Improving Health Care Response to Preeclampsia

June 12, 2014

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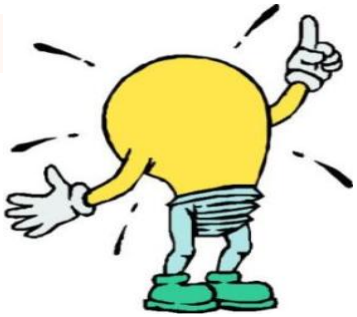
Medical Director Perinatal Safety

Dignity Health

Presented at Washington State Hospital Association Safe Table Webcast June 12, 2014

Learning Objectives



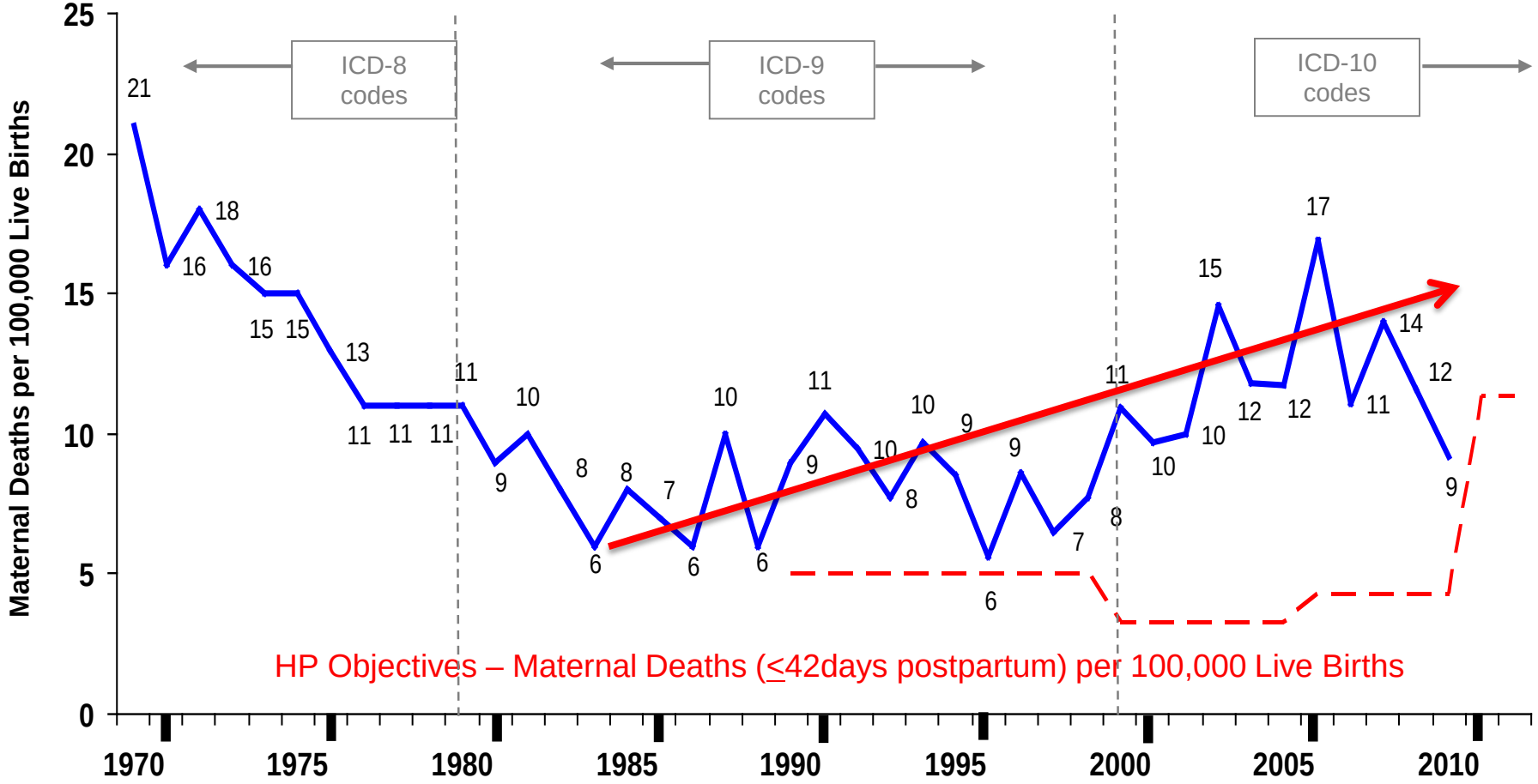
- To review the impact of hypertensive disorders of pregnancy and highlight the lack of progress in reducing maternal morbidity and mortality
- To review guidelines for care of hypertensive disorders of pregnancy from ACOG and the California Preeclampsia Task Force (PTF) of CMQCC
- To present some of the preliminary results from the California Preeclampsia Collaborative.

California Births

- 550,000 births in 350 hospitals
- Comparisons:
  - France: 830,900
  - Germany: 679,981
  - Great Britain: 648,516
  - Italy: 505,757
  - Canada: 354,148
  - Texas: 385,963
  - Washington: 82,592
  - Catholic HSW: ~70,000 --> 1/10 births

2005 birth data

Maternal Mortality Rate, California Residents; 1970-2010



SOURCE: State of California, Department of Public Health, California Birth and Death Statistical Master Files, 1970-2010. Maternal mortality for California (deaths ≤ 42 days postpartum) was calculated using the ICD-8 cause of death classification for 1970-1978, ICD-9 classification for 1979-1998 and ICD-10 classification for 1999-2010. Healthy People Objectives: HP2000: 5.0 deaths per 100,000 live births; HP2010: 3.3 deaths, later revised to 4.3 deaths per 100,000 live births, and; HP2020: 11.4 deaths per 100,000 live births. Produced by California Department of Public Health, Center for Family Health, Maternal, Child and Adolescent Health Division, December, 2012.

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Key Steps of California Pregnancy-Associated Mortality Review (CA-PAMR) Methodology

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STEP 1: Hospital discharge data linked to birth, death certificates
Identifies women who died within one year postpartum from any cause (*Pregnancy-Associated Cohort*)

↓

STEP 2: Additional data gathered for each death
Coroner Reports, Medical Records (office and hospital), Autopsy Results,

↓

STEP 3: Cases selected for CA-PAMR Committee review
Documented (ICD-10 obstetric ("O") code) and suspected pregnancy-related deaths are prioritized for review

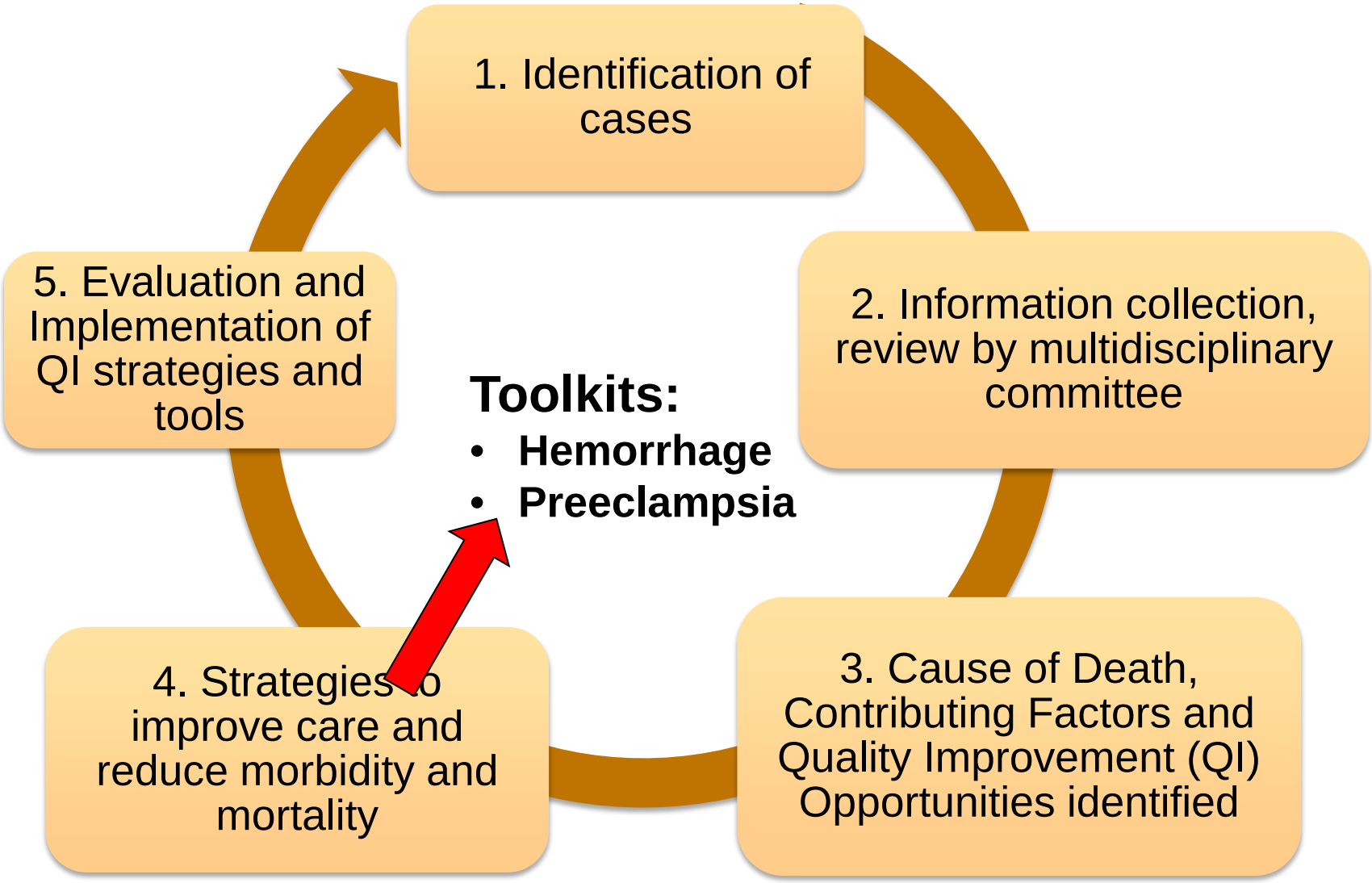
↓

STEP 4: Records abstracted and summarized

↓

STEP 5: Cases reviewed by CA-PAMR Committee
Committee determines whether the death was pregnancy-related, the cause of death, contributing factors and quality improvement opportunities

