Economics of Health and Healthcare
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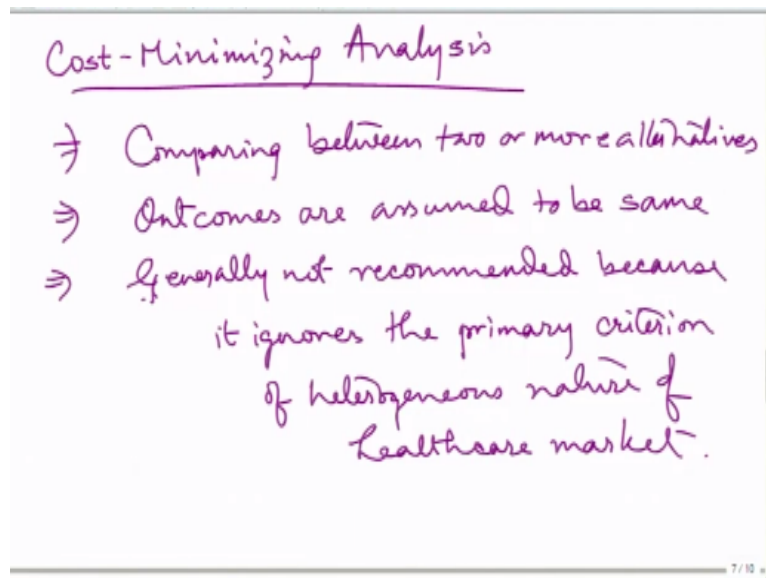**Department of Management, Amirtha Vishwa Vidyapeetham, Bangalore**

Lecture – 37
Cost Minimization Analysis and Cost Effectiveness Analysis

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So, now let us you know learn what is cost minimization analysis, as I said the objective is minimize cost here more than maximize output because the effectiveness is similar you know, and you we learnt here, we learnt here that this is yes that is you know, we have a good evidence of effectiveness and then we do cost minimization analysis when we have this question yes as well.

That means, our effectiveness of interventions are equal, so which primarily says that over here my objective is not output maximization, my objective is basically, cost minimization and that is why it is known as cost minimizing analysis yes, so the first thing is that we are comparing between 2 or more alternatives always similar, always same between 2 or more alternatives, uniform for all these you know techniques.

Next is you know, outcomes are assumed to be same, they may differ but we are assume assuming that economics is assumption yeah, so outcomes are assumed to be same, third is you know generally, not recommended because it ignores the primary criteria of heterogeneous

nature of healthcare; market; healthcare market yeah, so this is about cost minimization analysis and we really do not, we really do not recommend cost minimization analysis.

If and only if you know it is like say, I am taking paracetamol, right and then I take Crocin, I take Calpol or I take Dolo 650, they are all together same, Dolo 650 maybe not but yeah, these things or Combiflam, maybe so, if the compositions are more or less similar or I apply Moov, I apply Volini gel, I apply some other you know, whatever these things are so and if my fever in the first example comes down in 3 days over here my you know, muscle spasm gets relaxed in 3 days, so the effectiveness is similar.
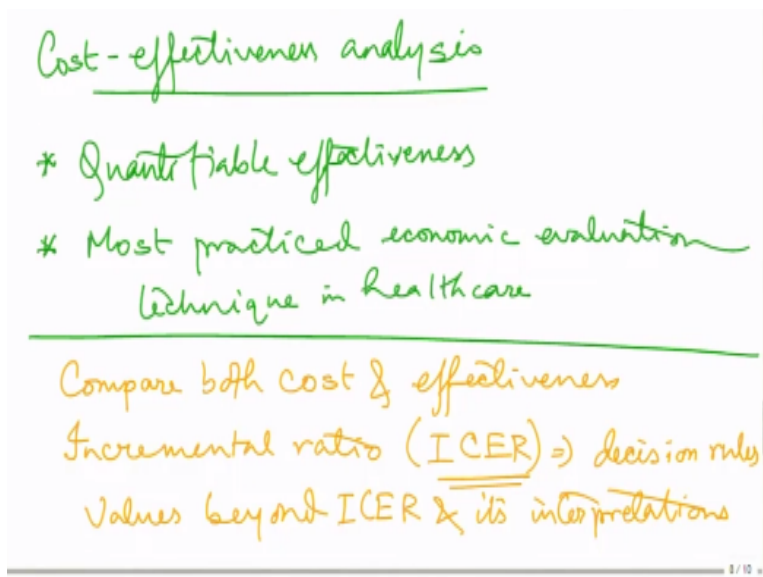
And then, it is straight away I just ask that which cost so much and eventually, we will find that the prices are very, very close to each other, they do not really differ by a large margin, you know if they are very, very one, if one pain bomb is 70, the other one is 72, maximum, yeah or 75 that is all, so there is not much of price advantage either that is primarily because they also accept the effectiveness you know are similar so or close to similar.

