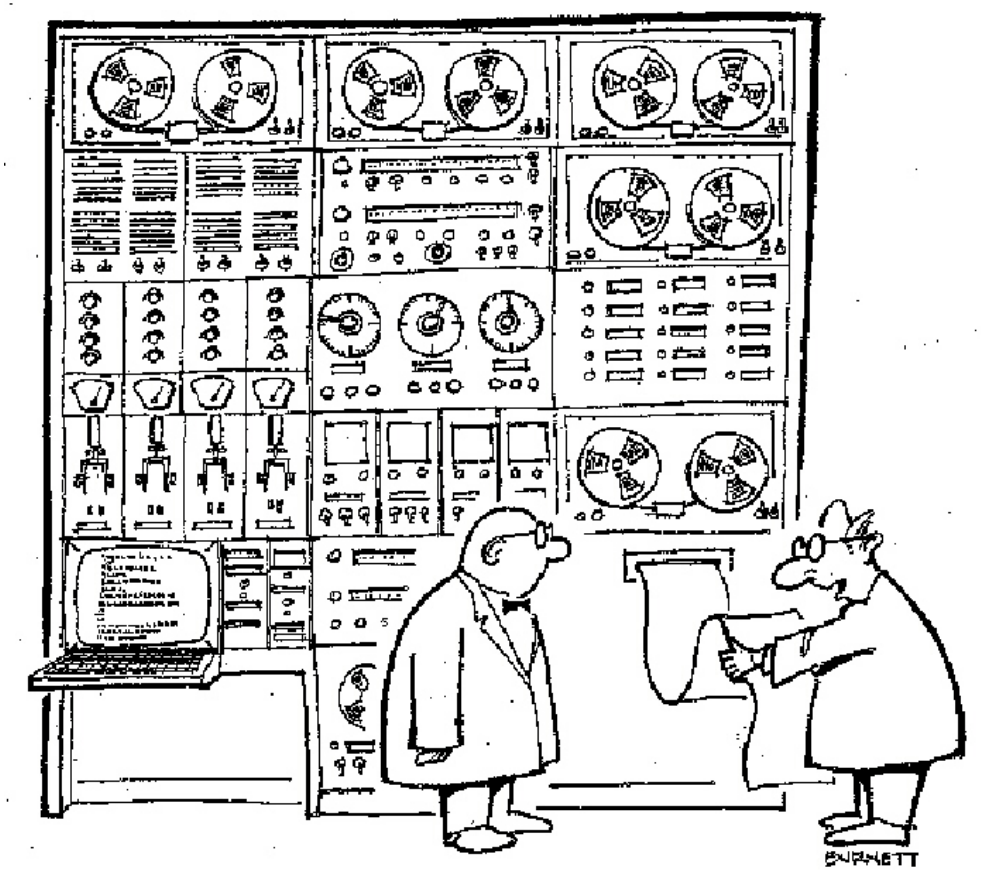
- Individuals or units may register their non-binding interest to
  the link below int

High Reliability Example 3

Stanford MEDICINE

Preoccupation with Failure

"Global monitoring of quality – The Baby-MONITOR"



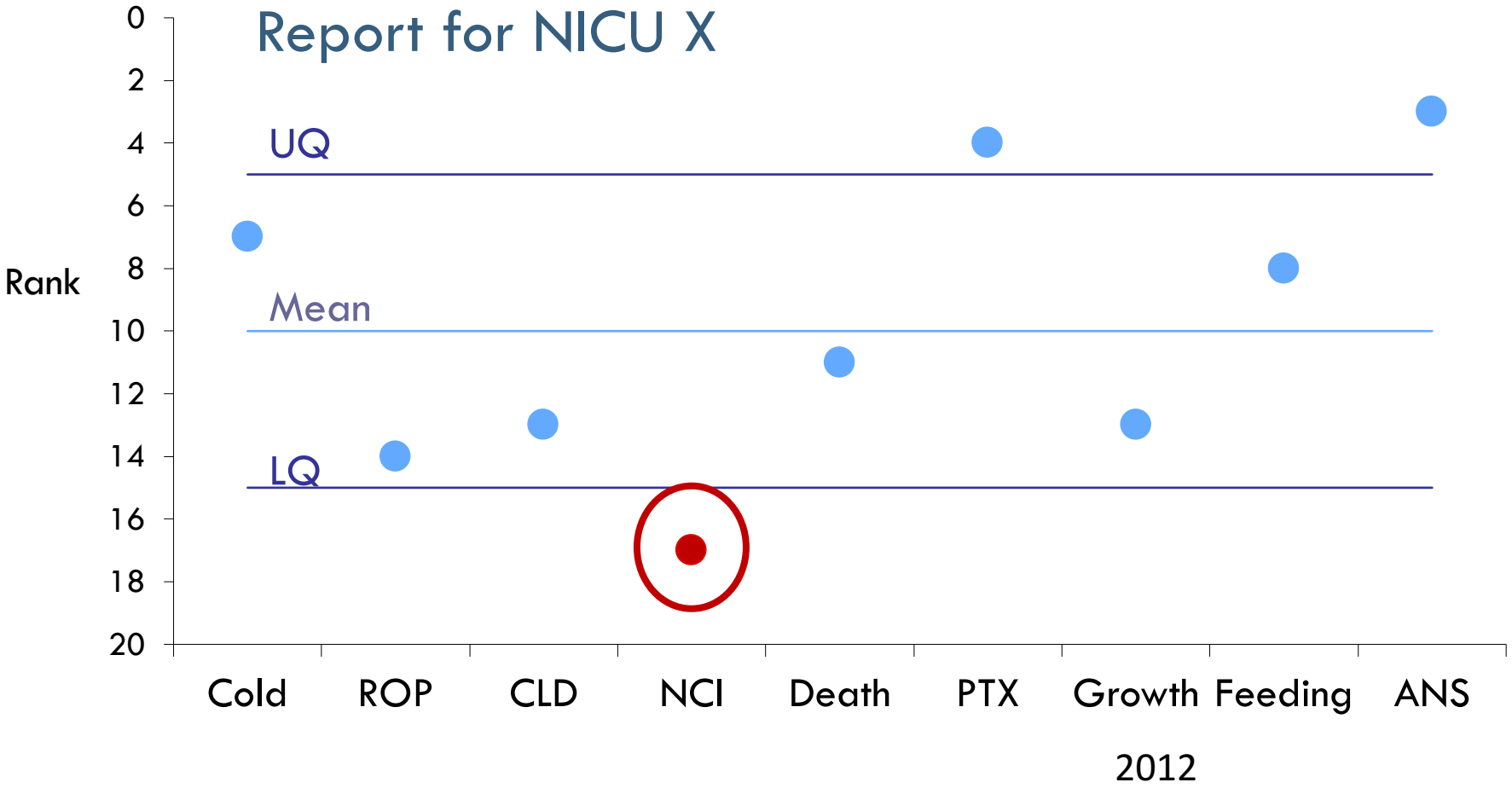
Stanford Children's Health | Lucile Packard Children's Hospital Stanford

cpqcc california perinatal quality care collaborative

Why is sustained improvement so difficult?