California Pregnancy-Associated Mortality Review (CA-PAMR) Quality Improvement Review Cycle



Cause of U.S. Maternal Mortality

- CDC Review of 14 years of coded data: 1979-1992
- 4024 maternal deaths ***790 (19.6%) from preeclampsia***

Table 2. Specific Causes of Death Among Women Who Died of Preeclampsia or Eclampsia

Cause of death	Percent of deaths		
	Preeclampsia	Eclampsia	Total
Cerebrovascular events	17.3	21.4	38.7
Cerebrovascular hemorrhage	15.8	18.8	34.7
Cerebral edema	1.1	1.8	2.9
Cerebral embolus	0.4	0.8	1.1
Renal or hepatic failure	7.2	5.4	12.5
HELLP syndrome	4.8	2.3	7.1
Other complications of hypertension	13.9	11.8	25.7
Not specified hypertension	7.6	8.3	15.9
Preeclampsia and eclampsia	50.8	49.2	100

HELLP = hemolysis, elevated liver enzymes, and low platelet count syndrome.

90% of CVA were from hemorrhage

MacKay AP, Berg CJ, Atrash HK. Obstetrics and Gynecology 2001;97:533-538

How Do Women Die Of Preeclampsia in CA?

CA-PAMR Final Cause of Death Among Preeclampsia Cases, 2002-2004 (n=25)

Final Cause of Death	Number	%	Rate/100,000
Stroke	16	**64%**	1.0
Hemorrhagic	*14*	**-87.5%**	
Thrombotic	*2*	-12.5%	
Hepatic (liver) Failure	4	16.0%	.25
Cardiac Failure	2	8.0%	
Hemorrhage/DIC	1	4.0%	
Multi-organ failure	1	4.0%	
ARDS	1	4.0%	

Blood Pressure Control and Stroke

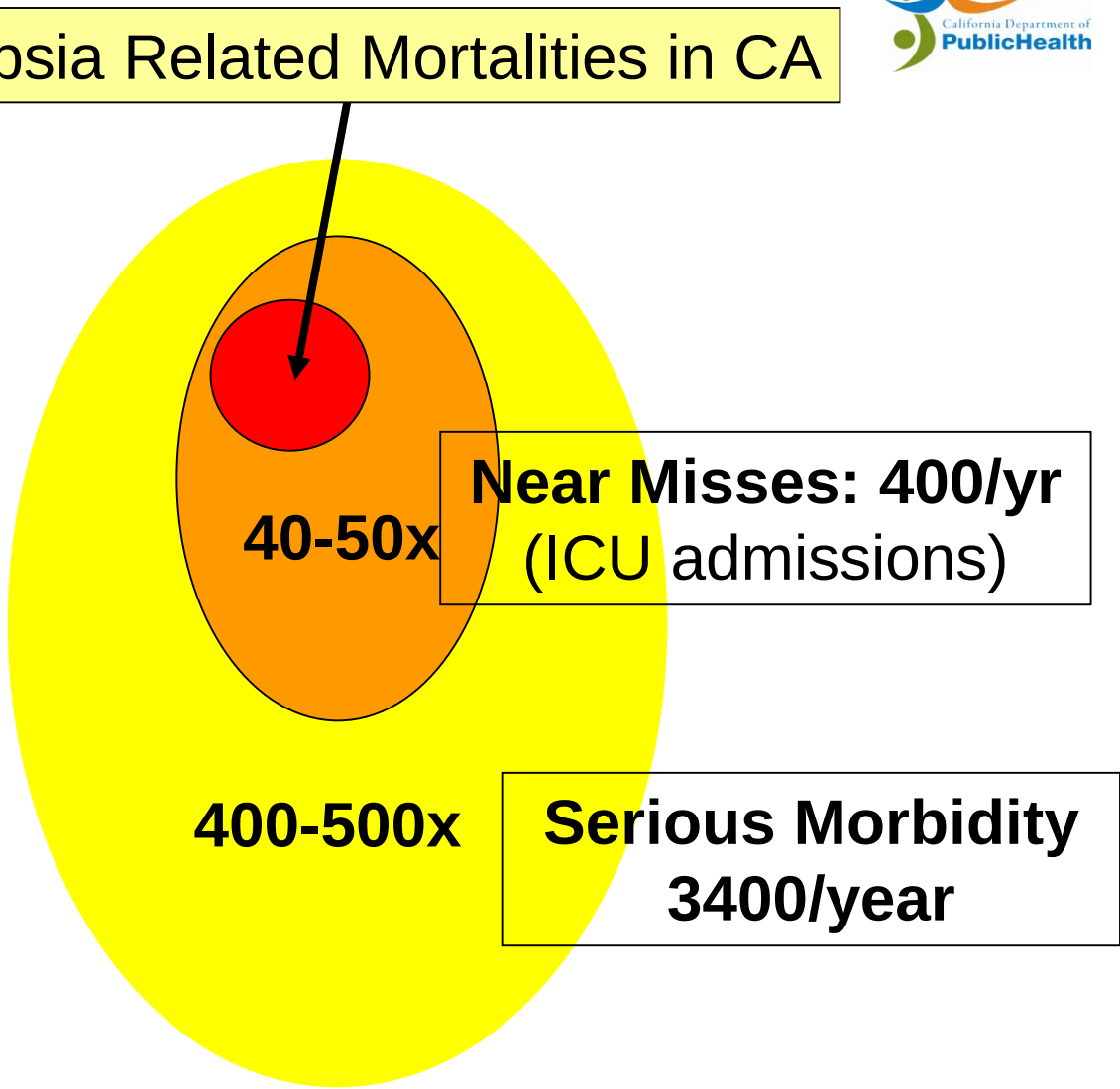
- 23/24 (***95.8%***) women with ***systolic BP ≥ 160mm Hg***
- 24/24 **(*100%*)** had a ***BP ≥ 155 mm Hg***
- 3/24 (***12.5%***) women with ***diastolic BP > 110mm Hg***
- 5/28 **(*20.8%*)** women with ***diastolic BP > 105mm Hg***

Martin JN et al. Stroke and Severe Preeclampsia and Eclampsia:
A Paradigm Shift Focusing on Systolic Blood Pressure, Obstet Gynecol 2005;105-246.

Gestational Age Groups of CA-PAMR Deaths, 2002 to 2004

GESTATIONAL AGE GROUPS	CA-PAMR PREECLAMPSIA DEATHS	CA-PAMR NON-PREECLAMPSIA DEATHS
	N (%)	N (%)
<24 weeks	0 (0)	2 (2%)
24-31w6d	2 (8%)	13 (11%)
32-36w6d	**12 (48%) -- 56%**	**29 (24%) -- 37%**
≥37 weeks	11 (44%)	76 (63%)
TOTAL	**25**	**120**

Maternal Morbidity and Mortality: Preeclampsia



Source: 2007 All-California Rapid Cycle Maternal/Infant Database for CA Births: CMQCC

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Factors Contributing to Pregnancy-Related Deaths, CA-PAMR 2002-2004

