Bronchiolitis Evidence Based Management

Ricardo Quiñonez, MD, FAAP, FHM

Associate Professor of Pediatrics

Section of Pediatric Hospital Medicine

Texas Children's Hospital®

BCM

Baylor College of Medicine

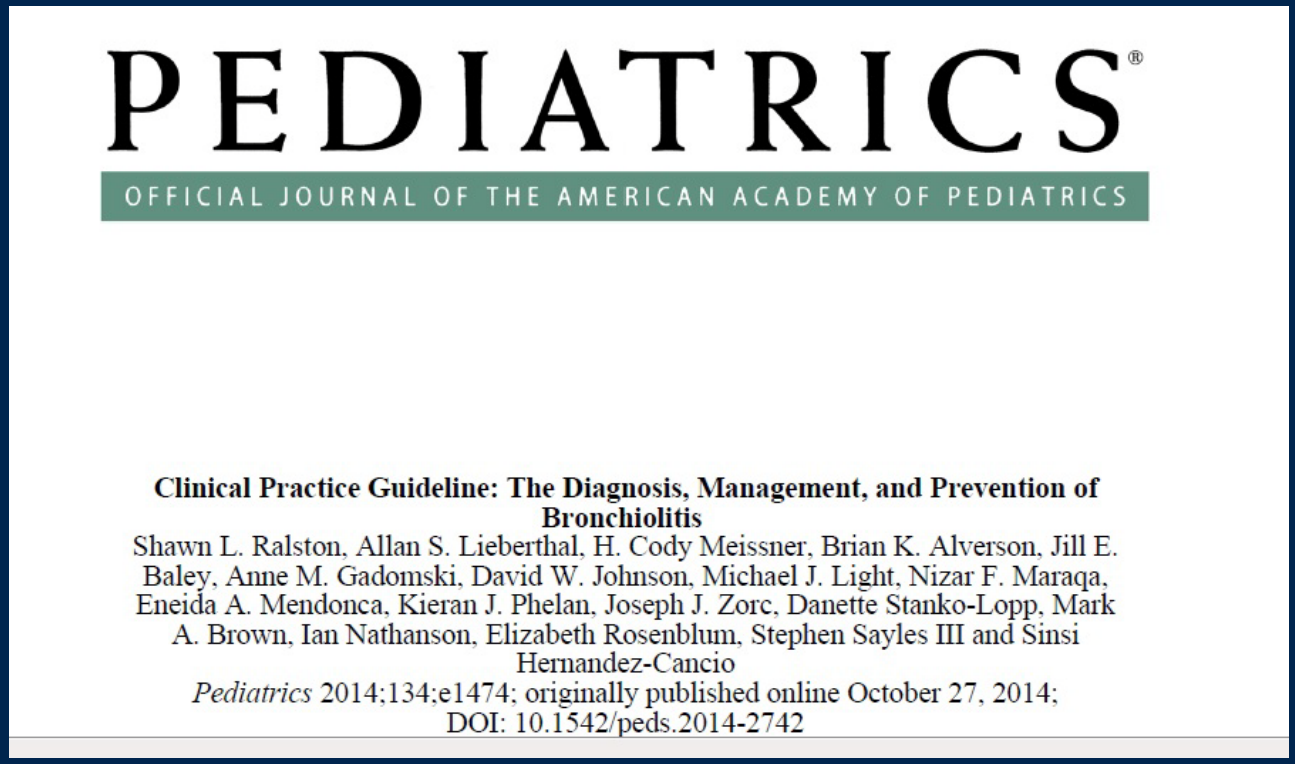
Pediatrics

Resumen

- "Como la bronquiolitis viral aguda es una enfermedad auto-limitante de relativamente buen pronóstico, el principio de *primum-non-nocere* debiese templar la frustrada ansiedad de hacer algo, cualquier cosa para aliviar la disnea. Sus energías no debiesen ser malgastadas por el fastidio de tratamientos innecesarios o medicamentos y procedimientos fútiles. El descanso debe ser atesorado."

Wright and O'Beem,
Pediatrics, 1965

New AAP Guidelines



PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Clinical Practice Guideline: The Diagnosis, Management, and Prevention of Bronchiolitis

Shawn L. Ralston, Allan S. Lieberthal, H. Cody Meissner, Brian K. Alverson, Jill E. Baley, Anne M. Gadomski, David W. Johnson, Michael J. Light, Nizar F. Maraqa, Eneida A. Mendonca, Kieran J. Phelan, Joseph J. Zorc, Danette Stanko-Lopp, Mark A. Brown, Ian Nathanson, Elizabeth Rosenblum, Stephen Sayles III and Sinsi Hernandez-Cancio

Pediatrics 2014;134;e1474; originally published online October 27, 2014;
DOI: 10.1542/peds.2014-2742

10 of 14 Recommendations start with “Physicians should not…….”