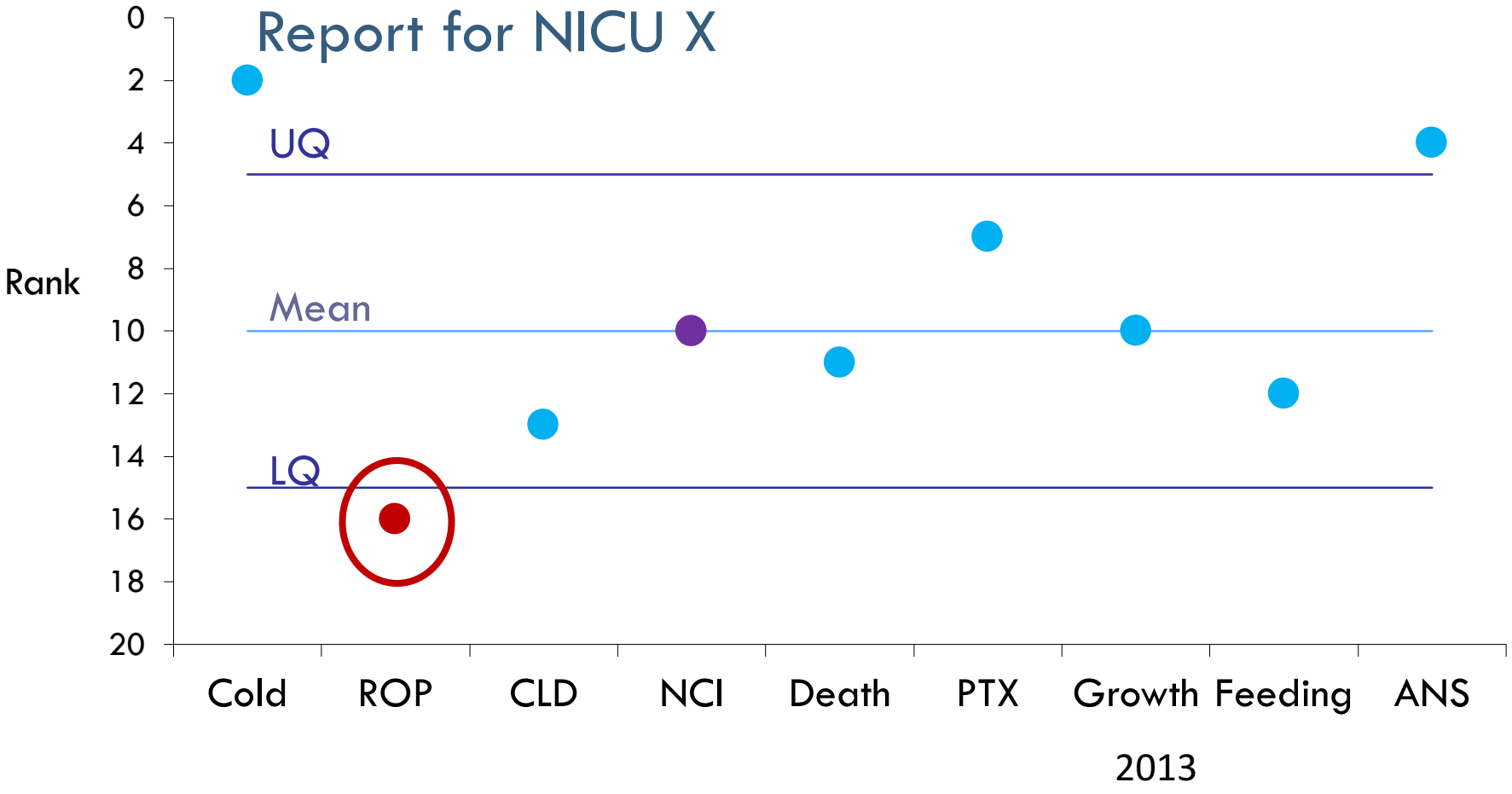
Current approach to QI is necessary but NOT sufficient

Stanford MEDICINE



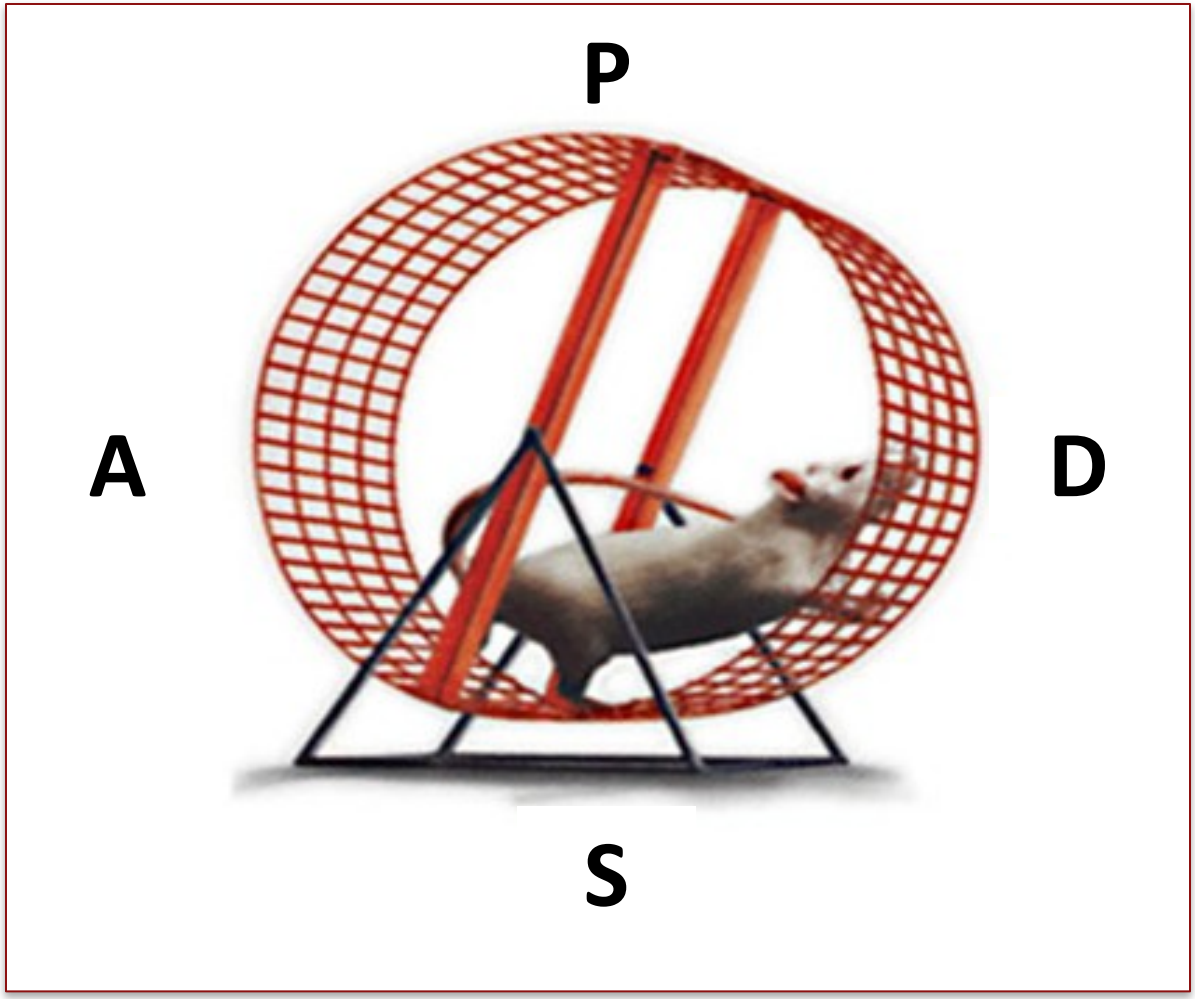
Are we getting better?

Stanford MEDICINE



The Illusion of Accomplishment?

Stanford MEDICINE



Cooking a perfectly boiled egg
Simple - Process driven

- Egg factors (Case mix)
  - Age of egg
  - Size of egg
- Cooking factors (Quality)
  - pH of water
  - Temperature of water
  - Time of cooking
  - Altitude

Providing a perfect dinner experience
Complex – Systems-based approach

French Laundry – "Best Food" in SF area

Food

Décor

Service

Cost

Context matters

Why a Composite Indicator?