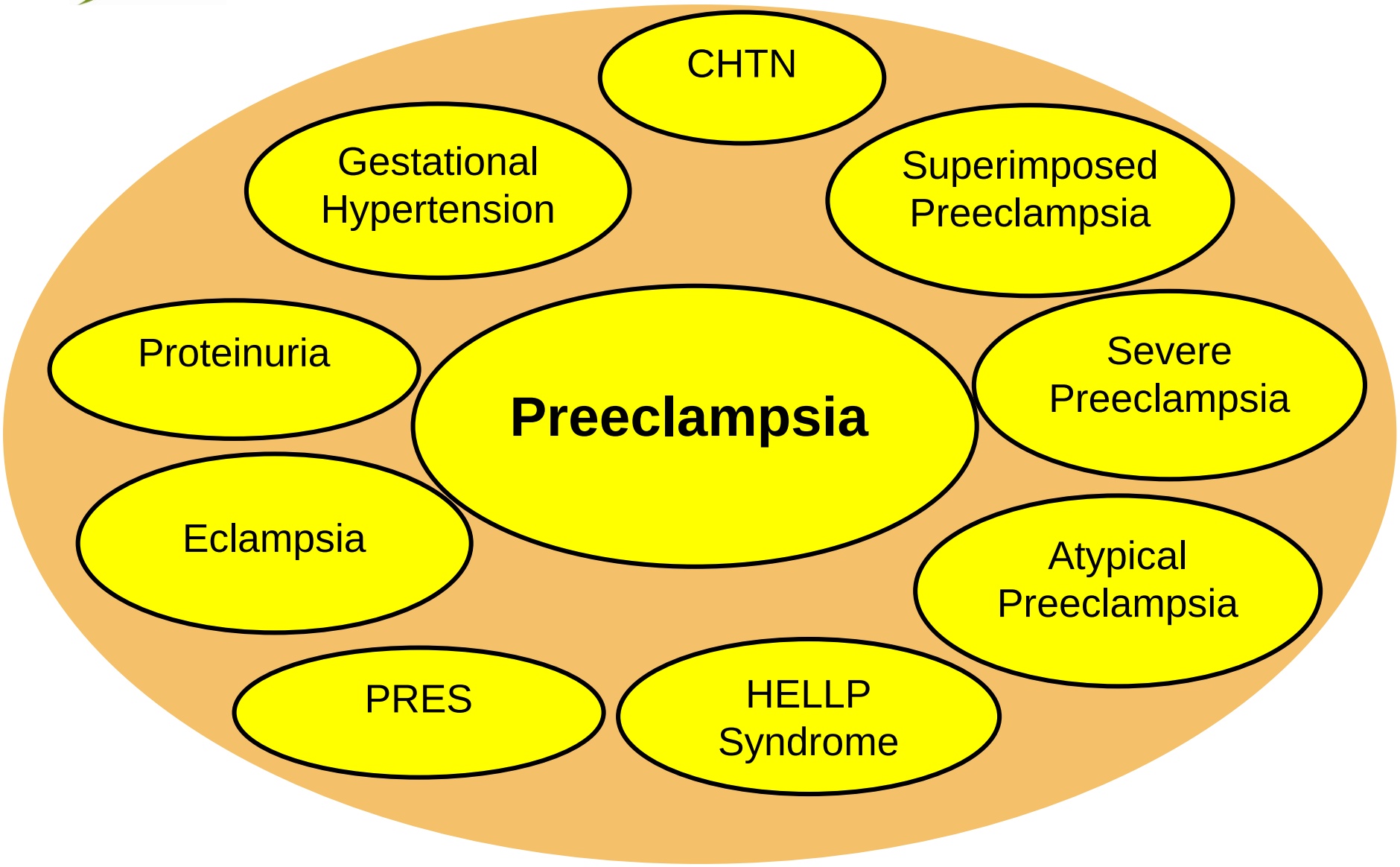
Contributing Factor (at least one factor probably or definitely contributed)	**Preeclampsia N (%)**	**TOTAL N (%)**
OVERALL	**25 (100%)**	**129 (89%)**
PATIENT FACTORS	16 (64%)	104 (72%)
Underlying significant medical conditions	8 (50%)	40 (39%)
Delay or failure to seek care	**10 (63%)**	**27 (26%)**
Lack of understanding the importance of a health event	**9 (56%)**	**16 (15%)**
HEALTHCARE PROFESSIONALS	24 (96%)	115 (79%)
Delay in diagnosis	**22 (92%)**	**62 (54%)**
Use of ineffective treatment	**19 (79%)**	**48 (42%)**
Misdiagnosis	13 (54%)	36 (31%)
Failure to refer or seek consultation	6 (25%)	26 (23%)
HEALTHCARE FACILITY	12 (48%)	72 (50%)

CA-PAMR: Chance to Alter Outcome

Grouped Cause of Death; 2002-2004 (N=145)

Grouped Cause of Death	Chance to Alter Outcome			
	Strong / Good (%)	Some (%)	None (%)	**Total** N (%)
Obstetric hemorrhage	**69**	**25**	6	16 (11)
Deep vein thrombosis/ pulmonary embolism	53	40	7	15 (10)
Sepsis/infection	50	40	10	10 (7)
Preeclampsia/eclampsia	**50**	**50**	**0**	**25 (17)**
Cardiomyopathy and other cardiovascular causes	25	61	14	28 (19)
Cerebral vascular accident	22	0	78	9 (6)
Amniotic fluid embolism	0	87	13	15 (10)
All other causes of death	46	46	8	26 (18)
Total (%)	**40**	**48**	**12**	**145**

Spectrum of Preeclampsia



ACOG Executive Summary on Hypertension In Pregnancy,

1. The term “mild” preeclampsia is discouraged terminology:
   a. “**preeclampsia without severe features**” *(mild*)
   b. “**preeclampsia with severe features**” (*severe***)**

2. Proteinuria **is not** a requirement to diagnose preeclampsia with **new onset** hypertension.

3. The **total** amount of proteinuria > 5g in 24 hours has been eliminated from the diagnosis of severe preeclampsia.

4. **Early treatment** of **severe** hypertension is **mandatory** at the threshold levels of **160 mm Hg** systolic or **110 mm Hg** diastolic.

Nov 2013

Key Clinical Pearl

Forty percent of
new onset hypertension or
new onset proteinuria will develop
classic preeclampsia.

Barton JR, Sibai BM. Prediction and prevention of recurrent preeclampsia. Obstet Gynecol. 2008;112(2 PART 1): 359-372.

ACOG PRACTICE BULLETIN

CLINICAL MANAGEMENT GUIDELINES FOR OBSTETRICIAN–GYNECOLOGISTS

NUMBER 33, JANUARY 2002

Reaffirmed 2012

Diagnosis and Management of Preeclampsia and Eclampsia

This Practice Bulletin was developed by the ACOG Committee on Practice Bulletins—Obstetrics with the assistance of Larry C. Gilstrap III, MD,

Summary of Recommendations

The following recommendations are based on good and consistent scientific evidence (Level A):

- Magnesium sulfate should be used for the prevention and treatment of seizures in women with severe preeclampsia or eclampsia.

growth restriction.

- Expectant management should be considered for women remote from term who have mild preeclampsia.
- Antihypertensive therapy (with either hydralazine or labetalol) should be used for treatment of diastolic blood pressure levels of 105–110 mm Hg or higher

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California Department of PublicHealth

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Development of the California Toolkit 'Improving Health Care Response to Preeclampsia' was funded by the California Department of Public Health (CDPH), Center for Family Health, Maternal Child and Adolescent Health (MCAH) Division, using federal Title V MCH funds.

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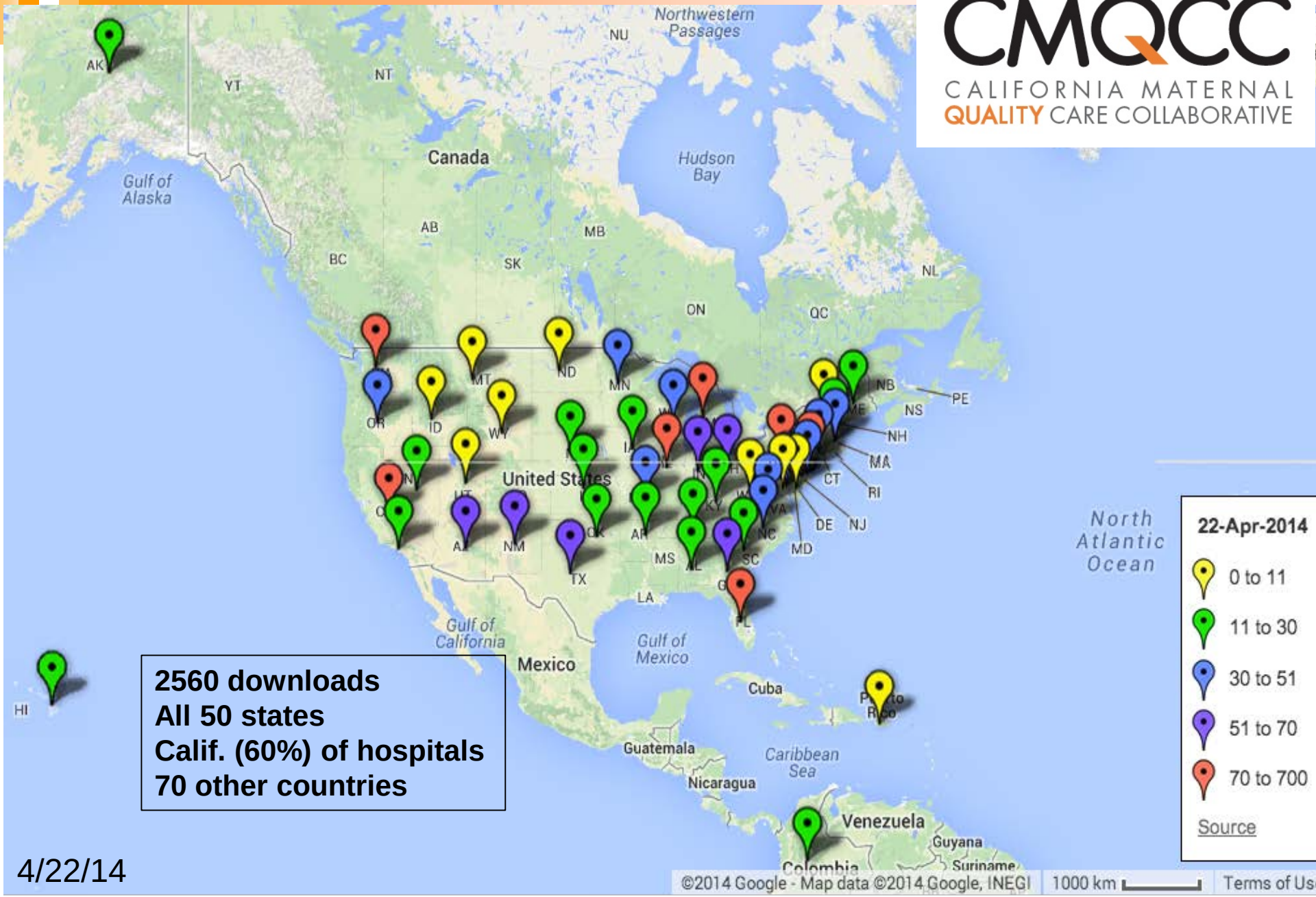

2560 downloads
All 50 states
Calif. (60%) of hospitals
70 other countries

4/22/14

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Rocket Science?