Trial of bronchodilator abolished

Continuous pulse ox, not recommended

Texas Children's Hospital®

BCM Baylor College of Medicine

Diagnosis

- Clinical
  - Respiratory status
  - Mental status
  - Feeding and hydration

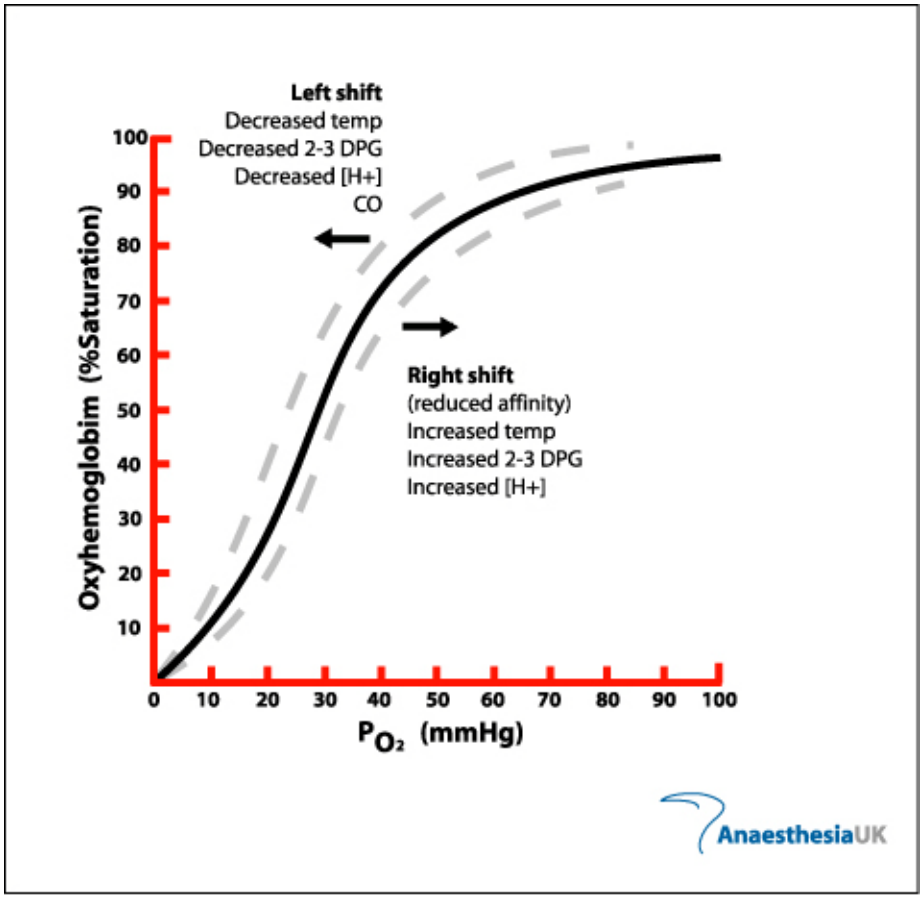
- Risk factors for severe disease
  - Age < 12 weeks
  - H/o prematurity
  - Underlying cardiopulmonary disease
  - Immunodeficiency

Respiratory Rate

- Count over a full 1 minute
- Normal RR
  - Infants < 1 yr: 30-60/min
  - Toddlers 1-3 yrs: 24-40/min
- Presence of tachypnea does not distinguish between viral and bacterial disease

Supplemental O_2

- Supplemental O_2 not needed unless **sats < 90%**
  - Adequate tissue oxygenation with sats ≥ 90%
- Nasal prongs are the best delivery method for O_2



Pulse Oximetry

- Intermittent pulse ox checks are adequate
  - Continuous pulse ox is not necessary
- Rationale
  - Transient desaturation is normal in healthy infants
  - Errors (frequent alarms, inaccurate measurements) with pulse ox
  - Reliance on pulse ox can lead to less careful monitoring of resp status

Schuh S, et al. JAMA. 2014;312(7):712-718
McCulloh R et al. JAMA Pediatr, 2015 Aug 31

Diagnosis

- Radiographic or laboratory studies should not be obtained routinely

Treatment

- Albuterol?
- Inhaled epinephrine?
- Steroids?
- Antibiotics?

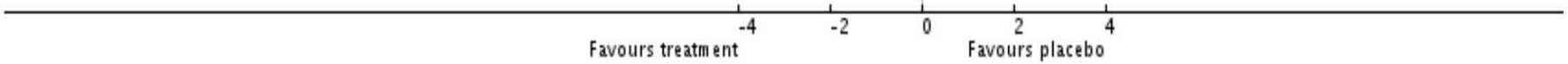
The Evidence

Gadomski AM, Brower M. Bronchodilators for bronchiolitis. *Cochrane Database Syst Rev*. 2014; (12):CD001266