Individual measures say little about overall quality

Correlation Among Quality Measures

	Surv	ANS	Not Cold	No PTX	No HAI	High GV	No CLD	BM
Survival	1							
ANS	.42*	1						
Not Cold	-.06	.01	1					
No PTX	.38*	.43*	.02	1				
No HAI	.05	.09	.01	-.01	1			
High GV	.08	-.07	.03	.05	.61*	1		
No CLD	.23	.46*	-.33	-.04	-.07	-.41*	1	
BM at dc	-.23	-.05	-.16	-.18	.11	-.44*	.35	1

* Only 6/28 correlations were significant

CPQCC 22 regional NICUs 2004-07, n = 5445 VLBW

Based on standardization and risk adjustment

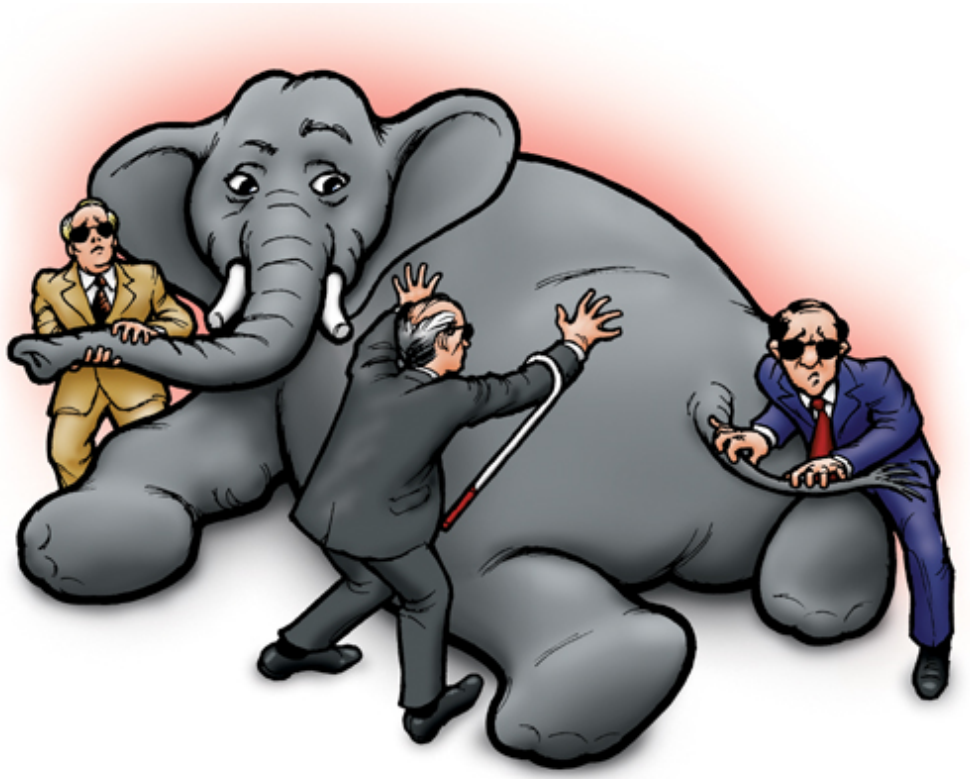
Each measure has its own risk model

Profit, Gould, et al. (accepted with revision), Arch Peds & Adol Med, 2012

Implications for Performance Measurement

- Cannot infer overall NICU performance based on one or a few metrics of quality

- Composite may better measure **overall** performance



Stanford Children's Health | Lucile Packard Children's Hospital Stanford

california perinatal quality care collaborative

Composites

ZAGAT

Composite Indicators

- Aggregate multiple measures into a single score
- National priority for quality assurance
- Multi-dimensional measurement may drive multi-dimensional systems-based improvements in quality

Development

- Complex process
- Developers' choice of methods may sway performance ratings
- Imperative to follow a standardized and explicit approach

Profit, et al., Imp Science. 2007

Composite Indices of Quality

PROS	CONS
Facilitate communication with stakeholders	Misleading if poorly constructed
Assess progress over time across multiple metrics	Simplistic conclusions
Assess effect of QI on multiple measures of quality	Methods could be the target of political challenge

Adapted from Nardo et al, 2005

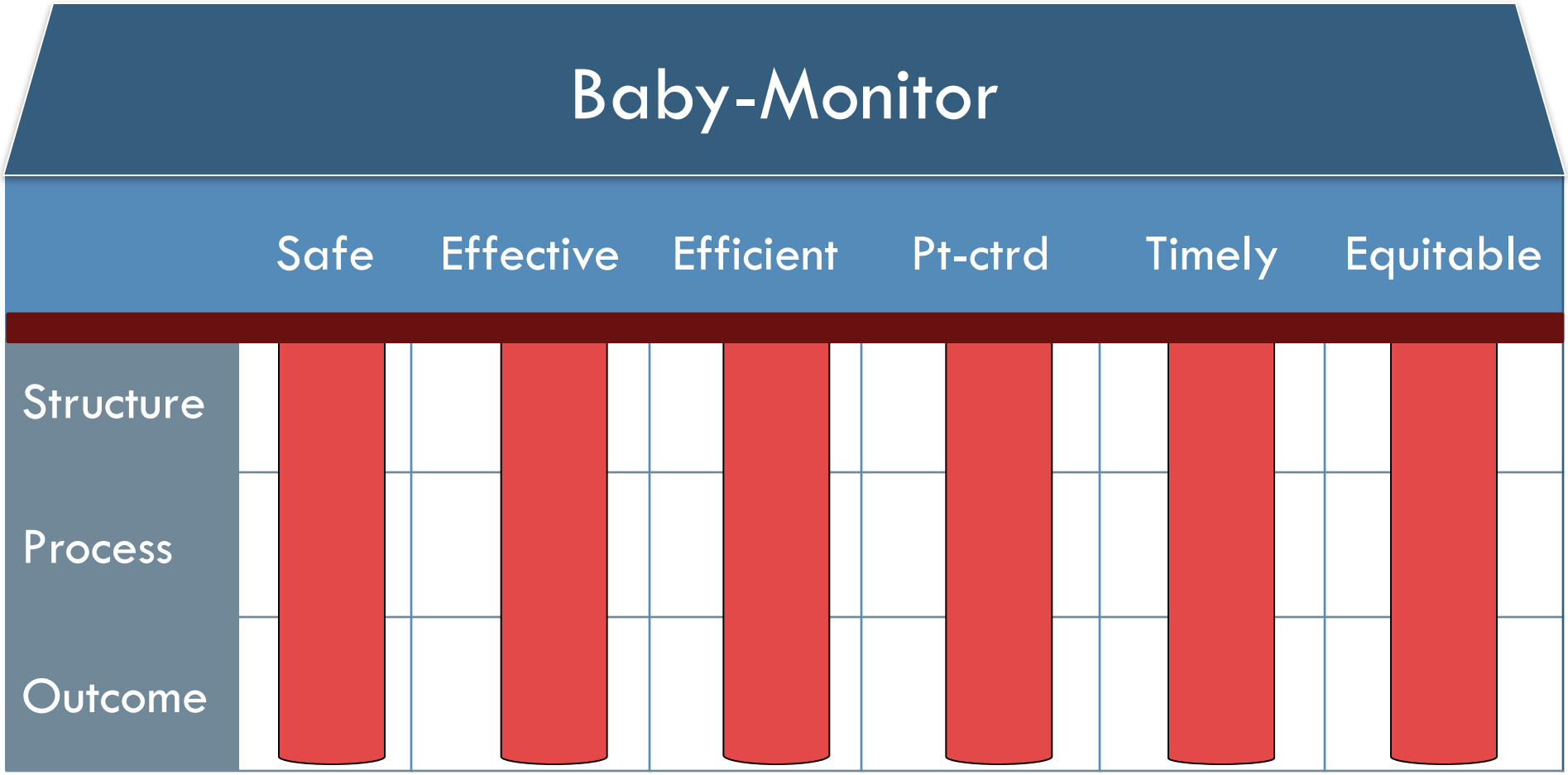
Development of the Baby-MONITOR

EC/OECD Guidelines

STEP	DESCRIPTION
1	Developing a theoretical framework
2	Measure selection
3	Initial data analysis
4	Handling of missing data
5	Normalization
6	Weighting and aggregation
7	Uncertainty and sensitivity analysis
8	Links to other measures
9	De-construction
10	Presentation and dissemination