Brain Surgery?

Classification:

1) PE
2) CHT
3) CHT+PE
4) GHTN

Only ~ 4 things

Management:

1) Recognize Symptoms
2) BP control
3) Seizure prevention
4) Delivery- 34wks, 37wks.
5) Postpartum surveillance

Only 5 things

Key Clinical Pearl

Patients with vague symptoms of:

- headache
- abdominal pain
- shortness of breath
- generalized swelling
- complaints of “I just don’t feel right”

Need to be evaluated for atypical presentations of preeclampsia or “severe features”

Sibai BM, Stella CL. Diagnosis and management of atypical preeclampsia-eclampsia. Am J Obstet Gynecol. May 2009;200(5):481 e481-487.

Do Patients Recognize Symptoms?

754 → Self selected women on the Preeclampsia Foundation website

317 → 42% recalled information regarding PE education

169 → 53% understood the information

- 75% v. 6% acted if they had symptoms

J Mat-Fet Neo Medicine 2013

Preeclampsia Toolkit BP Treatment Recommendations

Systolic ≥ 160	Diastolic ≥ 110	Repeat BP and treat within 60 minutes (ideally ASAP)
≥155	≥105-110	Alternative triggers*

Recommendations apply to all forms of hypertension:

Gestational HTN = Preeclampsia = Severe Preeclampsia

Hypertensive Medication Administration Oral versus IV

- ***First line therapy*** recommendations for treatment of critically elevated BP are with either ***IV labetalol or hydralazine.***

- Treatment is needed in a patient without IV access ***oral nifedipine may be used (10 mg)***

- ***Oral labetalol*** would be expected to be less due to its' slower onset to peak and thus should be used <u>only if nifedipine is not available</u> in a patient without IV access.

ACOG Practice Bulletin #33, Reaffirmed 2012; ACOG Committee Opinion #514, 2012; Tuffnell D, Jankowitcz D, Lindow S, et al. BJOG 2005;112:875-880.

Hypertensive Medication Administration Oral v. IV

- IV Labetalol
  - Onset: 2-5 min
  - Peak: 5 min
- IV Hydralazine
  - Onset: 5-20 min
  - Peak: 15-30 min
- PO Labetalol:
  - Onset: 20 min-2 hrs
  - Peak: 1-4 hrs
- PO Nifedipine
  - Onset: 5-20 min*
  - Peak: 30-60 min

*PO, (oral) not sublingual nifedipine, onset of action is 15-30 minutes depending on the reference source.

Nifedipine in the Management of Hypertensive Emergencies: Report of Two Cases and Review of the Literature. Am J Emerg Med. 1985 (6):524-30

Raheem et al. Oral nifedipine versus intravenous labetalol for acute blood pressure control in hypertensive emergencies of pregnancy: a randomized trial. BJOG 2012;119:78-85.

http://www.uspharmacist.com/content/d/feature/i/1444/c/27112/

Current Cardiovascular Drugs, 4th edition 2005 pg. 2-186

Protocol for Labetalol Treatment

California Department of PublicHealth

LABETALOL:

Threshold Blood Pressure:
Systolic 160 OR Diastolic 105-110

Target Blood Pressure:
140-150 - 90-100

If BP above threshold:
Give 20 mg IV over 2 minutes.
Repeat BP in 10 minutes

BP above threshold after 10 min:
40 mg IV over 2 minutes. Repeat BP in 10 minutes

If BP above threshold after 10 min:
80 mg IV over 2 minutes. Repeat BP in 10 minutes

BP above threshold: repeat 80mg over 10 minutes to maximum dose of 220 mg

Switch TO:

Hydralazine: 10mg over 2 minutes

Seek Consultation[1]
(Maternal-Fetal Medicine, Critical Care, Anesthesia, Internal Medicine)

If No IV Access:
Give Oral Labetalol 200 mg

Check BP in 30 minutes; if above threshold, labetalol 200 mg dose

OR

If No IV access:
Give PO Nifedipine 10 mg

Check BP in 30 minutes; if above threshold, repeat PO nifedipine 10 mg[2]

Adapted from ACOG Committee Opinion #514; (1) MFM, Critical Care, Anesthesia, Internal Medicine; (2) Raheem I, Saaid R, Omar S, Tan P. Oral nifedipine versus intravenous labetalol for acute blood pressure control in hypertensive emergencies of pregnancy: a randomised trial. *BJOG.* 2012;119:78-85.

Key Clinical Pearl

Algorithms for acute treatment hypertension and eclampsia should be readily available or *preferably* posted in all clinical areas that may encounter pregnant women.

Emergency Medication Box for Severe Preeclampsia and Eclampsia

L&D Severe Preeclampsia & Eclampsia Box – Content and Dose Guideline	
Magnesium 20 grams/500 ml bag	**IV (Use Magnesium Sulfate Continuous Infusion under L&D protocol in Alaris Pump Library):** *Initial (Loading Dose):* 4-6 g (100 ml – 150 ml) over 20 minutes *Maintenance Dose:* 1-2 g/hour (25 ml/hr – 50 ml/hr) continuous infusion
Labetalol 100mg/20ml vial	***Initial: Draw 4 ml from the vial.*** **20 mg (4 ml)** IV bolus followed by **40 mg (8 ml)** if not effective within 10 minutes; then **80 mg (16 ml)** every 10 minutes (maximum total dose of 300 mg/60ml)
Hydralazine 20mg/ml vial	***Initial: Draw 0.25 ml from the vial.*** **5-10 mg (0.25-0.5 ml)** doses IV every 15-20 minutes
Esmolol 100mg/10ml vial **(By Anesthesiologists ONLY)**	**1-2 mg/kg (0.1-0.2 ml/kg)** IV over 1 minute
Propofol 10mg/ml, 20ml vial **(By Anesthesiologists ONLY)**	**30-40 mg (3-4 ml)** IV bolus
Calcium gluconate 1000 mg/10ml vial	1000 mg/10 ml IV over 2-5 minutes
Labetalol 200 mg tablets	200 mg PO and repeated in 30 minutes if needed
Nifedipine 10 mg PO	10 mg PO and repeated in 30 minutes if needed
Supply contents	3 ml, 10 ml, and 20 ml syringes, appropriate needles and appropriate tubing sets

Kindly used with permission of Stanford University Medical Center and Gillian Hilton, MD 2013

Magnesium Sulfate in the management of Preeclampsia

Magpie Trial Collaboration Group. Do women with pre-eclampsia, and their babies, benefit from magnesium sulfate?

The Magpie Trial: a randomized placebo-controlled trial. *Lancet* 2002;359:1877-90.

- 58% reduction in seizures
- 45% reduction in maternal death*
- 33% reduction in placental abruption

Who Should Get Magnesium ?

	Mild Preeclampsia	Severe Preeclampsia	Eclampsia
ACOG		**X**	**X**
NICE		**X**	**X**
SOGC	**X***	**X**	**X**
CMQCC	**X***	**X**	**X**
WHO	**X**	**X**	**X**

ACOG 33: there is no unanimity of opinion regarding the prophylactic use of magnesium sulfate for prevention of seizure in women with gestational hypertension or mild preeclampsia

** Should be considered:* ***NNT = 109 for mild, 63 for severe***
(NNT = number needed to treat)

Magnesium Sulfate

- Primary effect is via CNS depression
- Improves blood flow to CNS via small vessel vasodilation
- Blood pressure after magnesium infusion:
  - 6 gm loading then 2 gm/hr.

	sBP	sBP 30 min	sBP 120 min	dBP	dBP 30 min	dBP 120 min
Mild Group	145 ±10	143 ±13	141 ±14	87 ±10	79 ±9	82 ±9

Magnesium sulfate is **<u>not</u>** **<u>antihypertensive</u>** medication

Hypertens Pregnancy. 2008;27(4):315-27.

Who should get Magnesium Sulfate?

- Which patient is safer in your OB unit:
  - A patient receiving magnesium ?
  - A patient that is having a seizure ?