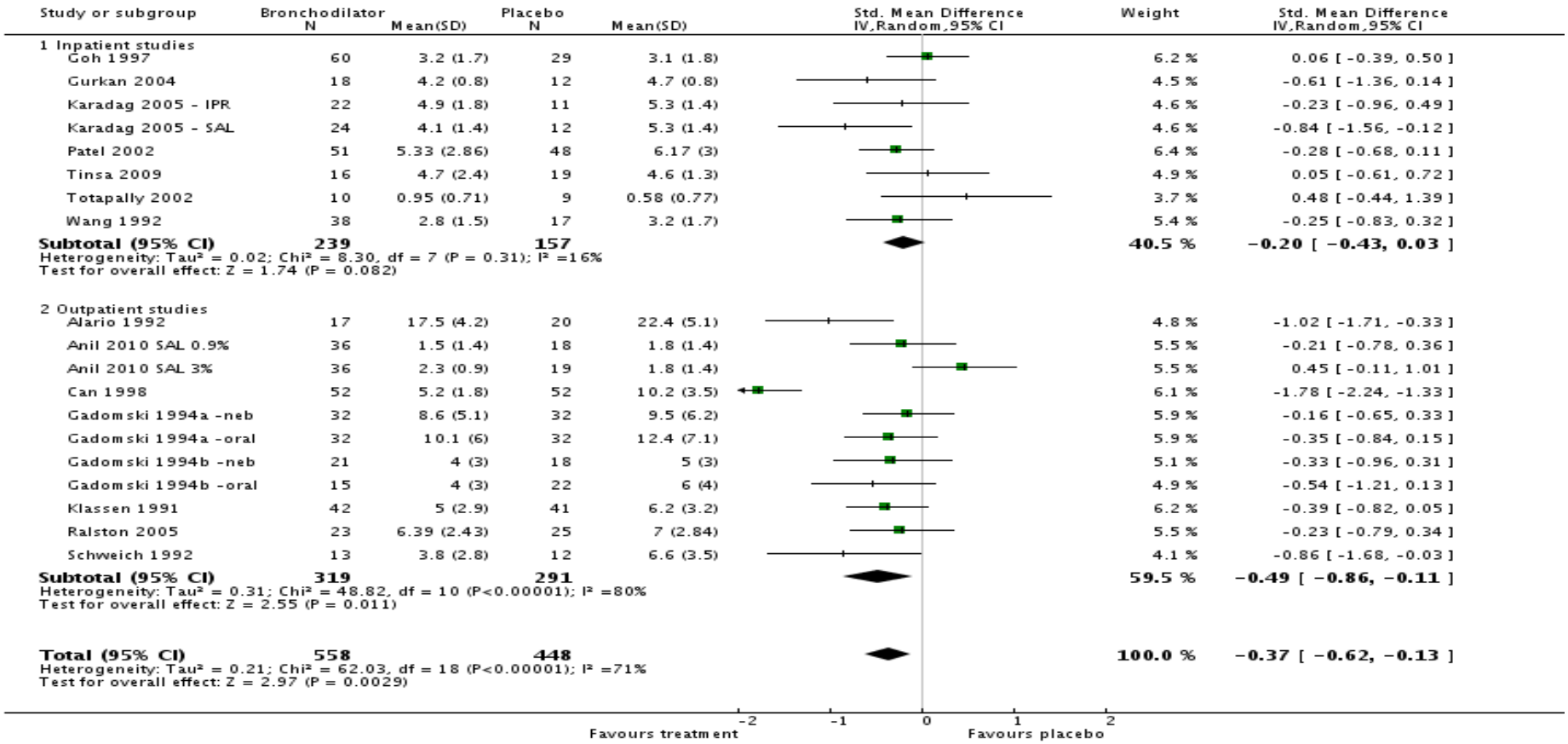
Review: Bronchodilators for bronchiolitis
Comparison: 1 Bronchodilators compared to placebo for treatment of acute bronchiolitis
Outcome: 5 Duration of hospitalization (inpatients)

Study or subgroup	Bronchodilator N	Mean(SD)	Placebo N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Chowdhury 1995	67	4.5 (1.4)	22	4.3 (1.1)		33.5 %	0.20 [-0.37, 0.77]
Karadag 2005 - IPR	22	2.91 (1.65)	11	2.48 (1.2)		11.1 %	0.43 [-0.56, 1.42]
Karadag 2005 - SAL	24	2.17 (1.2)	12	2.48 (1.2)		15.7 %	-0.31 [-1.14, 0.52]
Patel 2002	51	2.56 (2.25)	48	2.64 (1.96)		15.7 %	-0.08 [-0.91, 0.75]
Tinsa 2009	16	3.3 (1.99)	19	2.57 (1.95)		6.3 %	0.73 [-0.58, 2.04]
Wang 1992	40	2.7 (1.65)	17	2.9 (1.24)		17.8 %	-0.20 [-0.98, 0.58]
Total (95% CI)	**220**		**129**			**100.0 %**	**0.06 [-0.27, 0.39]**

Heterogeneity: Chi² = 3.07, df = 5 (P = 0.69); I² =0.0%
Test for overall effect: Z = 0.38 (P = 0.70)
Test for subgroup differences: Not applicable



Review: Bronchodilators for bronchiolitis
Comparison: 1 Bronchodilators compared to placebo for treatment of acute bronchiolitis
Outcome: 3 Average clinical score after treatment: by treatment setting (continuous)



What, no albuterol???!!!

