WEEKLY EPIDEMIOLOGICAL REPORT

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Critical Appraisal (Part I)

This is the first in a series of two articles on Critical appraisal

Critical appraisal is the process of carefully and systematically examining research to judge its trustworthiness, its value and relevance in a particular context. It is an essential skill for evidence based medicine because it allows clinicians to find and use research evidence reliably and efficiently

It is essential that reliable information is available regarding what is harmful and what is beneficial when health care decisions are made. This information is generated using researches. Researches involve gathering data, then collating and analyzing it to produce meaningful information. However, not all research is good quality and many studies are biased and their results untrue. This can lead health care professionals to draw false conclusions. So, a health care professional should be able to decide whether a research has been done properly and that the information it reports is reliable and trustworthy or not. This is where critical appraisal helps.

If healthcare professionals are going to make the best decisions they need to be able to:

- Decide whether studies have been undertaken in a way that makes their findings reliable
- Make sense of the results
- Know what these results mean in the context of the decision they are making.

What makes studies reliable?

'Clinical tests have shown…'
Everyday we come across statements that try to influence our decisions and choices by claiming that research has demonstrated that something is useful or effective. Before we believe such claims, we need to be sure that the study was not undertaken in such a way that it was likely to produce the result observed regardless of the truth. Imagine for a moment that you are the maker of a beauty product and you want to advertise it by citing researches which suggest that it makes people look younger; for example, 'nine out of every ten women we asked agreed that the product makes their skin firmer and younger looking.'

You want to avoid making a claim that is not based on a study because this could backfire should it come to light. Which of the following two designs would you choose if you wanted to maximize the probability of getting the result you want?

- Ask women in shops who are buying the product whether they agree that it makes their skin firmer and younger looking?
- Ask a random sample of women to try the product and then comment on whether they agree that it made their skin firmer and younger looking?

Study A will tend to select women who are already likely to believe that the product works (otherwise they would not be parting with good money to buy it). This design thus increases the chance of a woman being surveyed agreeing with your statement. Such a study could find that nine out of ten women agreed with the statement even when study B shows that nine out of

Selection bias	Biased allocation to groups
Performance bias	Unequal provision of care apart from treatment under evaluation
Detection bias	Biased assessment of outcome
Attrition bias	Biased occurrence and handling of deviations from protocol and loss to follow up

Table 1. Key sources of bias in clinical trials

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ten women who try the product do not believe it helps. So, this study is biased (Bias can be defined as ' the systematic deviation of the results of a study from the truth because of the way it has been conducted, analyzed or reported'). Key sources of bias are shown in Table1

When critically appraising research, it is important to first look for biases in the study; that is, whether the findings of the study might be due to the way the study was designed and carried out, rather than reflecting the truth. It is also important to remember that no study is perfect and free from bias; it is therefore necessary to systematically check that the researchers have done all they can to minimise bias, and that any biases that might remain are not likely to be so large as to be able to account for the results observed. A study which is sufficiently free from bias is said to have internal validity.

Different types of questions require different study designs. There are many sorts of questions that research can address. They are Aetiology, Diagnosis, Prognosis, Harmful effect of a substance and Effectiveness. In addition, thay can address the Qualitative aspect also (i.e.what are the outcomes that are most important to patients with this condition?) Different questions require different study designs. To find out what living with a condition is like, a qualitative study that explores the subjective meanings and experiences is required. In contrast, a qualitative study relying only on the subjective beliefs of individuals could be misleading when trying to establish whether an intervention or treatment works. The best design for effectiveness studies is the randomised controlled trial (RCT), discussed below. A hierarchy of evidence exists, by which different methods of collecting evidence are graded as to their relative levels of validity.

A cross-sectional survey is a useful design to determine how frequent a particular condition is. However, when determining an accurate prognosis for someone diagnosed with, say, cancer, a cross sectional survey (that observes people who have the disease and describes their condition) can give a biased result. This is because by selecting people who are alive, a cross-sectional survey systematically selects a group with a better prognosis than average because it ignores those who have died. The design needed for a prognosis question is an inception cohort-A study that follows up a recently diagnosed patient and records what happens to them.

It is important to recognize that different questions require different study designs for critical appraisal; first, because you need to choose a paper with the right type of study design for the question that you are seeking to answer and, second, because different study designs are prone to different biases. Thus, when critically appraising a piece of research, it is important to first ask: did the researchers use the right sort of study design for their question? It is then necessary to check that the researchers tried to minimize the biases (that is, threats to internal validity) associated with any particular study design; these differ between studies. Simple critical appraisal checklists have been developed for the key study designs. These are not meant to replace considered thought and judgment when reading a paper but are for use as a guide and a memory aide.

The checklists cover three main areas: validity, results and clinical relevance. The validity questions vary according to the type of study being appraised, and provide a method to check that the biases to which that particular study design is prone have been minimized. (The first two questions of each checklist are screening questions. If it is not possible to answer 'yes' to these questions, the paper is unlikely to be helpful and, rather than read on, you should try and find a better paper.