NNT = 109 for mild, 63 for severe
(NNT = number needed to treat)

Eclampsia: Maternal-Perinatal Outcome: 254 Consecutive Cases over 12 years

- 83,720 deliveries
- *One in Five* (19%) ***did not have proteinuria***
- *One in Four* (23%) ***did not have hypertension***

Am J Obstet Gynecol Sep 163(3):1049-1054; discussion 1054-1065 1990.

Eclampsia: Maternal-Perinatal Outcome: 254 Consecutive Cases over 12 years

- 73 (29%) occurred postpartum.
- Of the postpartum cases, more than half (55%) were at >48 hours
- Half had normal BP but all had a headache or visual complaints

Am J Obstet Gynecol Sep 163(3):1049-1054;

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MANAGEMENT OF PREECLAMPSIA / ECLAMPSIA

- ✓ Recognize and Don’t Ignore Clinic Signs
- ✓ Treat and Control Blood Pressure
- ✓ Magnesium for Seizure Prophylaxis/Treatment
- ✓ Delivery – 34, 37 weeks
- ✓ Postpartum Surveillance/Treatment

Preeclampsia Collaborative Participants

Northern CA

- Alta Bates Summit
- Contra Costa Regional Med Ctr
- Doctor's Hospital of Modesto
- John Muir Medical Center
- Kaiser Hayward
- Kaiser Oakland
- Kaiser Roseville
- Kaiser Santa Clara
- Mercy San Juan Med Center
- NorthBay Medical Center
- Salinas Valley Memorial
- Sonora Regional Med Center
- Sutter Medical Center

Southern CA

- Arrowhead Regional Med Ctr
- Cedars Sinai Med Center
- Citrus Valley Med Center
- Henry Mayo Newhall Memorial
- Kaiser San Diego
- Kaiser West LA
- Long Beach Miller
- Riverside County Regional Med Ctr
- St. Jude Medical Center
- Saddleback Memorial
- UCLA
- St Bernardine Medical Center
- Maricopa (Phoenix, AZ)

Represents ~ 82,000 births in 2011 (1:6)

Primary Goals of Projects

CMQCC Collaborative:

- Initiate toolkit
  - Treatment of BP >160/105 with in 30-60 min of verification
- Measured:
  - Treatment met time goal
  - Balance measure:
    - Diastolic BP 80 mmHg, FHR cat. change
  - Morbidity
  - Final assessment “devil in the details”

Recurrent Barriers To Timely Treatment

- Nursing unable to give IV HTN meds
- Physicians reluctant to use IV meds/no perceived “crisis”
- Reluctance to treat at 160/105 threshold – no orders
- Magnesium will lower the BP
- Fear of hypotension or will result in abnormal FHR
- Use of IV labetalol require cardiac monitor – telemetry nurse
- Moving patient to left lateral supine position
- Only one cuff size on maternity floor
- EMR use and response from pharmacy resulted in a time lag of >1 hour

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Solutions – Obvious and Creative

- In-service sessions for nursing and CME for physicians
  - Preeclampsia “bingo” and “jeopardy” games for staff/physicians
- Changing pharmacy guidelines for who can use IV medications
- 1 hospital system developed regional care plans
- Algorithms/pocket guides posted outlining Pre-E symptoms, guidelines for treatment and medication information
- BP monitor kits (three cuff sizes, stethoscope, reflex hammer) follows patient throughout her stay
- Debriefs for continuous process improvement 0→20%)
- Pre-E med boxes and pyxis override

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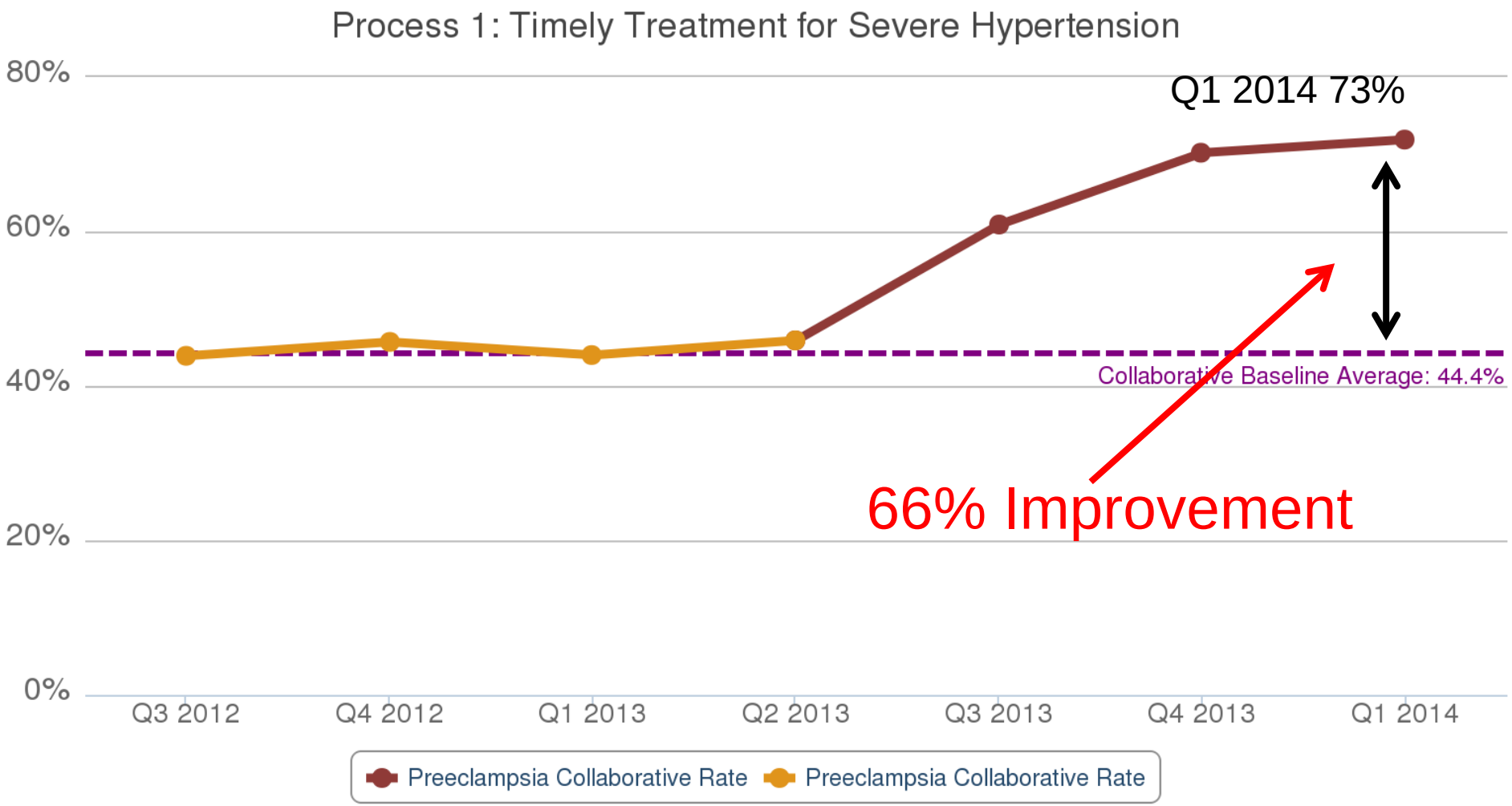
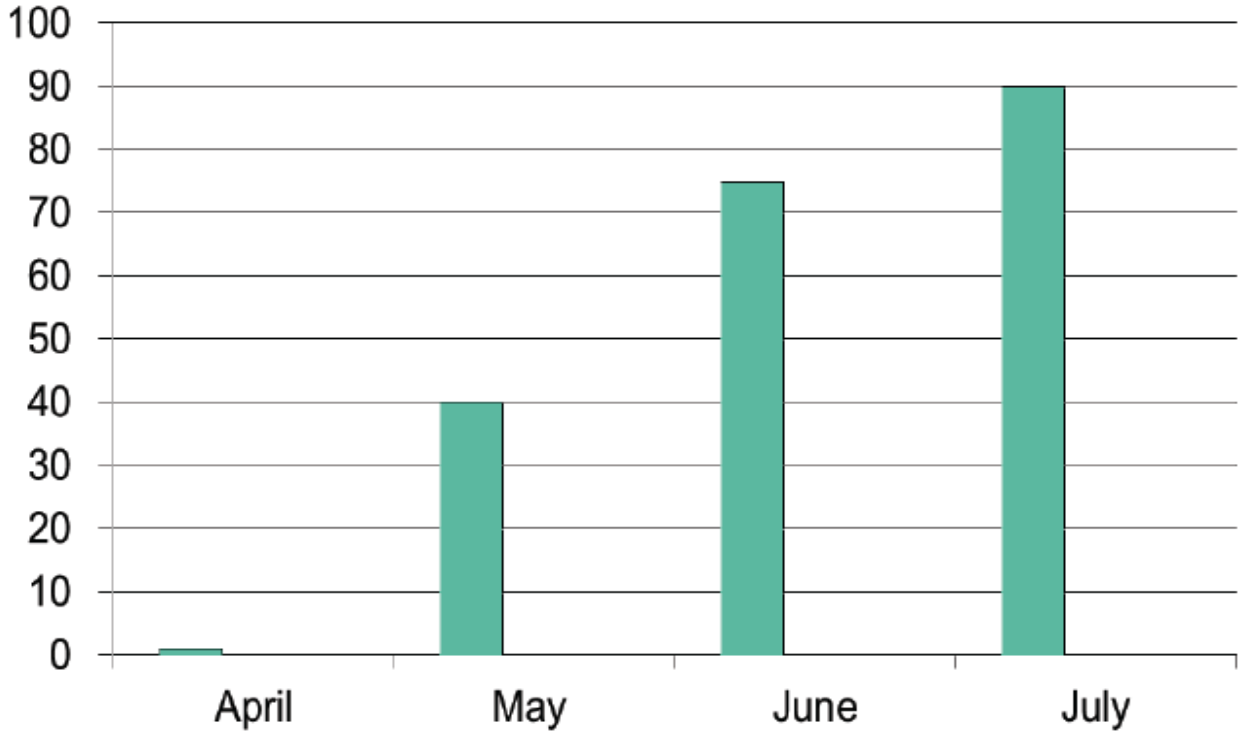
Timely Treatment: within 60 minutes

