Number Needed to Treat (NNT)

Definition

The NNT is the number of patients who need to be treated in order to prevent one additional bad outcome. It is the inverse of the Absolute Risk Reduction (ARR).

How to Calculate NNTs

NNT = 1/ARR
ARR = |CER - EER|

where

CER = control group event rate
EER = experimental group event rate

Sample Calculation

Western Carolina University conducted a study of prehospital continuous positive airway pressure (CPAP) in the management of acute pulmonary edema. Death occurred in 23% of patients who received standard therapy (oxygen, lasix, nitroglycerine, morphine) compared with 5% of patients who received CPAP. The number of patients we need to treat with CPAP to prevent one additional death can be determined by calculating the absolute risk reduction as follows:

Note: Convert all percentages to their decimal equivalents.

ARR = |CER - EER| = |0.23 – 0.05| = 0.17
NNT = 1/ARR = 1/0.17 = 5.88 or 6

We therefore need to treat 6 pulmonary edema patients with CPAP in the field to prevent one death.

Number Needed to Harm

Definition

The **number needed to harm** (NNH) is an epidemiological measure that indicates how many patients would require a specific treatment to cause harm in one patient from a side effect or untoward event. It is defined as the inverse of the Absolute Risk Increase (ARI).

How to Calculate NNHs

Calculating NNH is similar to calculating NNT except that instead of using absolute risk reduction (ARR) we instead use absolute risk increase (ARI) because we are concerned about the increase in a side effect or untoward event.

NNT = 1/ARI
ARR = |CER - EER|

where

CER = control group event rate
EER = experimental group event rate

Sample Calculation

For example, the drug warfarin, which reduces the risk of ischemic stroke, increases the risk of gastrointestinal bleeds. Let's assume that 7.6% of patients taking warfarin for stroke prevention experience GI bleeding compared with 1.5% of patients who do not take warfarin.

ARI = |CER - EER| = |0.076 - 0.015| = 0.061
NNH = 1/ARI = 1/0.061 = 16

Therefore, for every 16 patients placed on chronic warfarin therapy we can expect one of them to develop GI bleed.

The NNH is an important measure in evidence-based medicine and helps clinicians decide whether it is prudent to proceed with a particular treatment. If a clinical endpoint is devastating enough without the drug (e.g. death, heart attack), drugs with a low NNH may still be indicated in particular situations if the number needed to treat, or NNT, (the converse for side-effects, or the drug's benefit) is less than the NNH.

Examples of Studies Reporting Number Needed to Treat

Cardiology

Condition or Disorder	Intervention vs. Control	Outcome	Follow-up Duration	Event Rates %		NNT (95% CI)
				CER	EER	
Acute myocardial infarction[1]	Angiotensin-converting enzyme (ACE) inhibitors **vs.** placebo	Mortality	30 days	7.6	7.1	210 (125 to 662)
Acute myocardial infarction[2]	Angiotensin-converting enzyme (ACE) inhibitors **vs.** placebo	Nonfatal heart failure	30 days	15.2	14.6	165 (111 to 488)
Cardiovascular events in treated hypertension[8]	Aspirin vs. placebo	Major cardiovascular events	3.8 years	3.9	3.4	176 (90 to 3115)
		Myocardial infarction (MI)		1.4	0.9	208 (127 to 551)
Chronic heart failure (CHF)[10]	Exercise vs. no exercise	Death	3.4 years	40.8	18	5 (3 to 21)
		All cardiac events		75.5	34	3 (2 to 5)
		Hospitalization for CHF		28.6	10	6 (3 to 32)
Patients resuscitated from ventricular arrhythmias; use of implantable cardioverter-defibrillators (ICD) in reducing mortality[17]	ICD vs. antiarrhythmic drug therapy	All-cause mortality	18 months	24	16	13 (8 to 30)

Neurology

Condition or Disorder	Intervention vs. Control	Outcome	Follow-up Duration	Event Rates %		NNT (95% CI)
				CER	EER	
Alcohol-related seizures[1]	Lorazepam vs. placebo	Occurrence of a second seizure	6 hours	24	3	5 (4 to 9)
Care for acute stroke victims[2]	Patients were allocated to a Stroke unit or to Ward care	Proportion of patients living at home	5 years	18.2	34.5	6 (4 to 21)
Acute stroke unit care[4]	Stroke unit vs. general ward care	Quality of life measured by the Frenchay Activity index ≥ 30 points	5 years	40.6		5 (2 to 80)
Non-disabling stroke; carotid endarterectomy[5]	Carotid endarterectomy vs. medical care	Ipsolateral stroke	5 years	18.7	13.1	18 (10 to 186)
		Any stroke		26.4	19.8	15 (8 to 100)
		Stroke or death		36.4	27.9	12 (7 to 44)
		Disabling stroke or death		20.1	14.9	19 (10 to 783)