Development of the Baby-MONITOR

Step 1 – Framework



Development of the Baby-MONITOR
Measure Selection

Delphi Experiment (RAND)

- QI/HSR expert panel
- 27 VON/CPQCC measures
  - Importance, reliability, validity, scientific soundness, usability
  - Overall score
- 2 rounds of ratings on 9 point scale (9 is best)
- Ratings interspersed by telephone conferences

Profit, Gould et al., J Perinatol. 2011

Stanford Children's Health | Lucile Packard Children's Hospital Stanford

cpqcc california perinatal quality care collaborative

MEASURES

VLBW volume	Postnatal steroids for CLD
Antenatal steroids	Oxygen on day 28
Temperature measured in 1 hour	Oxygen at 36 weeks
Hypothermia on admission	Oxygen at discharge
Early surfactant	D/c on assisted ventilation
Timely ROP exam	Any NEC
Severe ROP	NEC surgery
ROP surgery	Human milk only at discharge
Any IH	Any human milk at discharge
Severe IH	Growth velocity
Cystic PVL	Infection
Use of assisted ventilation	Length of stay
Duration of assisted ventilation	28 day mortality
Pneumothorax	NICU Mortality

MEASURES NOT SELECTED FOR BABY-MONITOR

Measure	Overall Score	Measure	Overall Score
28 day mortality	7 (2)	Length of stay	5 (3)
Steroids for CLD	7 (2)	VLBW volume	4 (2)
Early surfactant	7 (3)	Use of AV	4 (2)
1st h temp measured	7 (4)	Duration of AV	4 (2)
Severe IH	6 (3)	Any IH	4 (3)
Severe ROP	6 (4)	Cystic PVL	4 (3)
ROP surgery	5 (1)	Dc on AV	4 (3)
Only human milk at dc	5 (2)	Oxygen at dc	4 (3)
NEC surgery	5 (2)	Oxygen on day 28	4 (4)
NEC	5 (3)		

Baby-MONITOR
Criteria for Measure Selection

Stanford MEDICINE

- High median rating on overall score (7-9)
- Agreement
  - 80% of the ratings within high region (7-9) ($p < 0.33$)
- Absence of Disagreement
  - 90% of ratings are within one of two regions (1-6 or 4-9) ($p < 0.10$)

Stanford Children's Health | Lucile Packard Children's Hospital Stanford

cpqcc california perinatal quality care collaborative

Baby-MONITOR

Delphi - Results

28 measures

13 rated high (7-9)

9 rated with agreement

Measures Selected by Panelists

Stanford MEDICINE

METRIC	Panel Median Rating (IQR)
Antenatal steroids	9 (0)
Timely ROP exam	9 (0)
Nosocomial infection	9 (1)
Cold (<36°C) on admit	8 (1)
Pneumothorax	8 (2)
Growth velocity	8 (2)
Oxygen at 36 weeks	7 (2)
Any human milk at dc	7 (2)
In hospital mortality	7 (2)

*Range 1-9, 9 is best.

Profit, Gould et al., J Perinatol, 2011

Clinicians Selected the Same Metrics for Inclusion in the Baby-Monitor as the Research Panel

METRIC	Panel Median Rating (IQR)	Clinician Agreement, % (SD)	Clinician Vote, %
Antenatal steroids	9 (0)	78.3 (0.42)	95
Timely ROP exam	9 (0)	95.5 (0.43)	95
Nosocomial infection	9 (1)	77.3 (0.43)	100
Cold (<36°C) on admit	8 (1)	78.3 (0.54)	95
Pneumothorax	8 (2)	56.5 (0.73)	66
Growth velocity	8 (2)	63.6 (0.69)	82
Oxygen at 36 weeks	7 (2)	76.2 (0.66)	77
Any human milk at dc	7 (2)	72.7 (0.54)	82
In hospital mortality	7 (2)	68.2 (0.63)	77

Clinician Agreement – % reporting metric reasonably rated; Clinician Vote – % voting in favor of metric inclusion in composite index (2/3 majority = Include)