Effectiveness studies

The fact that many illnesses tend to get better on their own is one of the challenges researchers face with when trying to establish whether a treatment – be it a drug, device or surgical procedure–is truly effective. If an intervention is tested by giving it to a patient (such an experiment is known as a trial),and it is shown that the patient improves, it is often unclear whether this is because the intervention worked or because the patient would have got better, anyway.

This is a well known problem when testing treatments and researchers avoid this bias by comparing how well patients perform with the intervention and how well patients perform without the intervention (a control group). Trials in which there is a comparison group which does not receive intervention being tested is known as controlled trials. It is important that the intervention and control groups are similar in all respects apart from receiving the treatment being tested. Otherwise we cannot be sure that any difference in outcome at the end is not due to pre-existing differences. If one group has a significantly different average age or social class make-up, this might be an explanation as to why that group did better or worse. Most of the validity questions on the checklist are concerned with whether the researchers have avoided those factors which are known to create differences between the groups.

The best method to create two groups that are similar in all important respects is by deciding entirely by chance into which group a patient will be assigned. This is known as randomization.

In true randomization, all patients have the same chance as each other of being placed into any of the groups. If researchers are able to predict which group the next patient enrolled into the trial will be in, it can influence their decision whether to enter the patient into the trial or not. This can subvert the randomization and produce two unequal groups. Thus, it is important that allocation is concealed from researchers. Sometimes even randomization can produce unequal groups, so the checklists ask whether baseline characteristics of the group were comparable or not.

Even when the groups are similar at the start, researchers need to ensure that they do not begin to differ for reasons other than the intervention. To prevent patients' expectations influence in the results they should be blinded, where possible, as to which treatment they are receiving; for example, by using a placebo. Blinding of staff also helps stop the groups being treated differently and blinding of researchers stops the groups having their outcomes assessed differently. It is also important to monitor the dropout rate, or treatment withdrawals, from the trial, as well as the number of patients lost to follow-up, to ensure that the composition of groups does not become different. In addition, patients should be analyzed in the group to which they were allocated even if they did not receive the treatment they were assigned to (intention-to-treat analysis).

These potential biases are the subject of the validity questions of the RCT checklist. In the other checklists, the validity questions cover the biases to which each individual study design is prone.

***Source**-What is critical Appraisal, available from www.medicine.ox.ac.uk/bandolier/.../what_is_critical_appraisal.pdf*

Compiled by Dr. Madhava Gunasekera of the Epidemiology Unit

to be continued

Table 1: Vaccine-preventable Diseases & AFP

03th – 09th November 2012 (45thWeek)

Disease	No. of Cases by Province									Number of cases during current week in 2012	Number of cases during same week in 2011	Total number of cases to date in 2012	Total number of cases to date in 2011	Difference between the number of cases to date in 2012 & 2011
	W	C	S	N	E	NW	NC	U	Sab					
Acute Flaccid Paralysis	00	00	00	00	00	00	00	01	00	01	00	68	74	- 08.1 %
Diphtheria	00	00	00	00	00	00	00	00	00	-	-	-	-	-
Measles	00	01	00	00	00	01	00	00	00	01	00	59	87	- 32.2 %
Tetanus	01	00	01	00	00	00	00	00	00	01	00	12	21	- 42.9 %
Whooping Cough	00	00	00	00	00	01	00	00	00	01	00	92	36	+ 155.6 %
Tuberculosis	110	07	42	00	03	15	05	08	35	226	326	7711	8877	- 13.1 %

Table 2: Newly Introduced Notifiable Disease

03th – 09th November 2012 (45thWeek)

Disease	No. of Cases by Province									Number of cases during current week in 2012	Number of cases during same week in 2011	Total number of cases to date in 2012	Total number of cases to date in 2011	Difference between the number of cases to date in 2012 & 2011
	W	C	S	N	E	NW	NC	U	Sab					
Chickenpox	01	06	13	03	05	11	04	04	06	53	16	3940	3701	+ 06.5 %
Meningitis	04 GM=2 KL=4	02 KD=2	03 HB=1 GL=2	00	01 AM=1	02 KN=2	03 AP=3	01 BD=1	01 RP=1	17	07	730	763	- 04.3 %
Mumps	00	05	02	02	01	05	02	00	04	21	20	4021	2820	+ 42.6 %
Leishmaniasis	00	01 ML=1	02 GL=1 MT=1	02 MU=1 VU=1	00	00	07 AP=4 PO=3	00	00	12	12	998	707	+ 41.2 %

Key to Table 1 & 2

Provinces: **W**: Western, **C**: Central, **S**: Southern, **N**: North, **E**: East, **NC**: North Central, **NW**: North Western, **U**: Uva, **Sab**: Sabaragamuwa.