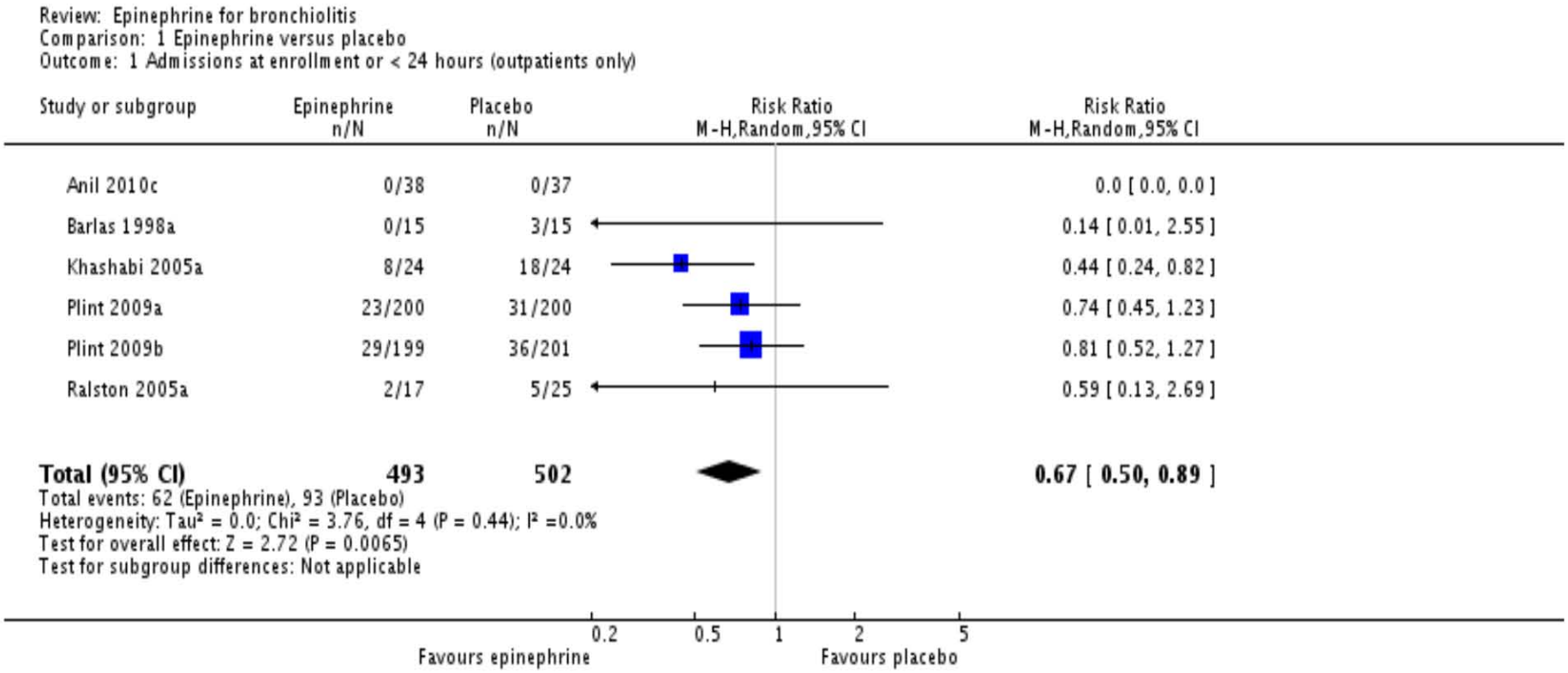
- Subtle impact on clinical score in outpatients (0.2 – 0.4 points on a 17 point scale)

- But… if it helps even a little, what's so wrong with a little trial?

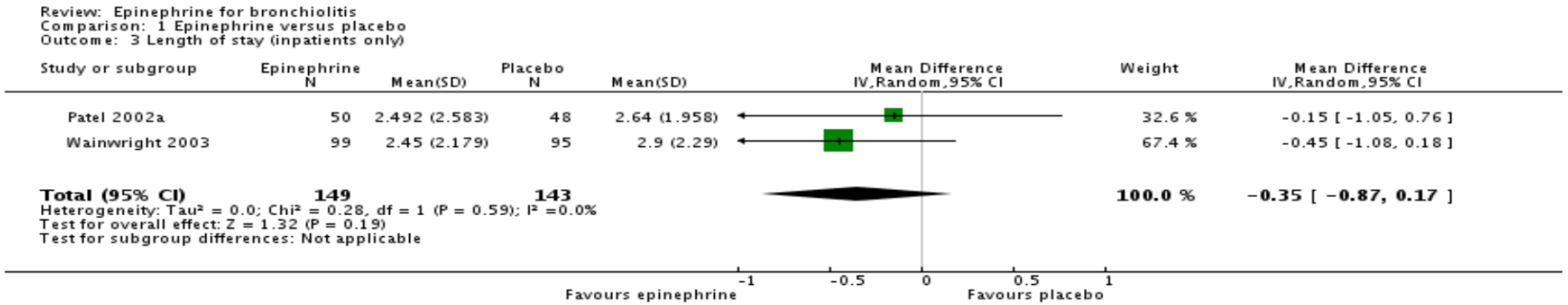
Albuterol: the downside

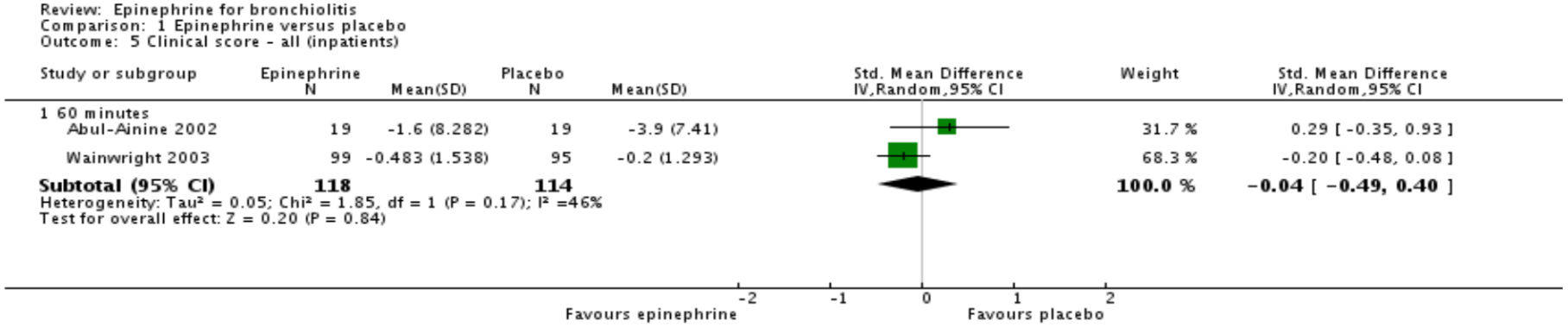
- Tachycardia
- Tremors
- Hypoxemia
  - V/Q mismatch (Ho, et al. *Arch Dis Child* 1991;66(9):1061-4.)
- Increased metabolic demand
  - increases O2 consumption by 50% in intubated patients (Ross,et al. *Ped Crit Care Med* 2014;15(9):e389-92)
- Begets other asthma therapies? Steroids, side effects…
- Chronic disease labels and specialist referrals
- Strengthened physician convictions that it is necessary to do something for all viral wheezing

