*Public Health lecture#9 notes:*

While practicing dentistry, you’ll encounter so many companies trying to sell you different types of products and information, you should always be able to identify if its evidence based or not. So, what we are going to discuss in this lecture is how to look at evidence and decide if this evidence is enough for you to incorporate that item into your practice or not.

Source of information is very important. Sadly, our community highly depends on RANDOM PEOPLE’s opinion about dentists and information in general. Another part of the community depends on information taken from non-scientific resources.

Any scientific paper should always include an **‘Introduction’**, for example if you’re launching a new filling material you should talk about old filling materials and then mention why this one is better.

You need **“Materials and methods’, “Results”,” Discussion” and “Conclusion”.**

So, we talked about ‘introduction”; what was done about the subject before, what previous researches have done, you should discuss why you brought up this subject and clearly state your goals and objectives. You’ll be surprised that a lot of people fail to achieve that in their papers.

-What is a null hypothesis? What is it based on?

Null hypothesis is based on the fact that “the difference between two things is ***not due to chance***”. Null hypothesis always states that there’s no difference between A and B.

Any study that is going to involve humans and in some areas animals needs an **ethical approval.** Nowadays, ethical approval is much stricter than the past, you can NOT get norms for any country today.

**Materials and Subjects**, everything done and anything used during the study must be explained specifically; the reader should be able to replicate the work done based on what he read. It should be transparent and clear nothing should be hidden.

One the biggest issues we have is *sample selection* and *power calculation.*

-Sample Selection is how did you pick the sample?

-Representative means that you have to specify the area you’re working on, for example you want to make study on the Jordanian population it should include people from all around Jordan while if your study was concerned of people in Amman then it should include people from Amman to be representative.

-Now the number you pick is based on the primary population you have. For ex if your population is 1000000 10% would not be accessible thus you go for a lesser percentage let’s say 1% and so on.

-Power Calculation. What do we mean by *statistically significant but no clinically significant*? This happens when the sample is very small. Any study that has a subgroup of less than 20 is prone to be statistically significant while insignificant clinically. The minimum number you need for a t-test which is the most basic statistical test is 20 (subgroups). So how can we omit it? By *Power Calculation* that is setting up a number based on my experience as a clinician (we don’t need to know how its calculated), so we answer the question of how much do you think the clinical significance difference is and according to it I select my sample size. What we do is we divide the clinical significance difference that we picked on the standard deviation of the study sample and we get what is called the standardized difference and accordingly I pick the power that I need. If it was 100% power means that 100% of the time I’ll be right. In Clinical studies, around 80% power is the standard anything less than that is questionable. So, we have to check is the number taken sufficient? Did he do the power calculation or not? And is the power high enough.

As we said, the sample must be representative (we can’t claim that a sample is representative if all the patients we examined were admitted to the JU hospital), random, must have an inclusion and exclusion criteria (such as excluding patients who had braces previously or those with facial deformities, patient with cleft palates etc.).

 If we are comparing groups, they must be matched; we can’t compare a group of 15 year old males with a group of females unless this is the aim of our study. If we want to compare the quality of treatment, all other factors must be predetermined and controlled (class I restorations under rubber dam using the same technique on the same tooth).

Research must be controlled! What does this mean?

 A control group must not receive treatment (Placebo or treatment using drug we are comparing against).

 One of the things in orthodontic treatment that fits this example is the use of functional appliances, for so long it was believed that they could treat a class II patient. All the studies regarding this subject were done only on patients that received treatment, i.e. no control group was present. However when research was done and compared with a control group that did not receive treatment, the result was that there is no difference (skeletal) whilst it was believed that they resulted in mandibular growth and restriction of the maxilla. They do however result in movement of teeth (Retroclining upper incisors and Proclining lower incisors).

**Methods**: Describe things in detail, which gives us the ability to replicate the study.

**Results**: If we see a paper with a results table that has 20 columns and rows, know that its results are useless (the writer is trying to find results out of nothing). The best thing is to have a few variables (7x7 table is the ideal), you’ll lose people’s attention if you add more.

This should address the objectives and the hypothesis. (A paper aimed to compare strength of fillings should not be talking about the esthetics in the result)

The conclusion should not be different from the objectives.

Results should be concise to the point (brief but comprehensive)

 We need to carry out certain statistical tests as well. There is a multitude of tests and we as dentists won’t know them all. We can’t start collecting data before knowing which test we want to carry out, we may consult someone before starting the study to make sure our methods are correct.

E.g. We are trying to find the micro-leakage and classify it as “Good, Fair, Poor” or on a scale from 1 – 10, these are subjective assessments and we have to be very careful about the type of data we have and the statistical test we will use.

 Interactions between variables: analysis should be as simple as possible. If the statistics are complicated, know that they are digging and trying to find a relation. In many studies, the interaction is determined while ignoring that something else might be going on. Micro-leakage may be influenced by your diet, by how much acid you are ingesting (The Dr is just making this up for the sake of the example, what he is trying to say is that other factors may influence our variables and they should not be ignored)

**Discussion**: In any paper, the discussion is the only section in which the authors may state their opinion regardless of the facts, the rest is only facts and science. In the discussion, we mainly compare the results our study to other studies. Like we said, this is the only section where you may elaborate on why you think there may be a difference.

**Conclusion**: What is the end result, e.g. drug A is better than drug B. And this is the take home message, this is what everyone looks for, this is what all the pages of the study in the end lead to. Of course this has to be related to the objectives.

The different types of studies have some sort of hierarchy, with the top being the most evidence based while those at the bottom having the least evidence.

 Descriptive or observational studies do have a place in science, all our conclusions came from observation (newton and his apple) and this is always the beginning of any science or project (noticing that amalgam always fractures in a particular scenario). This then takes us to the next step which is cross-sectional studies (researching something at a single point in time). Longitudinal is over time (placing a filling and seeing how long it’ll survive). After that we’ll start with reviews. A traditional review is going online to websites such as PubMed, looking at papers regarding a certain subject and reviewing them. A systematic review is one in which we have a criteria for the studies we are going assess (E.g. micro-leakage studies which were Random Control trials with a random sample and longitudinal and these are all determined before we start the study). A traditional review has no criteria and assess all papers regarding a certain subject. A systematic review only assesses studies with high evidence. After that comes meta-analysis. Finally comes the Cochrane collaboration; this is where we get the highest level of evidence for anything. We can access all reviews regarding a subject, even a lay person can understand it since it is written in both plain language and in details.



Hierarchy: case report 🡪 case series 🡪 retrospective 🡪 prospective 🡪RCT etc.

RCT: randomized controlled trial, E.g. for functional appliances, and RCT was carried out that brought patients who are of a certain age, similar overjet, and they were divided into 2 groups, one received functional appliances the other received no treatment.

**Common mistakes**: result in the rejection of a paper.

 - Introduction too long

 - Objectives not stated (null hypothesis should be stated somewhere, the best thing to do is to state it directly)

 - Ethical approval

 - Target sample not clearly defined (or not representative)

 - Methods not clearly described

 - Use of statistical analysis not suiting the results (not immediate rejection)

 - Results too long

 - Results not clinically significant (this may actually be useful)

 - Conclusion not clear

We don’t reject the paper for all those, some we may simply ask the writer to redo them. Using the wrong tests (parametric for non-parametric data) will need redoing (we can’t use tests for measurable data with subjective data).