EDITORIAL

Weighted event rates

When reporting results for dichotomous outcomes (for example, alive or dead) of systematic reviews, the event rates are labelled "weighted event rates." This weight reflects the relative contributions of individual studies to the overall risk difference, which is then used to compute the numbers needed to treat (NNTs).

The main factor in determining the weight for a trial is the number of events, which in turn depends on sample size, the event rate, and duration of follow-up. Trials with more events get more weight. The number of events and total number of patients in each of the treatment arms are combined into a single statistical concept called *variance*. Variances can be calculated for the event rates in each of the treatment arms, for the risk difference between the treatment groups, or for the relative risk. A good example of a weight would then be 1/variance.

Computer software is available to do most of the computations (e.g., RevMan, SAS, and Stata). For a fixed-effects model, RevMan (which is probably familiar to most reviewers) will generate a Mantel–Haenszel risk difference together with a corresponding weight for each of the trials, whereas the DerSimonian and Laird method is used for the random-effects model (1).

A review by van Dongen and colleagues (2) (abstracted in this issue of *ACP Journal Club*) illustrates the principles with incidence of recurrent venous thromboembolism at 3 months (Figure).

The weighted risk difference between the treatment and control groups is obtained by adding an individual trial's weight times the risk difference as follows: (1.04% of −0.07) + (2.36% of −0.04) + (2.57% of −0.04) + (2.99% of −0.04) + (4.60% of −0.01) + (7.03% of −0.01) + (7.04% of −0.01) + (7.60% of −0.04) + (8.80% of −0.01) + (10.77% of 0.00) + (13.42% of −0.05) + (13.83% of 0.00) + (17.96% of 0.00) = −0.02 (95% CI, −0.02 to −0.01). (It is noteworthy that in this case, a linear relationship exists between sample size and the weights.)

The overall event rate in the control (unfractionated heparin) group is calculated by simply pooling the results to give 149/2809 = 5.30%. The overall experimental event rate is obtained by sub-

tracting the weighted risk difference from the control event rate (i.e., 5.30% −2.00% = 3.30%). Both rates are subsequently labelled "weighted event rates." (In the case of a risk increase, the weighted risk difference is *added* to the control event rate to get the weighted experimental event rate.) Weighted and unweighted event rates from this example are presented in the Table.

Low molecular weight heparin (LMWH) vs unfractionated heparin (UFH) in venous thromboembolism (VTE) at 3 months

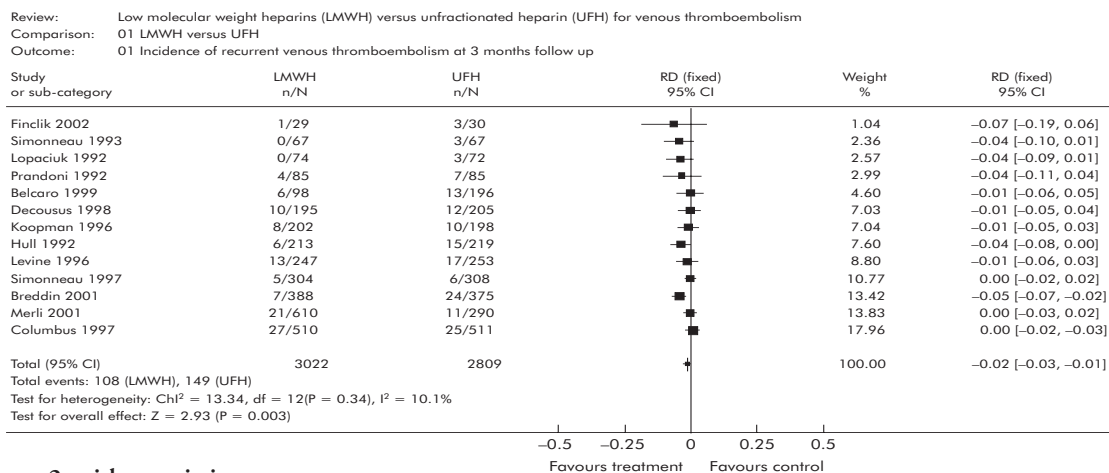| Outcome	Weighted event rates		RRR (95% CI)	NNT (CI)
	LMWH	UFH		
Recurrent VTE	3.30%	5.30%	30% (11 to 46)	50 (34 to 100)
	Unweighted event rates			
	LMWH	UFH		
	3.57%	5.30%	33% (14 to 47)	58 (36 to 148)

The reported relative risk reductions (RRRs) from meta-analyses are similarly weighted. A consequence of this approach is that the "eyeball calculation" of the RRR—when you quickly calculate the RRR in your head from the event rates—doesn't come out to what you would expect.

However, we feel this presentation gives the most accurate report of the event rates, and the "eyeball calculation" of the NNT will come out to what you would expect.

Stephen R. Werre, PhD
Cindy Walker-Dilks, MLS
McMaster University
Hamilton, Ontario, Canada

References
1. **Alderson P, Green S, Higgins JP, eds.** Cochrane Reviewer's Handbook 4.2.3 (updated November 2004). www.cochrane.org/resources/handbook/hbook.htm.
2. **van Dongen CJ, van den Belt AG, Prins MH, Lensing AW.** Fixed dose subcutaneous low molecular weight heparins versus adjusted dose unfractionated heparin for venous thromboembolism. Cochrane Database Syst Rev. 2004;(4):CD001100.

Review: Low molecular weight heparins (LMWH) versus unfractionated heparin (UFH) for venous thromboembolism
Comparison: 01 LMWH versus UFH
Outcome: 01 Incidence of recurrent venous thromboembolism at 3 months follow up

Study or sub-category	LMWH n/N	UFH n/N	RD (fixed) 95% CI	Weight %	RD (fixed) 95% CI
Finclik 2002	1/29	3/30		1.04	−0.07 [−0.19, 0.06]
Simonneau 1993	0/67	3/67		2.36	−0.04 [−0.10, 0.01]
Lopaciuk 1992	0/74	3/72		2.57	−0.04 [−0.09, 0.01]
Prandoni 1992	4/85	7/85		2.99	−0.04 [−0.11, 0.04]
Belcaro 1999	6/98	13/196		4.60	−0.01 [−0.06, 0.05]
Decousus 1998	10/195	12/205		7.03	−0.01 [−0.05, 0.04]
Koopman 1996	8/202	10/198		7.04	−0.01 [−0.05, 0.03]
Hull 1992	6/213	15/219		7.60	−0.04 [−0.08, 0.00]
Levine 1996	13/247	17/253		8.80	−0.01 [−0.06, 0.03]
Simonneau 1997	5/304	6/308		10.77	0.00 [−0.02, 0.02]
Breddin 2001	7/388	24/375		13.42	−0.05 [−0.07, −0.02]
Merli 2001	21/610	11/290		13.83	0.00 [−0.03, 0.02]
Columbus 1997	27/510	25/511		17.96	0.00 [−0.02, −0.03]
Total (95% CI)	3022	2809		100.00	−0.02 [−0.03, −0.01]

Total events: 108 (LMWH), 149 (UFH)
Test for heterogeneity: Chi² = 13.34, df = 12(P = 0.34), I² = 10.1%
Test for overall effect: Z = 2.93 (P = 0.003)

−0.5 −0.25 0 0.25 0.5
Favours treatment   Favours control

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