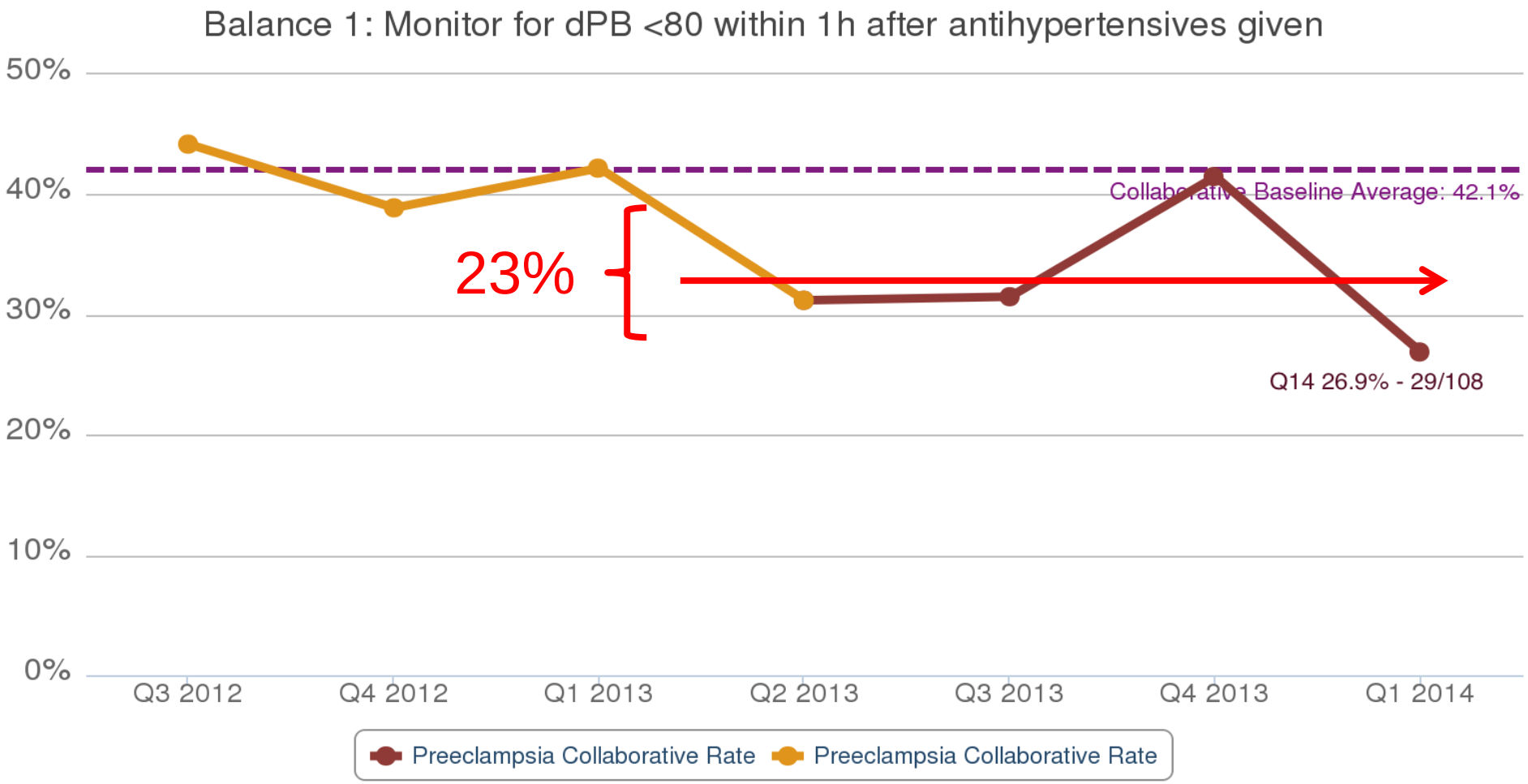


Hospital B

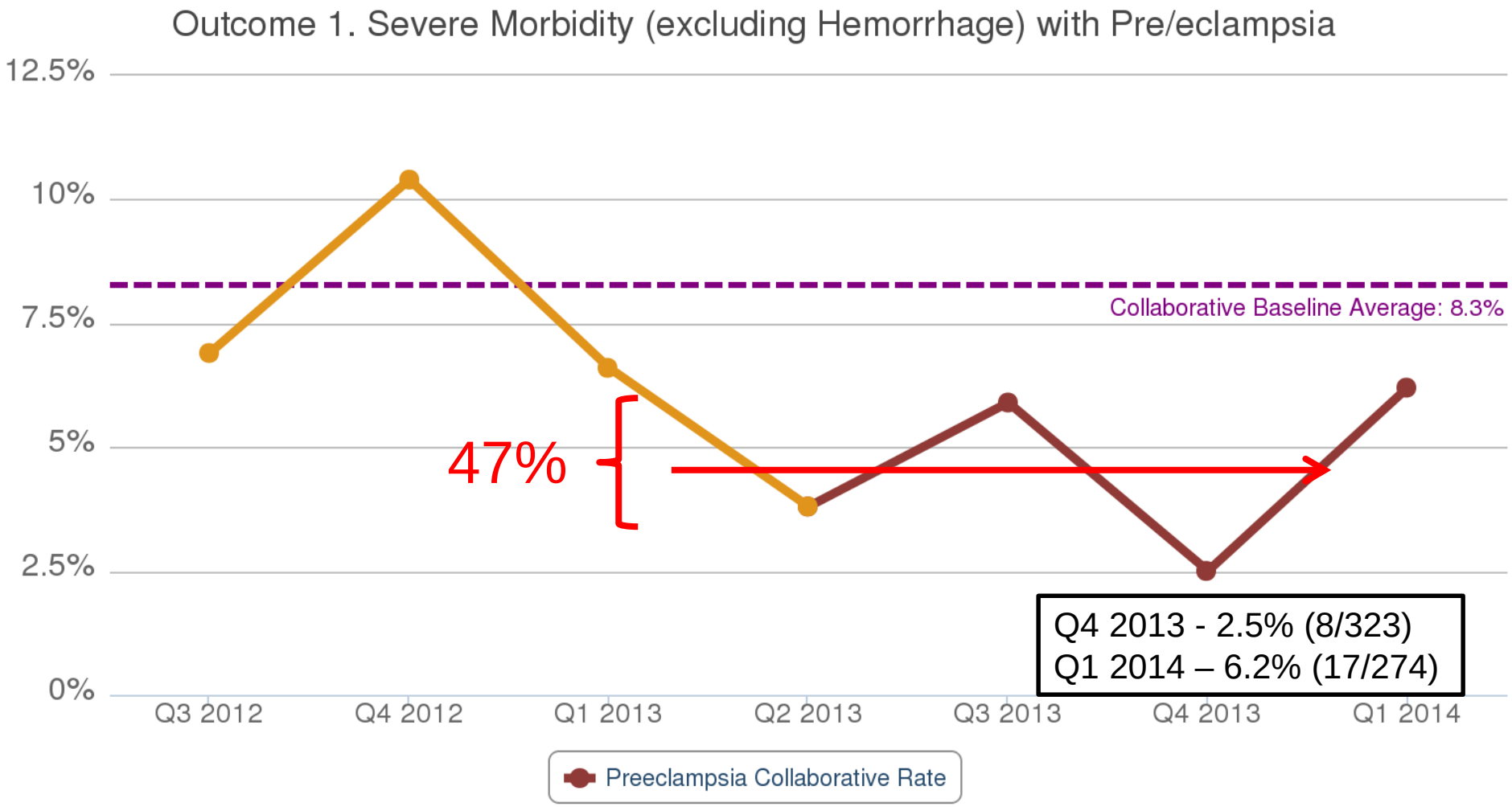
Percentage of patients in 2013 treated within 60 minutes with Labetalol:



Monitor for diastolic BP <80 within 1 hour after treatment



Severe Morbidity (excluding hemorrhage/transfusions)