Even though they can say that we have these, we have that and we are advanced and we you know so eventually, it is nothing like that and that probably can be the best example of cost minimization analysis which we practice it in our day to day life, whenever we go to a medicine shop and then maybe if I do not have close idea about or I do not have a predetermined preference about a particular drug or a particular process, then probably I generally do a you know cost minimization analysis.

Or if I just need to get a polio drop to my child and I missed those dates, if I go to a; I need to go to a doctor you know, just giving a polio drop which is 100 rupees if I go to A hospital, 100 rupees I go to B or 100 rupees if I go to C or maybe they do not take anything but at the same time, even if they are giving it free of cost the doctor has to be paid right and in some you know, top tertiary hospital, if I go they may charge 700 rupees that is; that is the rate in Bangalore, 700, 800 rupees.

If I go to a general small time nursing home, it is 300 rupees, I go to a small clinic it can be even less, so it really and then you decide that okay, I do not really want to go to those tertiary care hospitals because why should I pay just for you know for this polio drop which for my mistake I missed those days, so you know I do not want to really pay that much. Anyways, so the next comes cost effectiveness analysis.

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Cost-effectiveness analysis

* Quantifiable effectiveness
* Most practiced economic evaluation technique in healthcare

Compare both cost & effectiveness
Incremental ratio (ICER) ⇒ decision rules
Values beyond ICER & its interpretations

So, what we do here; we first have an idea about the outcome, next the outcomes are not similar to each other but at the same time, the outcomes are close and common, the outcomes are not same you know, the effectiveness are not same, the effectiveness varies but the outcome is measured under the same unit yeah, so and then these outcomes can be the level of haemoglobin you know or kind of glucose level, my blood pressure.

These are the basic parameters right of our health and then my I do not contain calcium and all these things, if I take some treatment to improve all these conditions, so and these are the easy measures right and you can eventually measure it based on the disease adjusted life years that how many you know years you have basically, lost or lived with morbidities or with disease so these are and then the lesser is that the more is the effectiveness.

So, we can estimate it in some quantifiable techniques and which are uniform you know, across all these effective; all these alternative techniques therefore, so when we do these cost effectiveness analysis both of; of course, cost is an numeric figure but the effectiveness must have; have to be a numeric figure, they have to be quantifiable and the cost effective analysis.

So, quantifiable effectiveness in fact the, you know the measles can also be quantifiable such as that if not in terms of cost that the hours of exercises, the kind of food intake or the total calorie intake, right so and then you can again monetarily estimate the cost as well, so and then the, I forgot to tell you in basically, in cost effect, I mean in economic evaluation all these techniques are can be estimated in terms of cost, while we measure the cost it should include both the direct cost as well as indirect cost.

And when we include the direct cost and indirect cost when we learned about our cost mechanism, it should include all the parameters you know and it of course, have you know comes with a challenge but still to understand the best impact of the cost effectiveness analysis or a cost benefit analysis, it is important that we have a clear idea about the cost eventually, you know for certain techniques say for a cost benefit analysis which mean ask for a social cost or and a social benefit yeah.

So because that in our previous lecture say, we, we learned that the that external benefit and external cost is very, very important and if we do not really adjust for that and if we do not really get an idea about that then we are moving of course, towards this market imperfection and then inefficient output, inefficient output yeah, so having said that this, this you know cost effectiveness analysis is basically the most practiced one; most practiced economic evaluation technique in healthcare.

And most suitable yeah, it is most suitable as well I do not have to mention, so what we primarily do in cost effectiveness analysis that we bring and compare you know, we compare cost and effectiveness, compare both cost and effectiveness in a same common platform, in a same common platform yeah, the second thing how we is compare the cost and effectiveness, we measure it in terms of that incremental ratios.