Hartling L, Bialy LM, Vandermeer B. Epinephrine for bronchiolitis. *Cochrane Database Syst Rev*. 2011;(6):CD003123



Hartling L, Bialy LM, Vandermeer B. Epinephrine for bronchiolitis. *Cochrane Database Syst Rev*. 2011;(6):CD003123





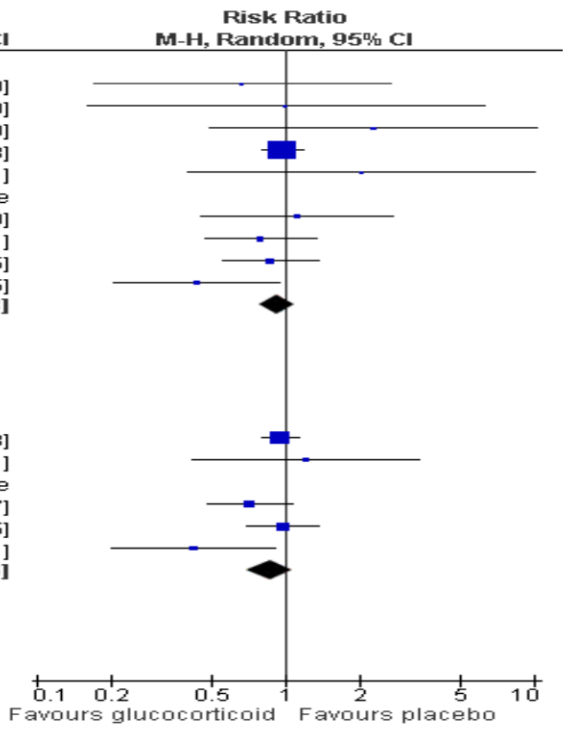
Epinephrine: yes, no, maybe?

- No evidence for regular use
- Might be appropriate as a short term urgent intervention

Fernandes RM, Bialy LM, Vandermeer B. Glucocorticoids for acute viral bronchiolitis in infants and young children. *Cochrane Database Syst Rev. 2010;(10):CD004878.*

Hospitalization Rates

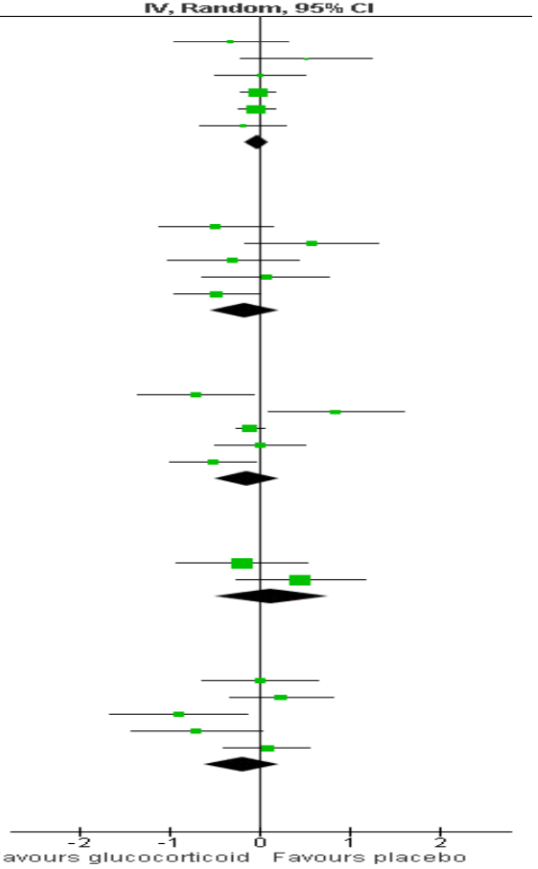
Study or Subgroup	Glucocorticoid Events	Glucocorticoid Total	Placebo Events	Placebo Total	Weight	Risk Ratio M-H, Random, 95% CI
1.1.1 Admissions day 1						
Barlas 1998 (G vs P) (1)	4	30	3	15	1.3%	0.67 [0.17, 2.60]
Barlas 1998 (G+S vs S) (2)	2	15	2	15	0.7%	1.00 [0.16, 6.20]
Berger 1998	5	20	2	18	1.1%	2.25 [0.50, 10.20]
Corneli 2007	121	305	121	295	65.9%	0.97 [0.80, 1.18]
Goebel 2000	4	24	2	24	1.0%	2.00 [0.40, 9.91]
Kuyucu 2004	0	46	0	23		Not estimable
Mesquita 2009	8	33	7	32	3.1%	1.11 [0.45, 2.70]
Plint 2009 (G+E vs P+E)	23	199	29	198	9.6%	0.79 [0.47, 1.31]
Plint 2009 (G+P vs P+P)	31	199	36	201	13.0%	0.87 [0.56, 1.35]
Schuh 2002	7	36	15	34	4.3%	0.44 [0.21, 0.95]
Subtotal (95% CI)		**907**		**855**	**100.0%**	**0.92 [0.78, 1.08]**
Total events	205		217			
Heterogeneity: Tau² = 0.00; Chi² = 6.87, df = 8 (P = 0.55); I² = 0%						
Test for overall effect: Z = 1.05 (P = 0.30)						
1.1.2 Admissions day 7						
Corneli 2007	133	284	131	265	45.0%	0.95 [0.80, 1.13]
Goebel 2000	6	24	5	24	3.8%	1.20 [0.42, 3.41]
Kuyucu 2004	0	46	0	23		Not estimable
Plint 2009 (G+E vs P+E)	34	199	47	198	19.6%	0.72 [0.48, 1.07]
Plint 2009 (G+P vs P+P)	51	199	53	201	24.8%	0.97 [0.70, 1.35]
Schuh 2002	7	35	15	32	6.8%	0.43 [0.20, 0.91]
Subtotal (95% CI)		**787**		**743**	**100.0%**	**0.86 [0.70, 1.06]**
Total events	231		251			
Heterogeneity: Tau² = 0.02; Chi² = 5.84, df = 4 (P = 0.21); I² = 32%						
Test for overall effect: Z = 1.38 (P = 0.17)						