Kowalkowski, Profit, et al., J Perinatol 2012

Baby-MONITOR

Stanford MEDICINE

Baby-MONITOR =

ANS + PTX + Cold + Eye exam + HAI + CLD + BM@dc + GV + Survival

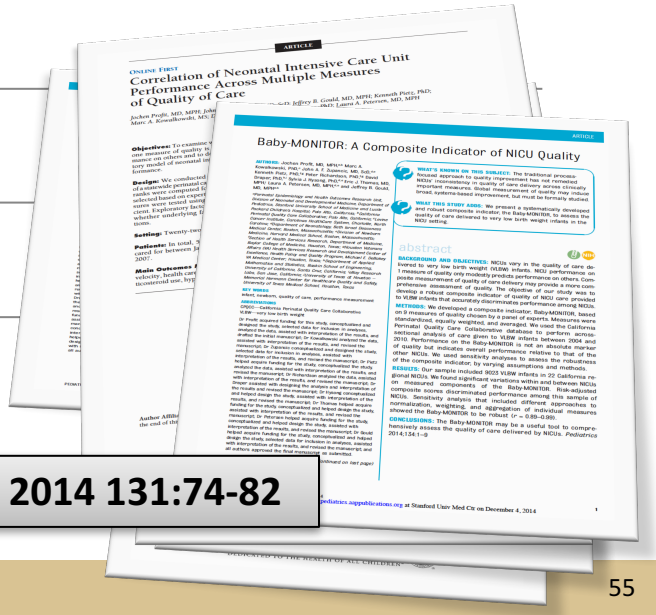
Score in Standard Units

4
3
2
1
0
-1
-2
-3

Better than expected

Worse than expected

NICUs



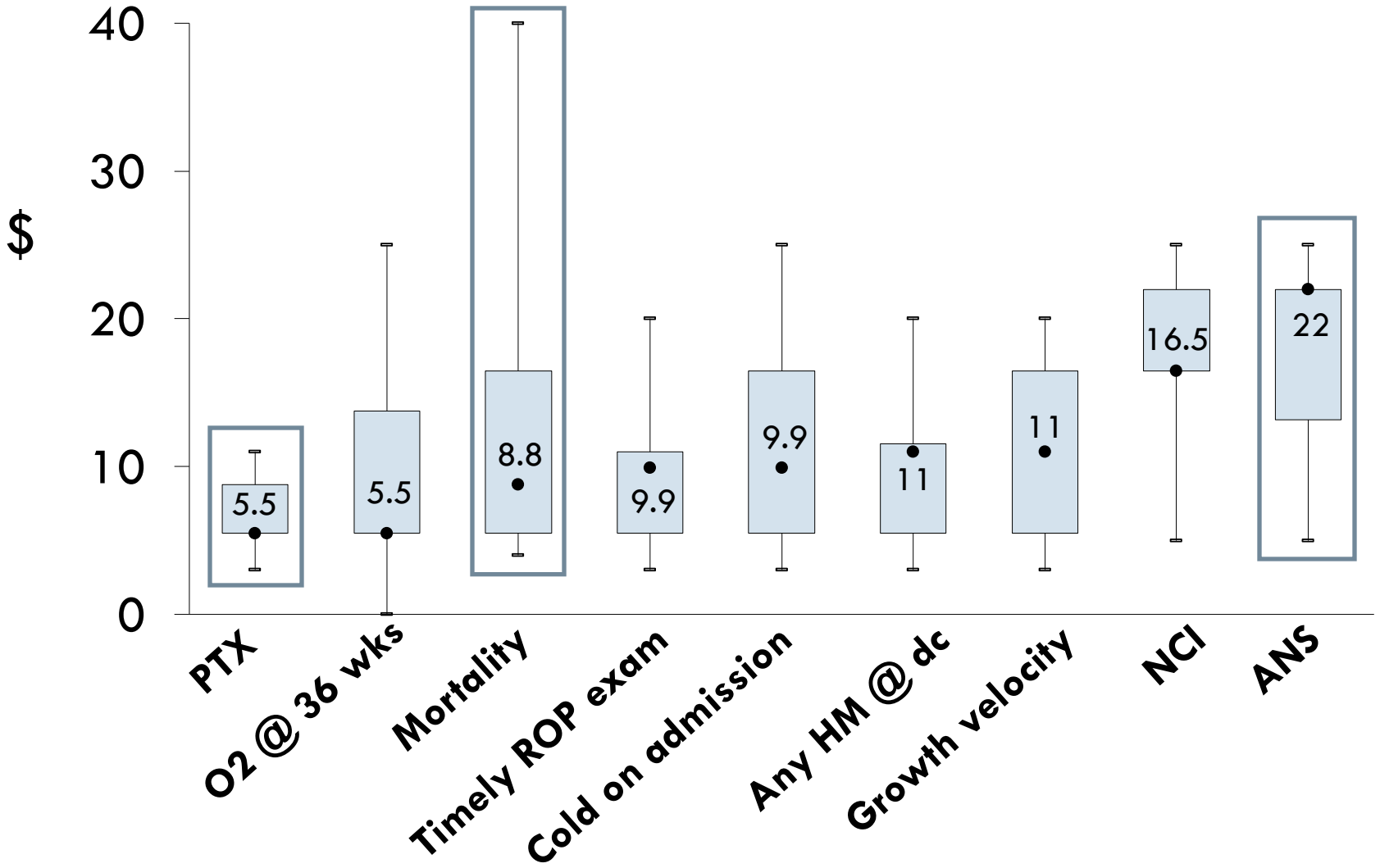
Profit et al. Pediatrics 2014 131:74-82