Yeah, so this is, this is also known as incremental cost effectiveness ratio and which sets my decision rule that you know based on this incremental cost effectiveness ratio, I will take my decision that whether I will adapt a particular technique or I would not or whether a particular cost effectiveness study says that this particular process is good enough and this particular process if I move from one process to another process; process A to process B, maybe the improvement is not really high in really convincing.

So, we do a cost incremental cost effectiveness ratio and then we try to understand the what is beyond the ICER, you know or I will say values beyond ICER and its implications or interpretations yes, so when we do a cost effectiveness analysis, we basically, we basically follow a framework, the first one is state objectives and perspective that is the constraint the scenario like the situation analysis.

You have to set your objective doing a situation analysis otherwise maybe you are setting your objectives wrong and maybe your research question is also wrong, your hypothesis does not really match with your current scenario or the future scenario what you are certainly going to meet.
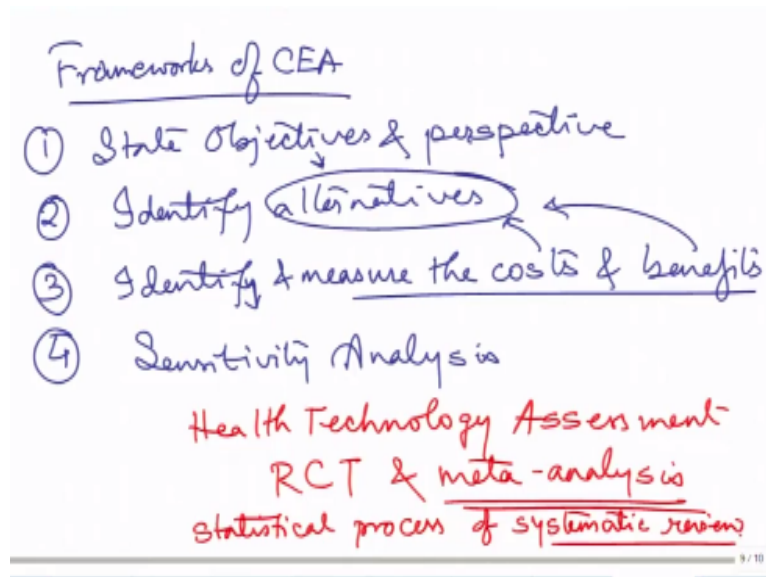
So, while we are talking about the frameworks of cost effectiveness analysis, the first thing is state objectives and perspective right, the second one is identifying the alternatives, right that is what we are going to do based on a particular objective because otherwise, I may have 1000's of alternatives but I have to find these alternatives which will be coming from the object is my objective and they all are related you know, healthcare is very related.

So, my objective is maybe by the improvement of my mobility but then then that improvement of mobility can be treated by an orthopaedic surgeon, can be treated by a you know neurologists, can be treated by a physiotherapist, so there are several and within a particular stream, within neurology, within orthopaedic, so there are several processes, right so all these are my, you know alternatives.

But looking at the objective that whether it is a neurological problem or whether it is the orthopaedic problem, my broad objective may be with a movement but then we do the perspective analysis that we need to understand that which are the logical alternatives because we would not probably studying all the alternatives and then making life cumbersome, we would not be doing that.

So, identify the alternatives and then, the third is identify and measure the cost and benefits, right and this costs and benefits are all these you know, sensible alternatives which we will be studying finally, the fourth one is after measuring the costs and benefits, we will be doing a sensitivity analysis, what is sensitivity analysis? Sensitivity analysis gives you a kind of confirmation about a relationship between the dependent variables as well as the independent variables.

There can be a set of dependent variables and a set of independent variables and one particular you know model you know with one dependent variable and a set of independent variable for a given population, the result can be very, very different from the result of the same model or you know worked out on a; worked on a different population and if you know, we do a meta-analysis or a systematic review on a particular subject.

We see that these kinds of effective cost-effectiveness analysis or economic impact evaluation studies or health technology assessment studies, I will just write you the name you know, health technology assessment studies, this is a similar thing, yeah and all these studies have found very varying examples outcomes yeah and then it is very difficult to come to a common understanding or come to come to an understanding that which is an average effectiveness or which is an expected one.