(1) Plint 2009 (factorial trial) and Barlas 1998 (parallel multiarm study) contribute two independent comparisons which are shown separately;
(2) G: Glucocorticoid, S:Salbutamol, E: Epinephrine, P: Placebo

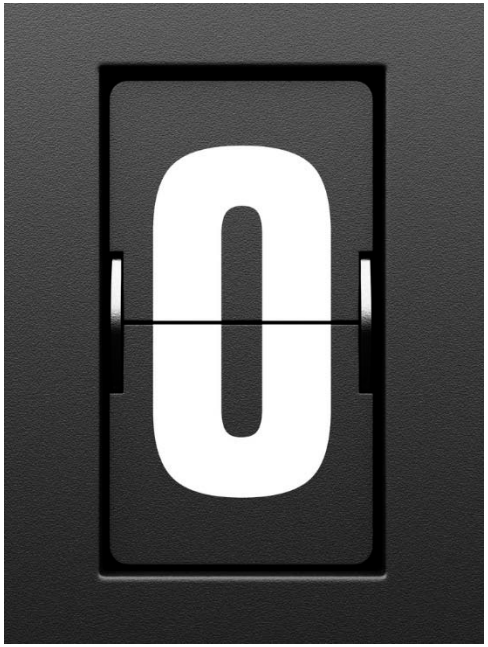
Clinical Scores – from Fernandes, cited previous slide

Study or Subgroup	Glucocorticoid Mean	SD	Total	Placebo Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
1.4.1 60 Minutes								
Barlas 1998 (G vs P) (1)	-1.135	1.72	30	-0.54	1.96	15	4.0%	-0.32 [-0.95, 0.30]
Barlas 1998 (G+S vs S) (2)	-1.2	2.28	15	-2.27	1.73	15	2.9%	0.51 [-0.21, 1.24]
Mesquita 2009	-2	2	33	-2	2	32	6.5%	0.00 [-0.49, 0.49]
Plint 2009 (G+E vs P+E)	-2.5	2.58	199	-2.45	2.32	198	39.7%	-0.02 [-0.22, 0.18]
Plint 2009 (G+P vs P+P)	-1.75	2.4	199	-1.65	2.42	200	39.9%	-0.04 [-0.24, 0.15]
Schuh 2002	-2.1	3.673	36	-1.5	2.677	34	7.0%	-0.18 [-0.65, 0.29]
Subtotal (95% CI)			**512**			**494**	**100.0%**	**-0.04 [-0.16, 0.09]**
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 3.44$, df = 5 (P = 0.63); $I^2 = 0\%$								
Test for overall effect: Z = 0.56 (P = 0.58)								
1.4.2 120 Minutes								
Barlas 1998 (G vs P)	-2.65	2.28	30	-1.47	2.54	15	20.5%	-0.49 [-1.12, 0.14]
Barlas 1998 (G+S vs S)	-2.07	2.75	15	-3.42	1.77	15	17.0%	0.57 [-0.16, 1.30]
Kuyucu 2004 (G+E vs P+E)	-3.5	0.959	23	-3.2	0.995	11	17.3%	-0.30 [-1.02, 0.42]
Kuyucu 2004 (G+S vs P+S)	-3.2	1.439	23	-3.3	1.386	12	18.1%	0.07 [-0.63, 0.77]
Schuh 2002	-3.7	3.673	36	-2.2	2.38	34	27.0%	-0.48 [-0.95, -0.00]
Subtotal (95% CI)			**127**			**87**	**100.0%**	**-0.17 [-0.55, 0.21]**
Heterogeneity: $Tau^2 = 0.08$; $Chi^2 = 6.98$, df = 4 (P = 0.14); $I^2 = 43\%$								
Test for overall effect: Z = 0.89 (P = 0.37)								
1.4.3 3-6 hours								
Barlas 1998 (G vs P)	-2.915	2.67	30	-1.07	2.31	15	15.8%	-0.71 [-1.35, -0.07]
Barlas 1998 (G+S vs S)	-2.39	3.25	15	-4.63	1.75	15	13.2%	0.84 [0.08, 1.59]
Corneli 2007	-5.3	4.7	304	-4.8	4.6	294	30.3%	-0.11 [-0.27, 0.05]
Mesquita 2009	-3	3	33	-3	2	32	20.2%	0.00 [-0.49, 0.49]
Schuh 2002	-5	3.1	36	-3.2	3.7	34	20.4%	-0.52 [-1.00, -0.05]
Subtotal (95% CI)			**418**			**390**	**100.0%**	**-0.14 [-0.50, 0.21]**
Heterogeneity: $Tau^2 = 0.10$; $Chi^2 = 12.46$, df = 4 (P = 0.01); $I^2 = 68\%$								
Test for overall effect: Z = 0.78 (P = 0.44)								
1.4.4 12-24 hours								
Kuyucu 2004 (G+E vs P+E)	-3.9	0.959	23	-3.7	0.995	11	49.4%	-0.20 [-0.92, 0.52]
Kuyucu 2004 (G+S vs P+S)	-3.3	1.439	23	-3.9	1.039	12	50.6%	0.44 [-0.26, 1.15]
Subtotal (95% CI)			**46**			**23**	**100.0%**	**0.13 [-0.51, 0.76]**
Heterogeneity: $Tau^2 = 0.08$; $Chi^2 = 1.57$, df = 1 (P = 0.21); $I^2 = 36\%$								
Test for overall effect: Z = 0.39 (P = 0.70)								
1.4.5 3-10 days								
Berger 1998	-2.45	1.9	20	-2.45	2	18	19.6%	0.00 [-0.64, 0.64]
Goebel 2000	-3.1	1.47	24	-3.5	1.96	24	21.7%	0.23 [-0.34, 0.79]
Kuyucu 2004 (G+E vs P+E)	-5	0.48	23	-4.5	0.663	11	16.5%	-0.90 [-1.65, -0.14]
Kuyucu 2004 (G+S vs P+S)	-4.7	0.48	23	-4.3	0.693	12	17.3%	-0.70 [-1.42, 0.02]
Schuh 2002	-8.9	5.2	35	-9.3	4.9	34	24.9%	0.08 [-0.39, 0.55]
Subtotal (95% CI)			**125**			**99**	**100.0%**	**-0.20 [-0.61, 0.21]**
Heterogeneity: $Tau^2 = 0.12$; $Chi^2 = 8.81$, df = 4 (P = 0.07); $I^2 = 55\%$								
Test for overall effect: Z = 0.96 (P = 0.34)								