Children's Health | Children's Hospital Stanford

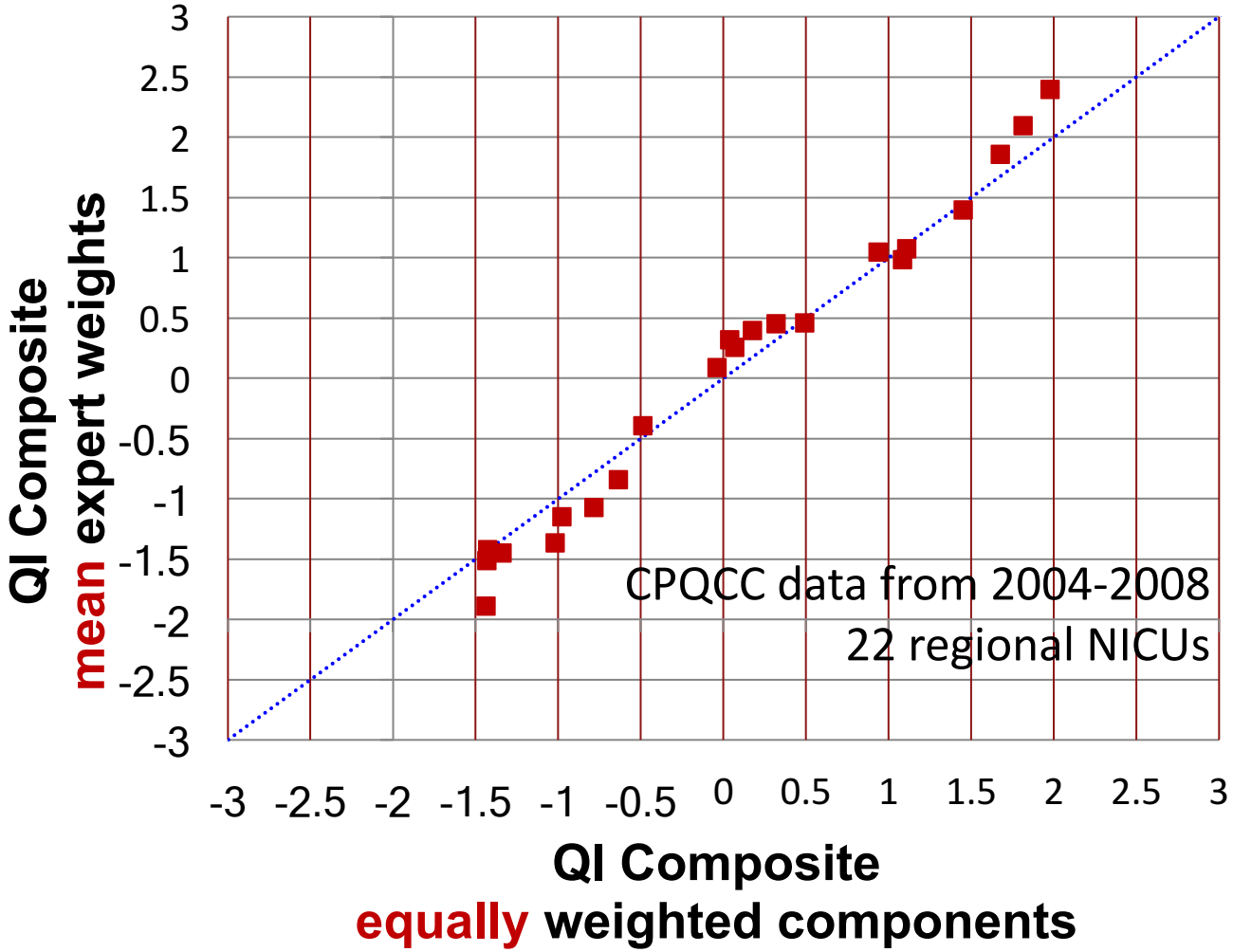
Development of the Baby-MONITOR

Step 6 – Relative Weight of Measures

Stanford MEDICINE

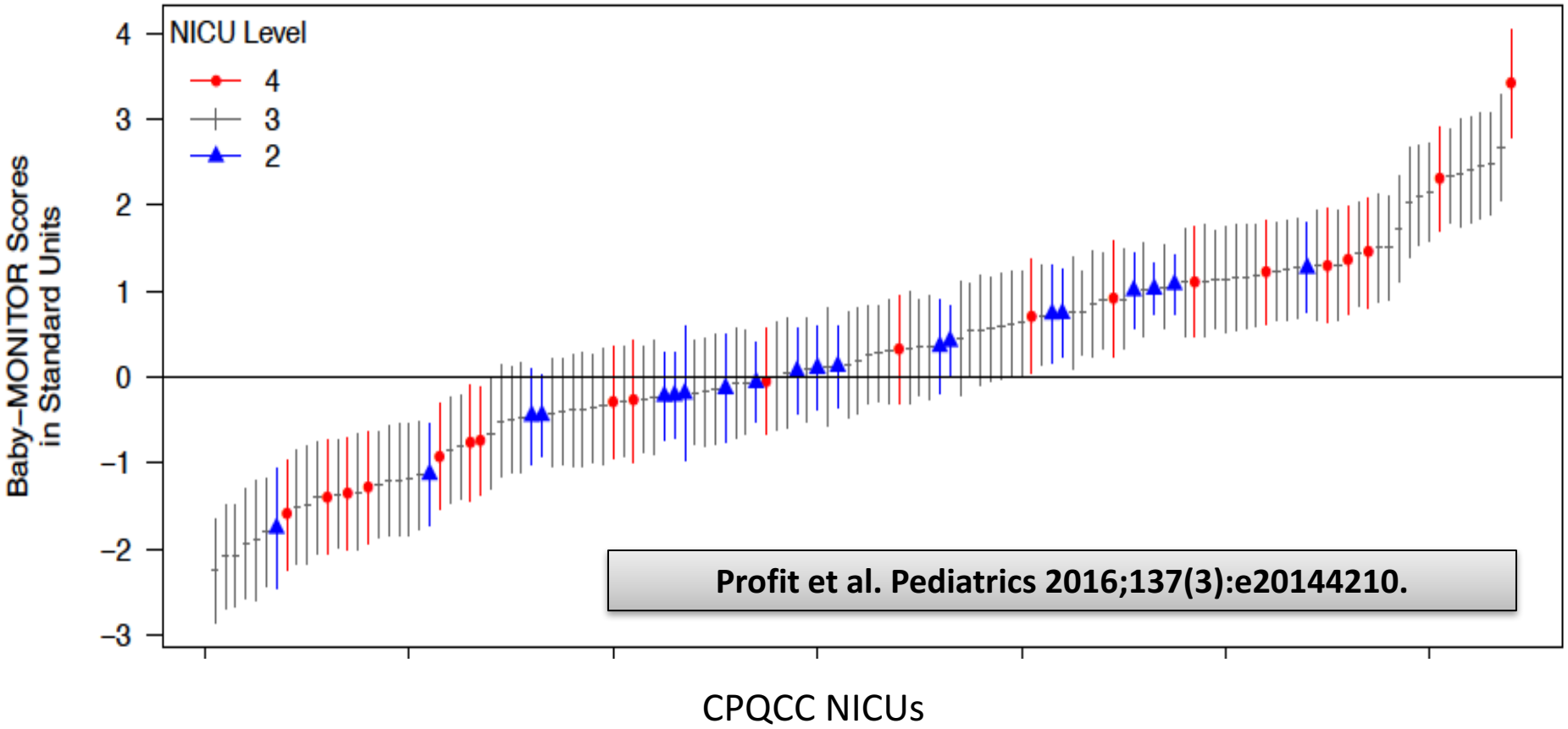


Different approaches to weighting
Sensitivity analysis



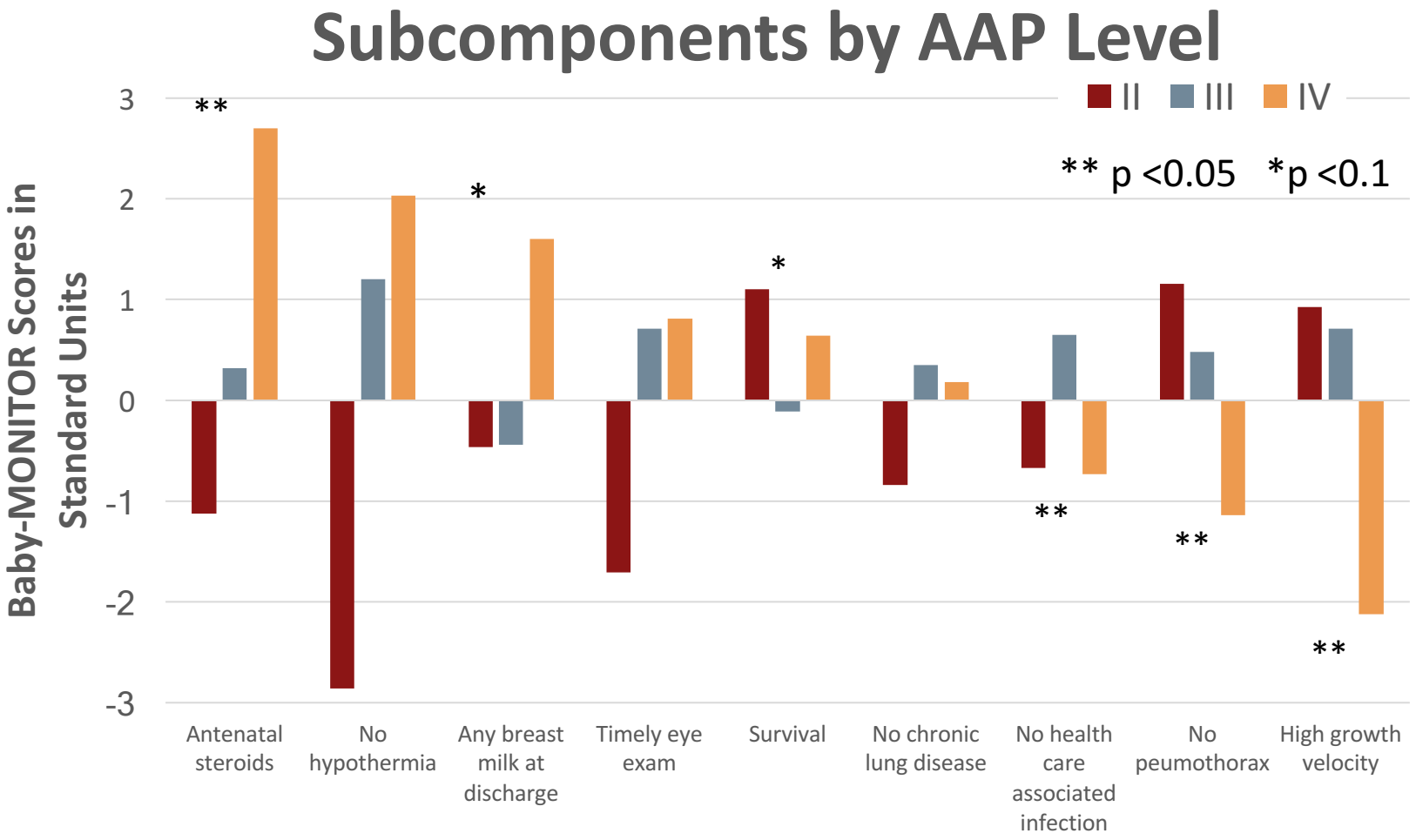
Generalizing the Baby-MONITOR to all NICU levels