DPDHS Divisions: **CB**: Colombo, **GM**: Gampaha, **KL**: Kalutara, **KD**: Kandy, **ML**: Matale, **NE**: Nuwara Eliya, **GL**: Galle, **HB**: Hambantota, **MT**: Matara, **JF**: Jaffna, **KN**: Killinochchi, **MN**: Mannar, **VA**: Vavuniya, **MU**: Mullaitivu, **BT**: Batticaloa, **AM**: Ampara, **TR**: Trincomalee, **KM**: Kalmunai, **KR**: Kurunegala, **PU**: Puttalam, **AP**: Anuradhapura, **PO**: Polonnaruwa, **BD**: Badulla, **MO**: Moneragala, **RP**: Ratnapura, **KG**: Kegalle.

Data Sources:

Weekly Return of Communicable Diseases: Diphtheria, Measles, Tetanus, Whooping Cough, Chickenpox, Meningitis, Mumps.

Special Surveillance: Acute Flaccid Paralysis.

Leishmaniasis is notifiable only after the General Circular No: 02/102/2008 issued on 23 September 2008.

Dengue Prevention and Control Health Messages

Reduce, Reuse or Recycle the plastic and polythene collected in your home and help to minimize dengue mosquito breeding.

Table 4: Selected notifiable diseases reported by Medical Officers of Health

03th – 09th November 2012 (45thWeek)

DPDHS Division	Dengue Fever / DHF*		Dysentery		Encephalitis		Enteric Fever		Food Poisoning		Leptospirosis		Typhus Fever		Viral Hepatitis		Human Rabies		Returns Received
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	%
Colombo	0	8457	0	133	0	8	0	198	0	46	0	174	0	6	0	105	0	5	**0**
Gampaha	128	6998	1	80	1	16	2	58	0	43	8	263	0	21	3	301	0	0	**73**
Kalutara	45	2525	1	99	0	5	1	46	0	28	8	251	0	4	1	33	0	2	**54**
Kandy	25	2221	1	114	0	4	1	25	0	56	3	71	1	112	4	112	0	0	**83**
Matale	5	495	4	87	0	5	0	12	0	49	0	40	0	3	0	33	0	0	**75**
Nuwara	5	308	5	177	0	3	0	26	0	8	1	33	2	62	0	18	0	1	**85**
Galle	17	1407	2	119	0	6	1	18	0	17	5	121	0	66	0	4	0	0	**84**
Hambantota	9	542	0	41	0	3	0	8	0	30	2	70	1	54	0	23	0	0	**83**
Matara	47	1663	2	82	0	8	0	19	0	28	11	177	1	76	4	133	0	0	**100**
Jaffna	17	547	9	198	0	14	2	326	0	82	0	2	0	257	0	18	0	1	**75**
Kilinochchi	0	81	0	36	0	2	0	33	0	45	0	4	0	31	0	4	0	1	**25**
Mannar	5	140	3	73	0	4	7	56	0	17	1	24	0	42	0	2	0	0	**60**
Vavuniya	0	84	1	39	0	21	0	12	0	20	0	18	0	3	0	1	0	0	**75**
Mullaitivu	1	24	0	22	0	1	1	13	0	30	0	3	0	5	0	1	0	0	**40**
Batticaloa	5	643	3	255	0	3	0	16	0	307	0	8	0	0	1	9	0	4	**71**
Ampara	2	136	1	87	0	3	0	6	0	13	0	27	0	0	0	3	0	0	**43**
Trincomalee	3	142	8	211	0	2	0	16	0	15	0	38	0	18	0	4	0	0	**58**
Kurunegala	57	2568	4	189	1	17	1	95	1	41	0	137	1	33	0	130	0	4	**81**
Puttalam	16	1336	1	96	1	9	0	12	0	12	0	40	0	16	0	6	0	2	**42**
Anuradhapu	4	346	1	84	0	7	0	13	0	21	0	78	1	24	0	58	0	1	**53**
Polonnaruw	3	223	2	70	0	2	0	4	0	121	1	47	0	3	1	42	0	1	**57**
Badulla	2	335	2	115	0	4	0	50	3	9	0	36	0	115	0	43	0	0	**65**
Monaragala	1	246	1	60	0	6	0	26	0	6	0	64	2	79	1	170	0	2	**73**
Ratnapura	33	3614	12	248	0	25	1	49	0	12	4	282	1	40	2	116	0	2	**67**
Kegalle	15	2426	0	56	0	9	0	25	2	16	2	163	0	61	2	542	0	0	**82**
Kalmune	0	202	4	265	0	2	0	8	0	89	0	9	0	1	0	10	0	3	**31**
SRI LANKA	**445**	**37709**	**68**	**3036**	**03**	**189**	**17**	**1170**	**06**	**1134**	**46**	**2180**	**13**	**1134**	**18**	**1921**	**00**	**29**	**66**

Source: Weekly Returns of Communicable Diseases WRCD).
***Dengue Fever / DHF** refers to Dengue Fever / Dengue Haemorrhagic Fever.
****Timely** refers to returns received on or before 09th November , 2012 Total number of reporting units 329. Number of reporting units data provided for the current week: 222
A = Cases reported during the current week. **B** = Cumulative cases for the year.

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