So and that is where we do, we collect the data through these meta-analysis either randomized control trials or meta-analysis, this is you know our systematic review, it is a; this is a statistical this thing, process of systematic review, highly practiced in medicine sciences because the effectiveness are so, so widely varying, so and then just looking at a literature it is difficult to take a decision that oh, my God this literature says that so I expect this.

No, it does not really happen like that as far as this clinical studies, medical studies are concerned okay, so I will just wipe this of or probably I could keep it anyways.

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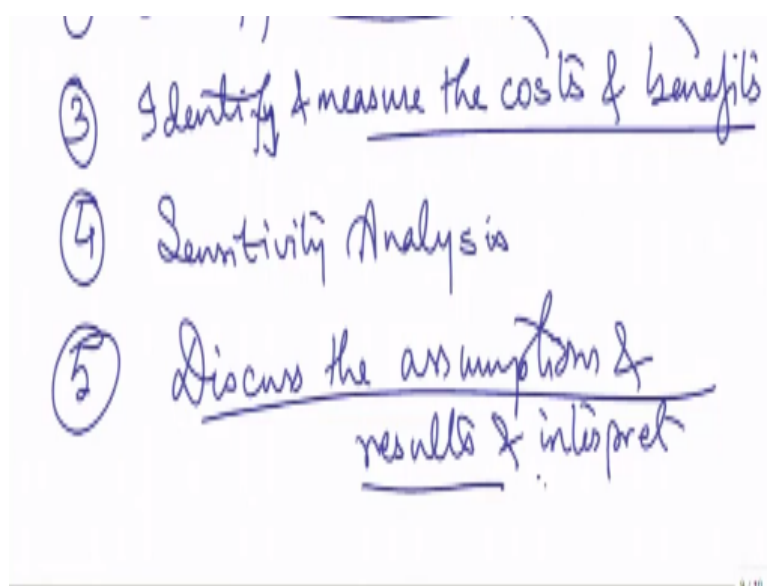
So, then the next is to contribute the flow that after we do a sensitivity analysis, we come to a consensus, we have an idea about you know kind of confirmed or confirmed or kind of

convincing outcome or the relationship pattern and then the last one is; discuss the assumptions and results and interpret, right, discuss the assumptions and results and finally interpret that you have drawn few several assumptions right.

You have probably not taking all the variables, you have not probably considered the you know, the difference of effectiveness in that way which used to be or which is generally, like that and now to simplify your problem because operations is probably it is a kind of a population resist problem in an operation research problem, we try to simplify our problem you know general problem was story; boil down to a simple mathematical formula.

So, this is in terms of the framework of you know, cost effectiveness analysis, now this as I say that the cost effectiveness analysis we measure in terms of incremental cost effectiveness ratio right.

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Incremental cost effectiveness ratio, again, as the name sized incremental means that marginal changes, changes right that if one unit of something changes, how much the dependent factors change right, so over here incremental cost effectiveness ratio again cost and then effectiveness, so it is like, I we can call it as, ICER, it is delta C/ delta E, so Delta C is change in cost, a percentage change in cost whatever, change in effectiveness.

So, to bring one unit change in effectiveness, how much cost I am incurring; to bring one unit change in effectiveness, how much cost I am incurring and based on this ratio, I will set my decision rules that whether I consider a particular improvement or change in you know, to get one unit more effectiveness, if my cost increases say by 5 rupees, I say oh, it is not that you know maybe it is not that much, so I can continue.

You know, it probably says that if I can bring this effectiveness, it has a; at a long run, it has a high you know, longer benefit or larger benefit, so maybe and for that 5 rupees, I would not let go that benefit. At the same time, if again one unit effectiveness increment will charge me this for the same one unit but a different process, costs me 15 rupees more, then I will say no, I am not going to get that.

So this this incremental cost effectiveness ratio gives me, based on that I will set my decision rules and my decision rule will may vary from others yeah and that that depends upon the budgets and everything, managerial aspects but at the same time and the you know these ratios for a particular treatment process or a particular treatment, particular objective will be very, very different from another objective, right.

So, it varies from objective; objective to objective from the you know, research setting to research setting, so we cannot really standardized the decision rules for a particular process and these all processes are independent programs and we really do not take decisions based on the averages, averages you know or average cost effectiveness right, this is simple C / E, so and we do not take decisions based on that based on C/ E, average cost effectiveness ratio yeah.