Stanford MEDICINE

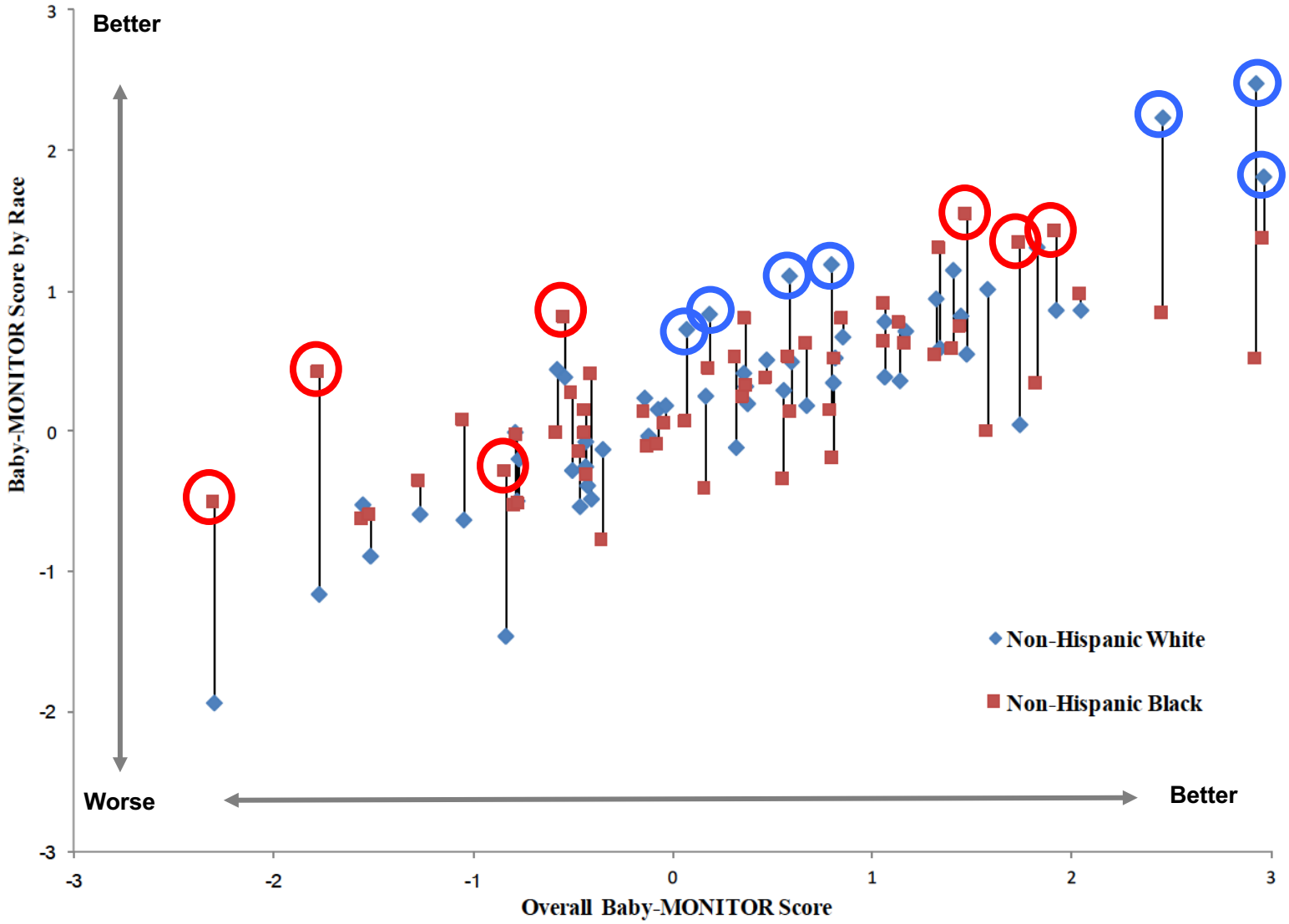


Stanford Children's Health | Lucile Packard Children's Hospital Stanford

cpqcc california perinatal quality care collaborative

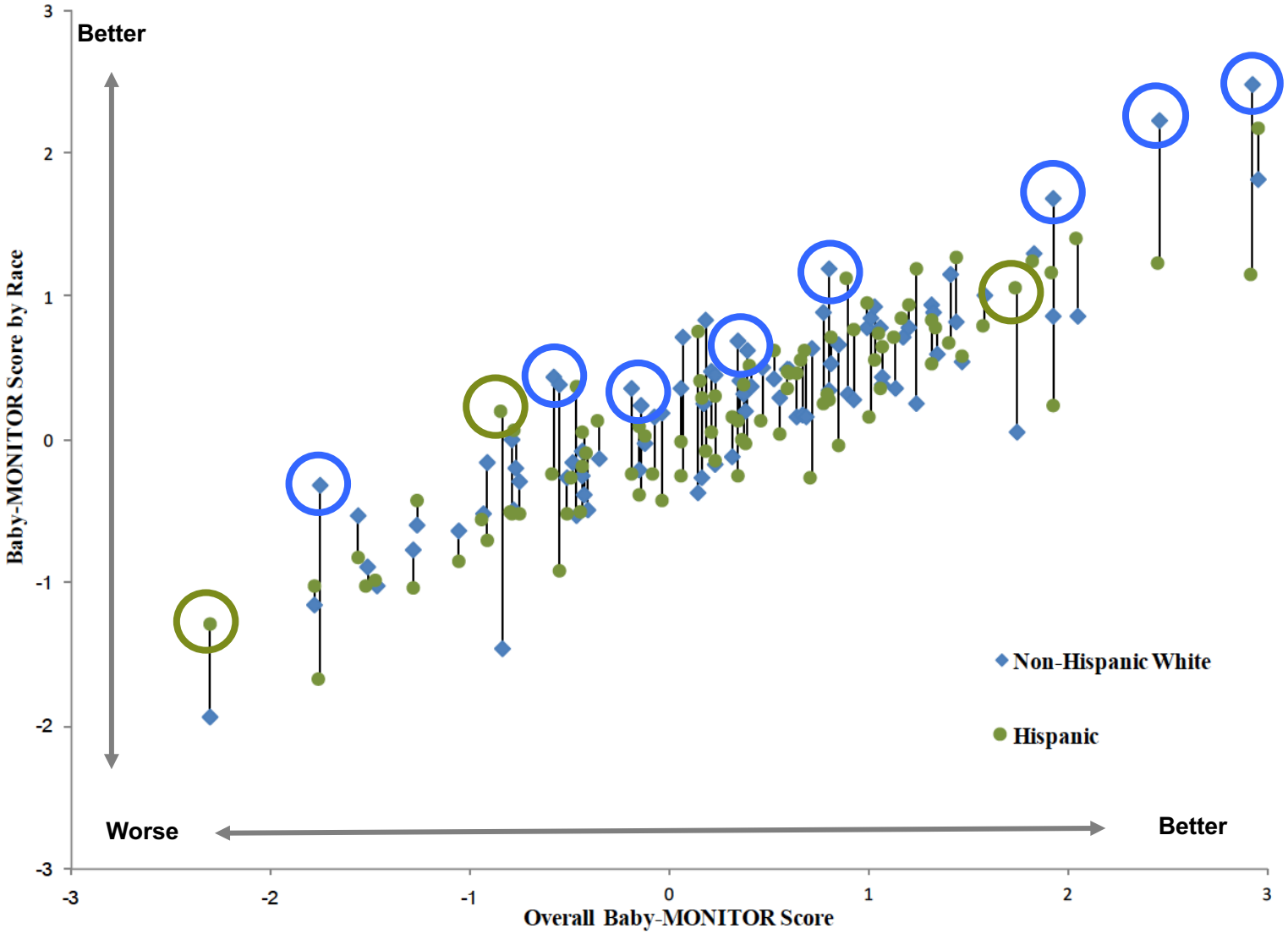

Subcomponents by AAP Level
II
III
IV
** p <0.05 *p <0.1
Baby-MONITOR Scores in Standard Units
3
2
1
0
-1
-2
-3
**
*
*
**
**
**
Antenatal steroids
No hypothermia
Any breast milk at discharge
Timely eye exam
Survival
No chronic lung disease
No health care associated infection
No peumothorax
High growth velocity