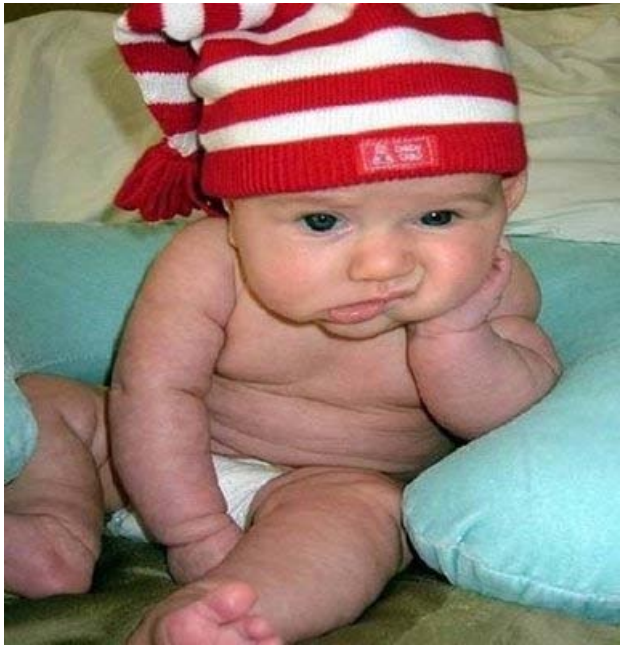


(1) Kuyucu 2004 and Plint 2009 (factorial trials) and Barlas 1998 (parallel multiarm study) contribute two independent comparisons which are shown se
(2) G: Glucocorticoid, S:Salbutamol, E: Epinephrine, P: Placebo

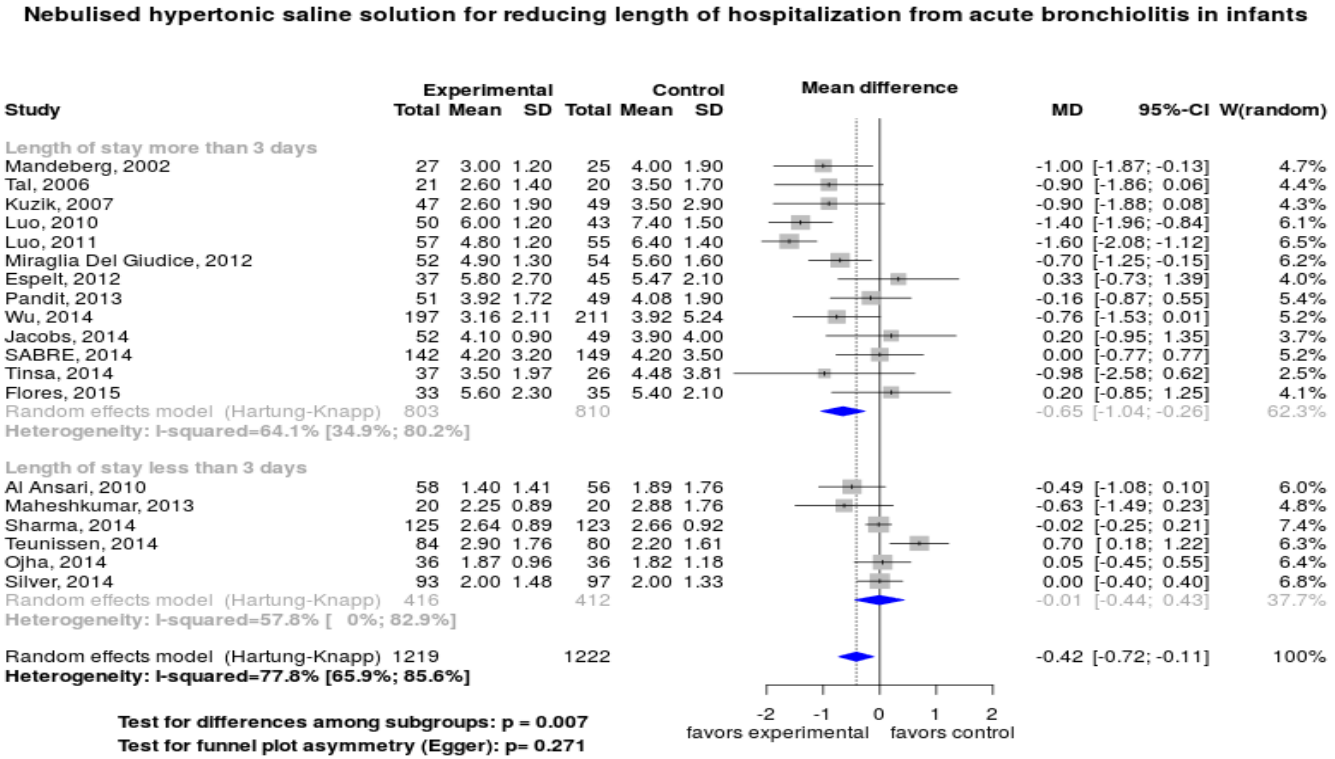
What is the right rate for steroid use?