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So, therefore say, if I have an example like A, B, C and D and then I have cost of a screening test here, anything screening; the screening test and my effectiveness , cost and effect basically yeah and then my cost, if say this is 100, this is 20, this is 200, this is 35, this is 500, this is maybe 76, this is 800, this is something close to 157 and then I can measure as C/ E right which is 100/20, 200/35 and so on.

But we would not measure based on this, we will estimate a cost effectiveness, so the first one will be blank, the second one of course is you know kind of cost, so change in cost is 100 rupees by the changing effectiveness is 15, so this is my cost effectiveness ratio and for each I will have a cost effectiveness ratio that you know say from this minus this and then this minus this and that is my cost effectiveness ratio.

And based on these values cost effectiveness ratio or marginal you know that is the marginal impact I will take the decisions but not on this yes, so remember that. So and if and this, this these are these are this ICER based on which we take the decision rules.

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And if we want to plot you know, this decision rules technique on, on a 4 quadrant diagram then it should be like, over here my new treatment is effective, more effective, new treatment less effective, new treatment less costly, new treatment more costly, so if I am on this quadrant, any point on this quadrant you know, there will be new treatment is more costly and more effective, so it is a win-win scenario right.

Here, so it is; sorry, it is a you know win-loss scenario because here, your treatment is becoming more effective but the cost is increasing right, so you are you do not really take a decision yes or you, you; it is not easy to take a decision, over here new treatment dominates because if this is the starting point or this is the you know the current technique, current process so and I am you know, comparing this 0, 0 that is the origin from 0, 0, I am trying to estimate that which one.

So, over here if I move, I get any point and these all points over here gives me this incremental cost effectiveness ratio, they will give me an ICER and then, if I can estimate them, then over

here on this quadrant, on this quadrant we can see that my new treatment is more effective but that cost is also coming down yeah, so the treatment is more effective cost is coming down, so it is a win-win scenario.

And you will, you know certainly close your eyes and will go for this new treatment, so the new treatment dominates whereas, over here you know again that catch is the new treatment is less costly, so a positive over here but the most important thing is that it is less effective yes, so I understand that it is less effective but I shall I go for the lower the cost you know that given the condition that it is less effective, so I need to decide on that.

Over here old treatment dominates because for the new treatment not only my new treatment is less effective but the cost is also high, why should I take that I will stay here right, so on any these; of these points over here, on any of these points, I will never take this decision that is primarily because it is not only cost; more costly but my effectiveness is also going down, so I will stick to my old you know, a process or old decision.

Therefore, we; what we do; we draw a line through this point, yes and this gives my maximum ICER, incremental cost effectiveness ratio yes, anything more than that anything beyond this, I would choose, right, I will stick to the old treatment, so any value more than this that will show me that say, the point here, it will give me the new treatment is more effective I mean, more costly but less effective as compared to this or as compared to this.

Or this is you know, even if the effectiveness is similar, if I compare this point and this point, the effectiveness is similar but the cost is more right, so any point beyond this line, I will not choose. Similarly, over here say, a point over here, what is happening; so the treatment is less effective, even if the you know, cost is low, so shall I go to that extent that I understand that the cost is low but I go for a lesser effectiveness that I understand that you know homeopathy is lesser effective but I will go with that.

Because the cost is low because I cannot afford but how far, I may take that decision that that can be a part of my rational decision making but how far because after a certain while nobody wants to compromise on their health or you know if there is everything you know, ceteris paribus, everything given that the quality is there, the affordability, the accessibility is there, still people may choose that okay, even if it is a less effectiveness but I will go for less costly.

Because it really does not you know, it is not a very serious concern for me or I will just sit back at home and then who will take this antibiotic and all this yeah, so again over here the catch is you know, the cost may be lower but at the same time, you are compromising on the

quality but with the lowering cost, you will not lower your effectiveness by a large margin, so you will remain somewhere here, right.

So, you will or your decision rules will be taken by any points, which will be on this right hand side, on the right hand side and these decisions will be given by ICER, which is delta cost/ delta effectiveness and should be < lambda or <= lambda or this line yeah, either you take that or not so, <= lambda, so lambda is that that ICER value, maximum ICER value, this is the lambda, this value, yes.

So, we will stop here and then next class, we will discuss about cost utility analysis; the DALY, QALY and cost benefit analysis, thank you very much.