California NICU level B-W Scores

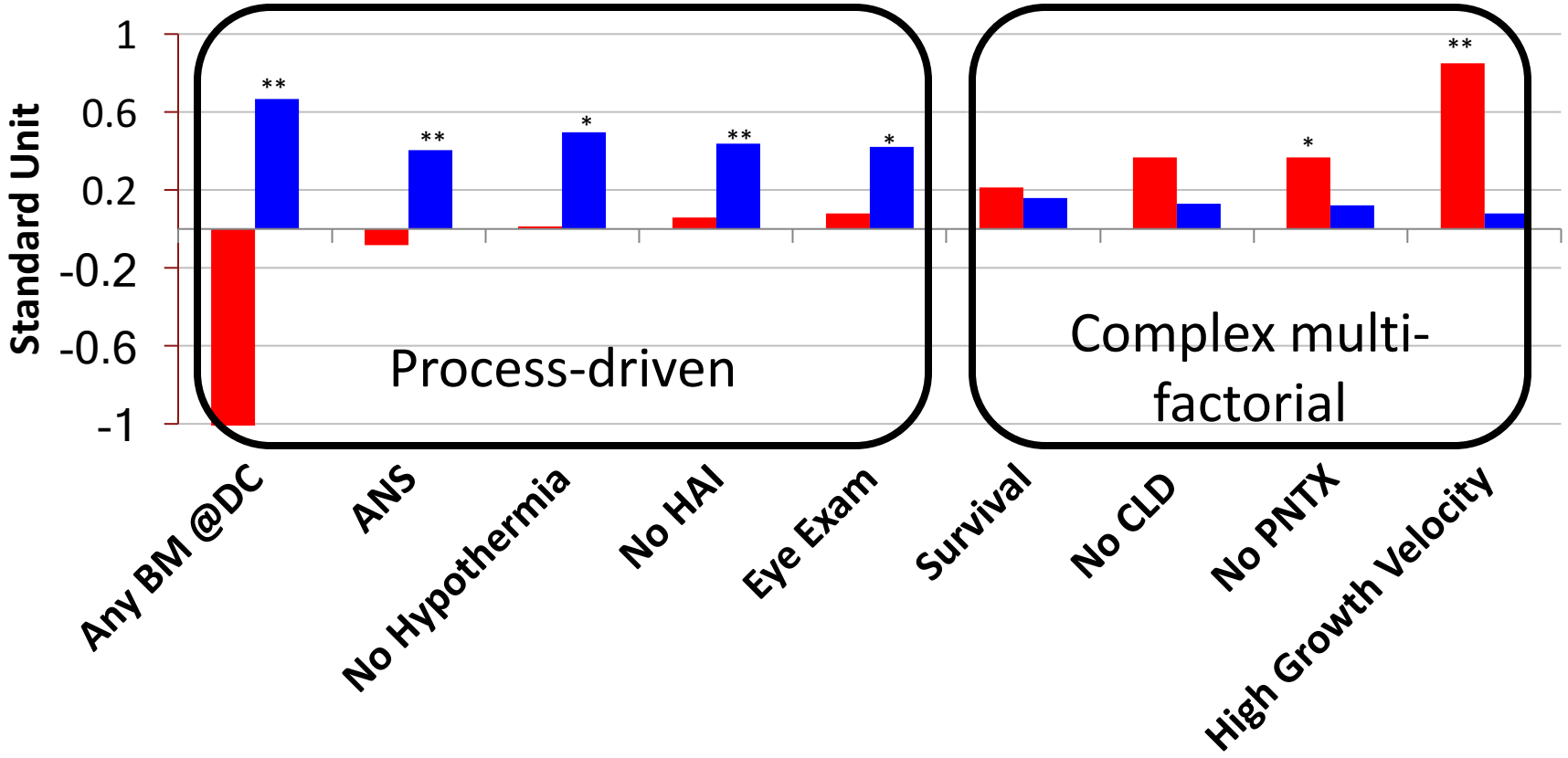


California NICU level H-W Scores

Stanford MEDICINE



NICU level disparity B-W



Stanford Children's Health | Lucile Packard Children's Hospital Stanford

** p <0.05 *p <0.1

cpqcc california perinatal quality care collaborative

Objective 2 – NICU level H-W

Stanford MEDICINE

Stanford Children's Health | Lucile Packard Children's Hospital Stanford

cpqcc california perinatal quality care collaborative

How Can Baby-Monitor Be Useful for QI?

Stanford MEDICINE

- Tracking of progress on overall quality over time
  - —Is your approach to QI working?

- Focus on system-based changes which may influence multiple measures of quality
  - —Poor performance may be a signal for poor staff relations and managerial shortcomings

Stanford Children's Health | Lucile Packard Children's Hospital Stanford

cpqcc california perinatal quality care collaborative

Dashboard

Summary

- Composite measurement can provide global overview of quality
  - Against other NICUs
  - Over time
- Can be practically applied to QI work
  - If systemic weakness → systemic solution
  - If individual weakness → address that measure

Acknowledgements

CPQCC, Stanford

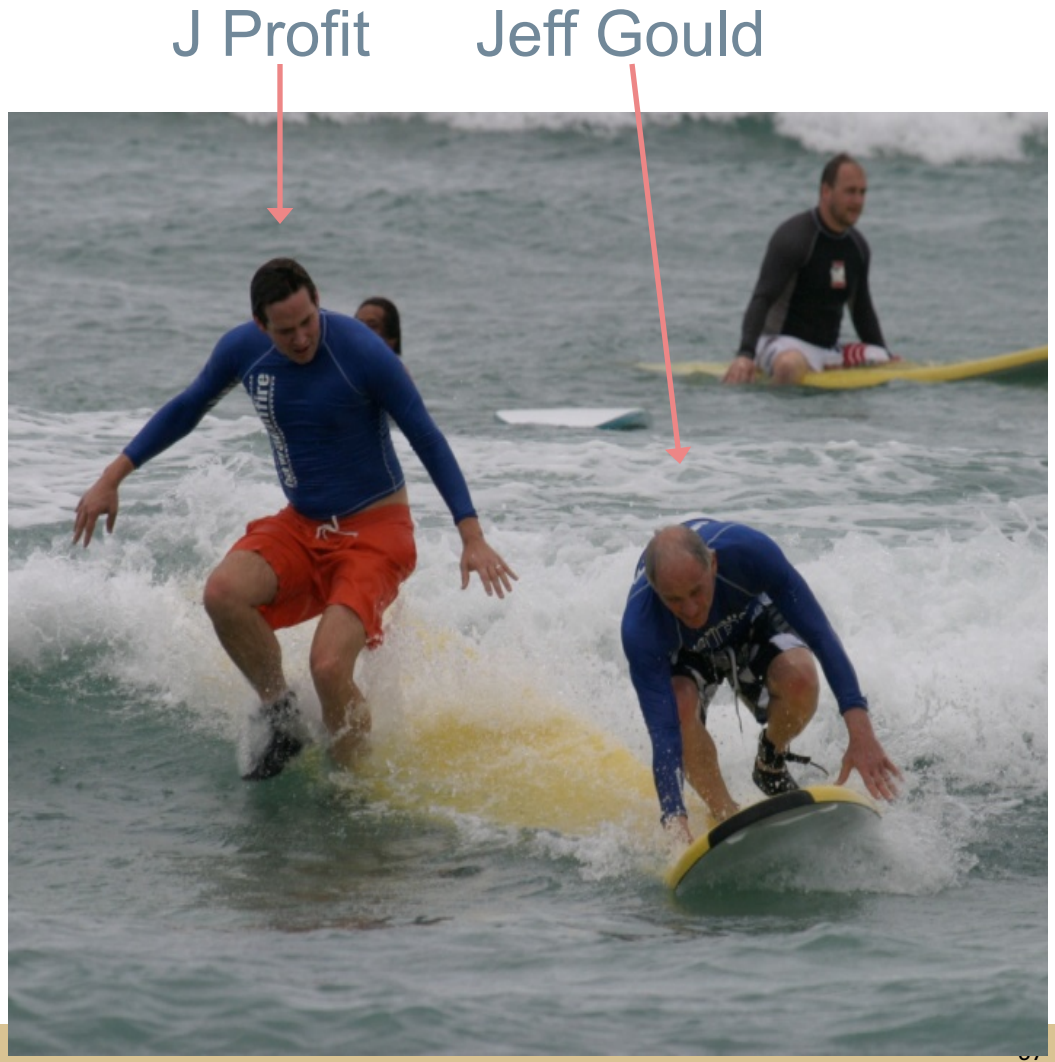
- Jeff Gould, MD, MPH
- Jessica Liu, PhD
- Miho Bennett, PhD

UCSC

- David Draper, PhD
- Daniel Kirsner,MStat

Harvard

- John Zupancic, MD, ScD



Acknowledgements

Judy L. Aschner, MD, Vanderbilt University
Reese H. Clark, MD, Pediatrix Medical Group
Edward F. Donovan, MD, University of Cincinnati
William H. Edwards, MD, Dartmouth University
Gabriel E. Escobar, Kaiser Permanente Medical Care Program
Donald A. Goldmann, MD, Harvard University and IHI
Jeffrey B. Gould, MD, MPH, CPQCC and Stanford University
Jeffrey H. Horbar, MD, Vermont Oxford Network and U of Vermont
Martin J. McCaffrey, MD, University of North Carolina, Chapel Hill
Lu-Ann Papile, MD, Baylor College of Medicine
Roger F. Soll, MD, Vermont Oxford Network and U of Vermont
Ann R. Stark, MD, Baylor College of Medicine
John E. Tyson, MD, MPH, University of Texas, Houston
Michele C. Walsh, MD, Case Western University
John A. Zupancic, MD, ScD, Harvard University

Thank you

profit@stanford.edu