

A few comments on meta-analysis of skewed continuous data

Doug Altman
Centre for Statistics in Medicine
University of Oxford



Length of intubation (hours)



Study	High dose opioid					Low dose opioid					Significance as reported by authors
	n	Mean	SD	Median	Range	n	Mean	SD	Median	Range	
Slogoff 1989	254	22.8	12.3			257	14.5	6.3			ANOVA p = 0.001
Enflurane						253	16.8	7.2			
Halothane						248	14.7	5.4			
Bell 1994	19			12.96		20			4.42		p = 0.0005
Cheng 1996	51	18.9	1.4			51	4.1	1.1			p < 0.02
Myles 1997	66	21.5	5.1	12.3	3.5-31.5	58	11.4	9.9			p = 0.006
Silbert 1998	42			7.0	2.1-19	38			4.0	0.5-15.5	p < 0.01
Michalopoulos 1998	72	11.6	1.3			72	7.3	0.7			p = 0.0001
Sakaida 1998	20	14.5	4.5	15	6-25.3	20	5.6	1.6	5.2	3.5-9	p < 0.05
Berry 1998	42			12.62	8.32-20.67	43			1.83	0.1-4.25	significant
Myles 2001	24			9.7	1.1-25	24			6.5	0.4-150	?significant

Anesthesiology 2003; 99:982-7

© 2003 American Society of Anesthesiologists, Inc. Lippincott Williams & Wilkins, Inc.

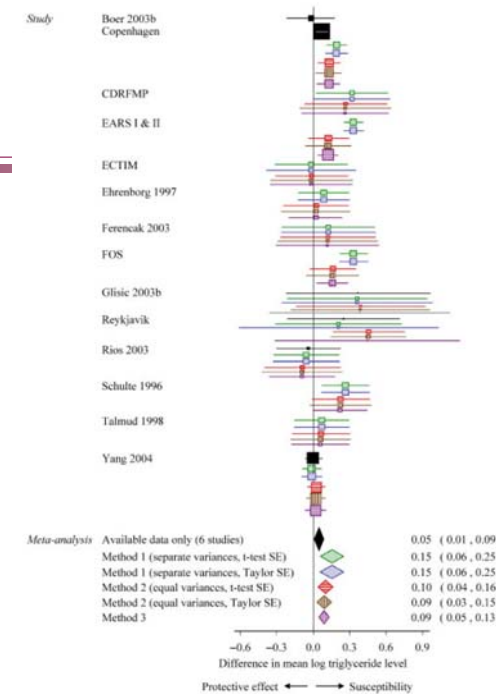
A Systematic Review of the Safety and Effectiveness of Fast-track Cardiac Anesthesia

Paul S. Myles, M.B.B.S., M.P.H., M.D., F.C.A.R.C.S.I., F.A.N.Z.C.A.,* David J. Daly, M.B.B.S., F.A.N.Z.C.A.,† George Djaiani, M.D., D.E.A.A., F.R.C.A.,‡ Anna Lee, B.Pharm., M.P.H., Ph.D.,§ Davy C. H. Cheng, M.D., M.Sc., F.R.C.P.C.¶

STATISTICS IN MEDICINE
Statist. Med. 2008; 27:6072-6092
 Published online 17 September 2008 in Wiley InterScience
 (www.interscience.wiley.com) DOI: 10.1002/sim.3427

Meta-analysis of skewed data: Combining results reported on log-transformed or raw scales

Julian P. T. Higgins*,†, Ian R. White and Judith Anzures-Cabrera



Data that might be available



Combination of

- Means, SDs for raw data
- Means, SDs for log data
 - (SE and CI convert simply to SD)
- Medians and centiles for raw data
 - Centiles convert simply to mean and SD on log scale if assume lognormal distribution

5

Mixed data



An approach to mixed data:

- Assume that the data are (close to) lognormal
- Convert centiles to mean and SD of log data
 - For ranges see Walter (2007)
- Combine summary statistics on raw and log scale using method of Higgins et al (2008)
- Other approaches developed by O'Rourke but unpublished
 - Example in Brady et al (Cochrane Library, 2010)

6

References



Brady M, Kinn S, Ness V, O'Rourke K, Randhawa N, Stuart P. Preoperative fasting for preventing perioperative complications in children. *Cochrane Database Syst Rev* 2009;(4):CD005285.

Higgins JP, White IR, Anzures-Cabrera J. Meta-analysis of skewed data: combining results reported on log-transformed or raw scales. *Stat Med* 2008;27:6072-92.

Walter SD, Yao X. Effect sizes can be calculated for studies reporting ranges for outcome variables in systematic reviews. *J Clin Epidemiol* 2007;60:849-852.

7