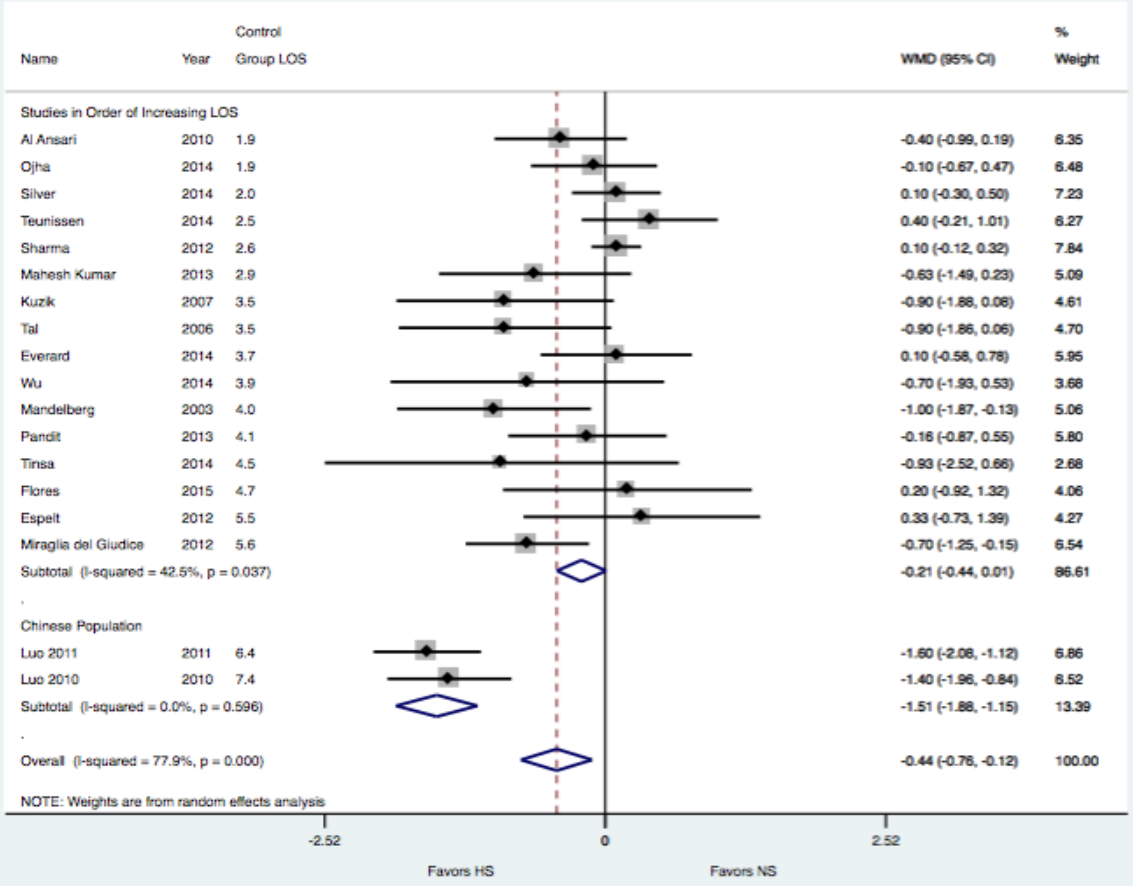
But wait, what about hypertonic saline?



Badgett RG, Vindhyal M, Stirnaman JT, Gibson CM, Halaby R. A Living Systematic Review of Nebulized Hypertonic Saline for Acute Bronchiolitis in Infants. JAMA Pediatr. 2015 Aug 1;169(8):788-9



Mean Difference in Length of Stay (LOS)



Resumen

NADA

- **N**ariz limpia
- **A**poyar la respiración
- **D**ar líquidos para mantener la hidratación
- **A**bsoluta PACIENCIA