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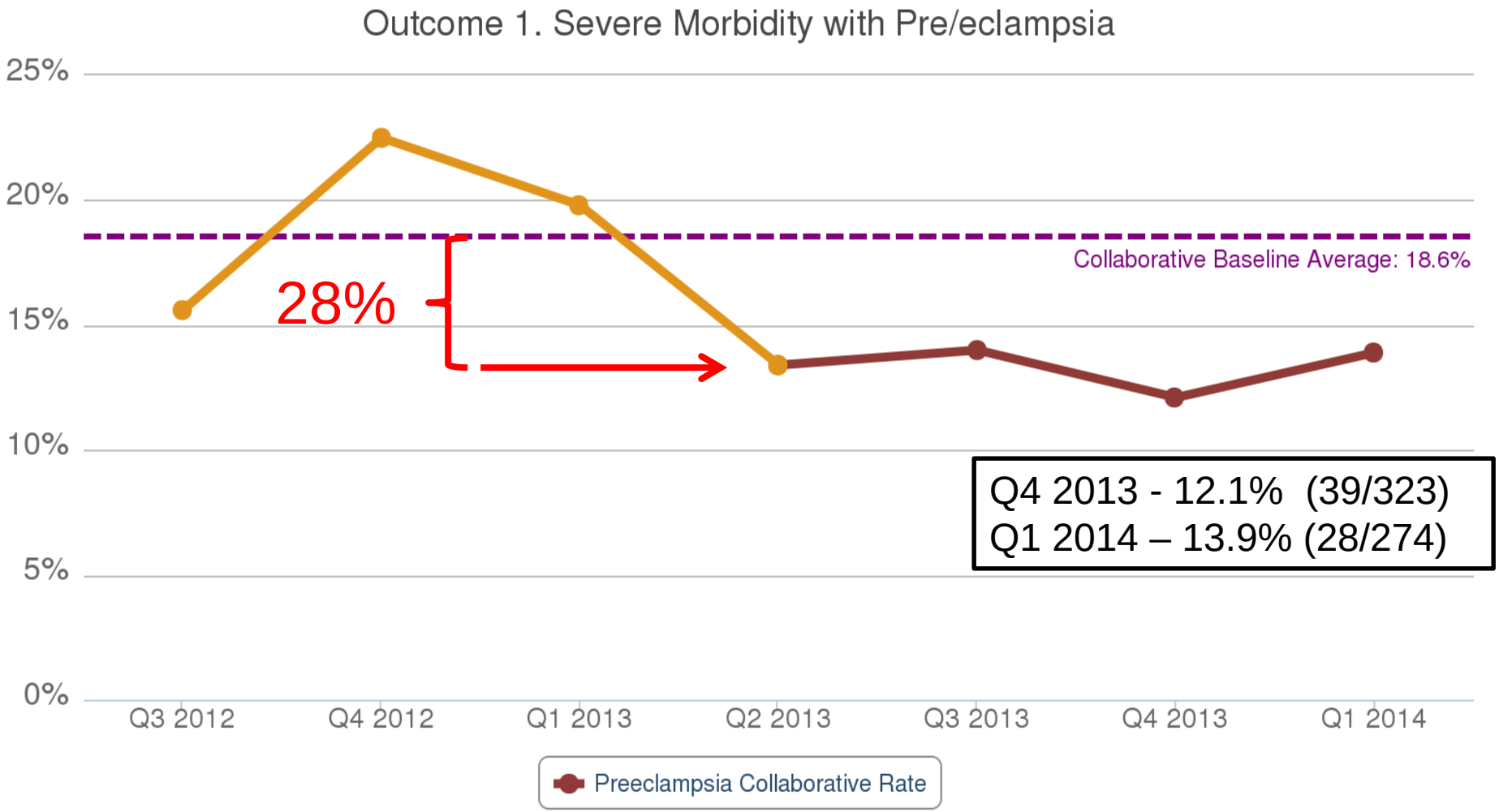
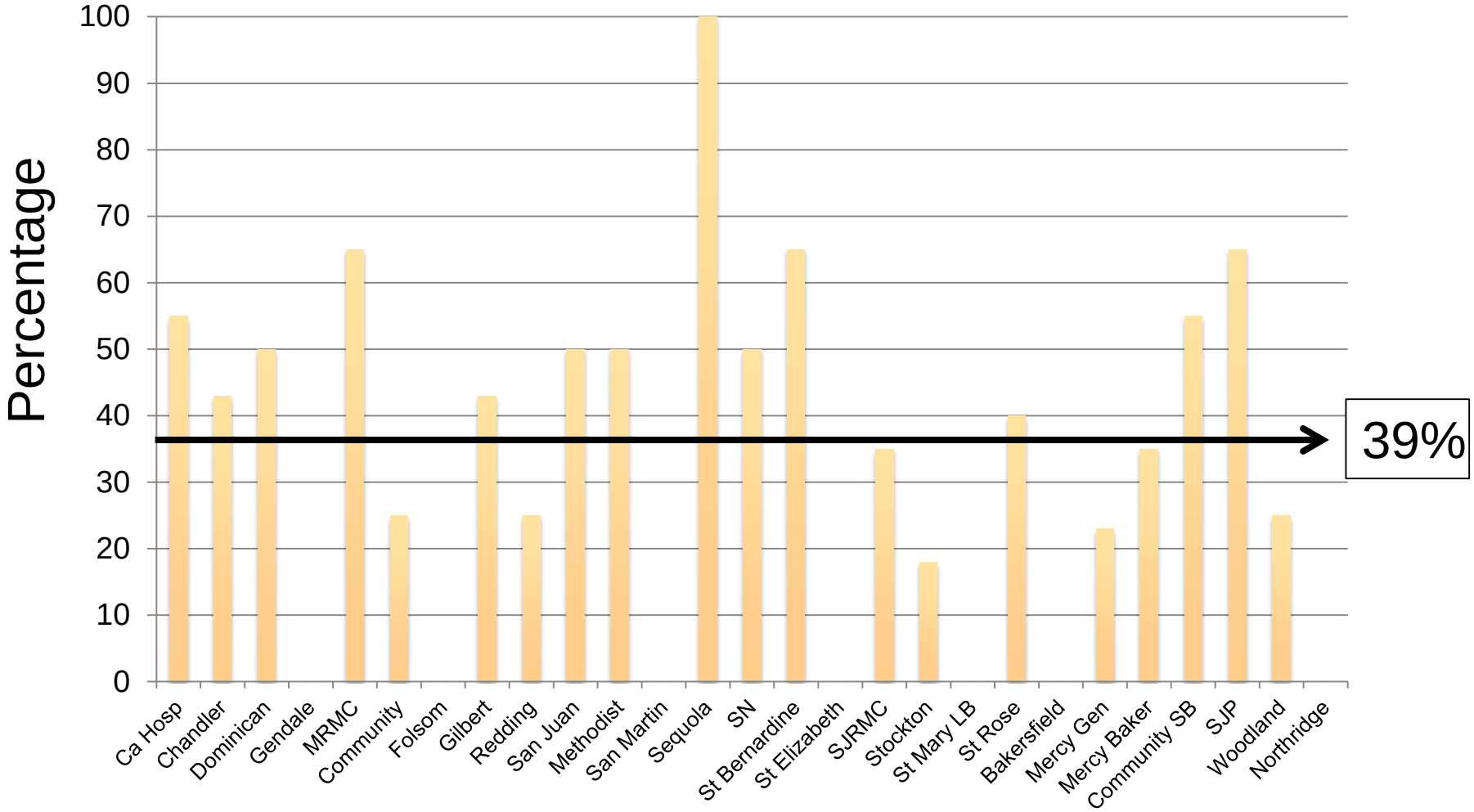
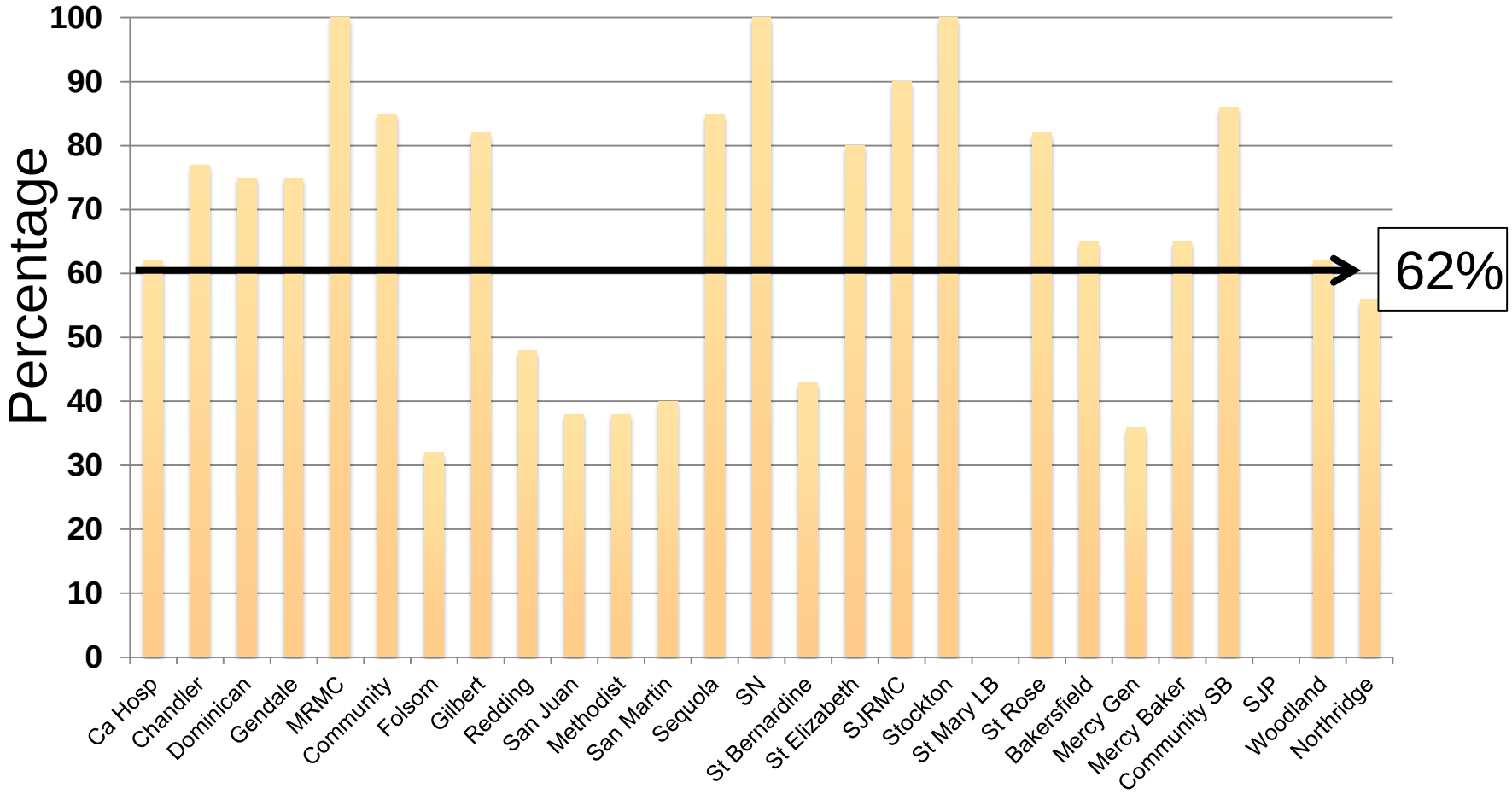
Severe Morbidity (including hemorrhage/transfusions)



Dignity Health:
Blood Pressure Treated within 1 Hour of Verification

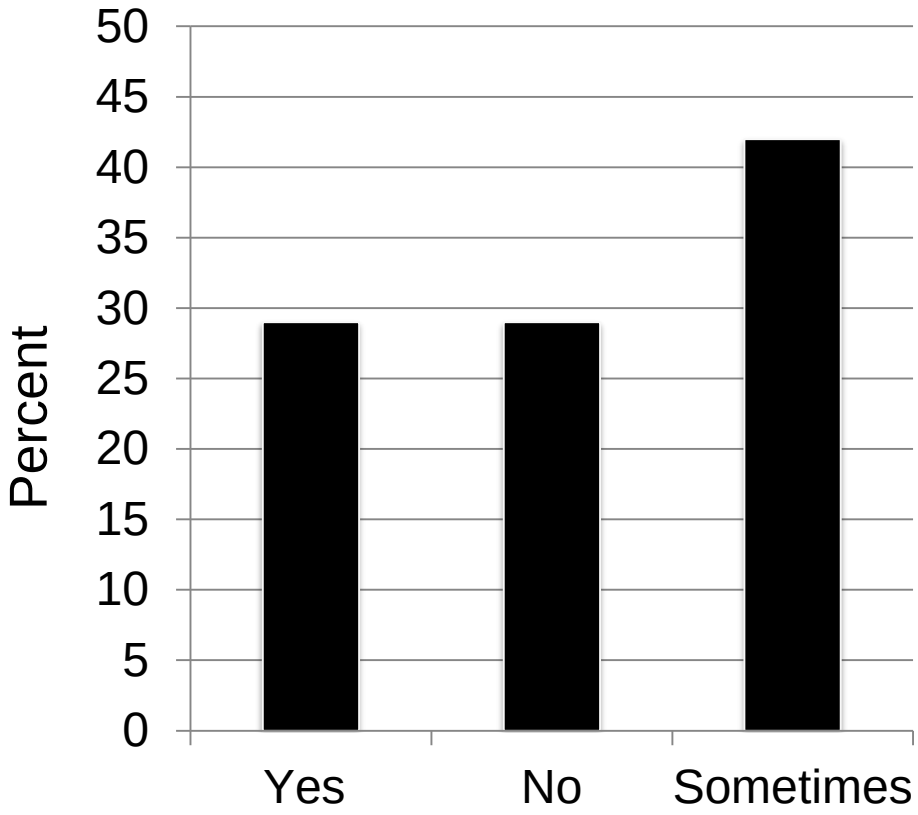


Dignity Health:
Patients Given Follow-up in 3-7 or 7-14 days

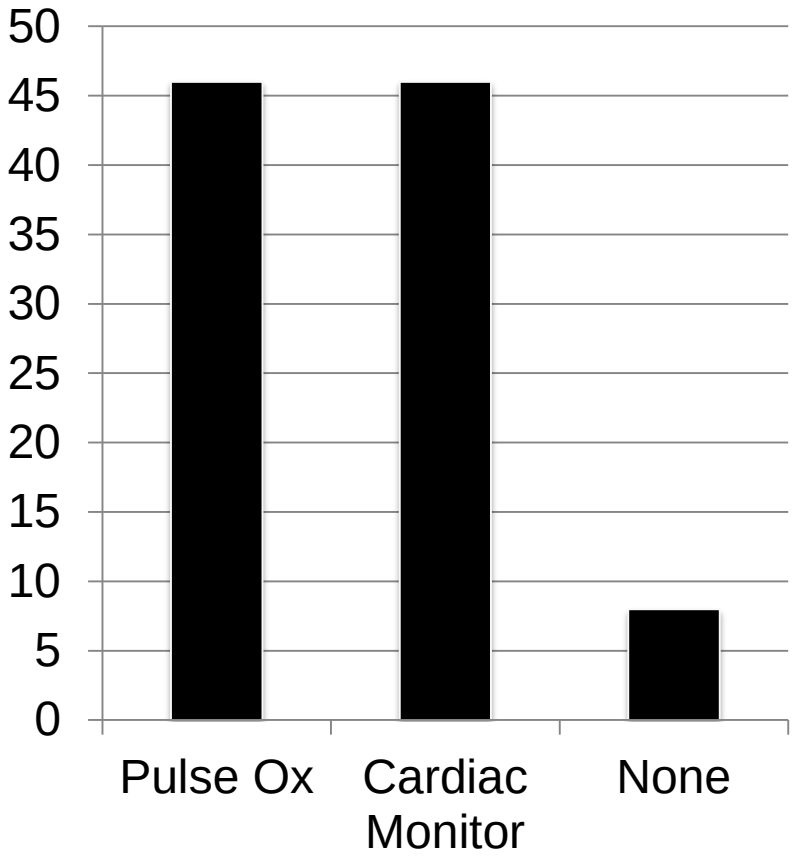


Dignity Health

Magnesium in OR



Labetalol Monitoring



Impression and Challenges:

- The number of facilities with significant barriers to timely treatment was surprising
- Modest improvements in *patient care* and *outcomes* seem achievable in relatively short periods of time
  - Physician education and buy-in → ACOG, CMQCC, results
  - Nursing education and change in patient assessment
  - Reconfiguring supplies and equipment
  - Improving rapid access to medications and restructuring who and where they can used
- Hospitals that have already worked on standardizing care will likely achieve results quicker

California Maternal Quality Care Collaborative

CMQCC CALIFORNIA MATERNAL QUALITY CARE COLLABORATIVE

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Preeclampsia Toolkit

Improving Health Care Response to Preeclampsia
A California Toolkit to Transform Maternity Care

The complete toolkit is available for free download HERE (Including Errata 5/13/14)

(a brief registration is required).

The Errata is as follows:
-On page 96 and 109 the flowchart "Part 1 of 2: Diagnosis
Antepartum and Postpartum Preeclampsia and Eclam partment",
the following sentence in the OB consult <60 page should read "If
patient's BP increases to SBP> 160 or hypertensives and
magnesium and notify OB **of** ch ady present."

-On page 97 and 11 atment-Evaluation and Treatment of
Antepartum ia and Eclampsia in the Emergency Department",
step 2 Anti-Hypertensive the second dose of Labetalol is not
hould read "administer 40 mg IV."

individual sections of the toolkit click below on the link you are interested in, they are available to individuals who have already download the Toolkit.

1. Care guidelines (in checklist, flowchart or table chart formats) and a compendium of eighteen "best practice" articles
2. A slide set for professional education
3. Education and patient information

PLEASE SHARE THIS LINK WITH YOUR COLLEAGUES. CMQCC Preeclampsia TOOLKIT

The CMQCC Preeclampsia Task Force, a multidisciplinary committee of experts co-chaired by Maurice Druzin, MD, Laurence Shields, MD and Nancy Peterson, RNC, PNNP has developed a Toolkit for health care providers who care for women during the prenatal, birth, and postpartum periods. The Toolkit was extensively researched and included peer review and consensus among experts from around the state on best practices for early recognition,

New! Preeclampsia Toolkit

Profile in Improvement

Learn how David Lagrew of Saddleback Memorial Medical Center is helping pro rs lower elective us inductions

https://www.cmqcc.org/preeclampsia_toolkit

Presented at Washington State Hospital Association Safe Table Webcast June 12, 2014