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The study of Pharmacoeconomics analysis on anti-tuberculosis drugs Rifampicin & Ethambutol

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ABSTRACT

Cost-benefit analysis can be used to quantify the value of clinical pharmacy services. Providing Effective Therapy and Minimum cost, Quantify costs of care, Quantify outcomes, Assess whether and by how much average costs and outcomes differ among treatment groups, Compare magnitude of difference in costs and outcomes and evaluate “value for costs” by reporting a cost-effectiveness ratio, net monetary benefit, or probability that ratio is acceptable – Potential hypothesis: Cost per quality-adjusted life year saved significantly less than Rs.75,000, To Perform sensitivity analysis. For providing good effective therapy with less adverse drug reaction at affordable price, Cost-Identification, Cost-Effectiveness Analysis, Cost-Utility Analysis, Cost-Benefit Analysis, Clinical outcomes: Cure, comfort and survival, Humanistic outcomes: Physical, emotional, social function, role performance, Economic outcomes, Economic Evaluation, Cost of Illness Evaluation (COI), Cost Benefit Analysis (CBA), Cost Minimization Analysis, Cost Effective Analysis: Cost Utility Analysis.

Keywords: Pharmacoeconomics; TB drugs: Anti-tuberculosis; clinical pharmacy; COI; CBA.

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INTRODUCTION

A Pharmacoeconomics study evaluates the cost and effects (expressed in terms of monetary value, effectiveness, efficacy or enhanced quality of life) of a pharmaceutical product.^[1] It identifies, measures, and compares the costs and consequences of drug therapy to healthcare systems and society. Pharmacoeconomics research in the managed care consolidation to diversification. Health Economics, as a

branch of economics is itself relatively young^[3]. Basically the pharmacoeconomics is needful in following manner;

- In Industry: Deciding among specific research and development alternatives.
- In Government: Determining program benefits and prices paid.
- In Private Sector: Designing insurance benefit coverage.

The direct medical costs contain the hospitalization, outpatient visits (to primary care providers and to specialists), procedures and tests (blood analysis, ultrasound scans, surgical interventions), medical devices, home care, nursing care and medications. The direct nonmedical costs comprise the transportations, nonmedical services (home helper, meals on wheels, social assistance), devices and investments or the informal

care. The indirect costs are mostly mean the sick leave or absences, reduced productivity at work, early retirement due to illness and the premature death^[13].

Cost-minimization analysis (CMA)

Cost-minimization or cost-identification is an analytical process used in pharmacoeconomics to examine the cost of drug treatment when the clinical effectiveness of the alternative therapies is identical.

Cost-effectiveness (CEA) and cost-utility analysis (CUA)

The professional literature distinguishes two analysis methods, where the costs and the utilities or benefits – opposite to the cost-benefit analysis – measured in different units: these are the cost-effectiveness (CEA) and the cost-utility analysis (CUA). As long as at the former method the outcomes are measured in some clinical characteristics, at the CUA the outcomes are expressed in special units, in quality adjusted life years (QALY), while the costs are calculated in monetary units. According to Wonderling^[28] cost-effectiveness analysis (CEA) is an economical or management tool for evaluating which therapy are the most cost-effective, so how to achieve greater effect next to unchanged expenditures or lower costs next to unchanged effects. The expansion in use of economic evaluation by health agencies has mirrored the growing recognition of the usefulness of health-related quality of life (HrQoL) as an important indicator of outcome of disease treatment among clinicians and patients^[21].

Like the CMA in micro level the application of CEA could show in the following example: there are four therapies, which treated the same type of disease (providing the comparability of their costs) and the effects are measured in quality of life generally.

Cost-benefit analysis (CBA)

According to David^[71] the cost-benefit analysis is a technique that is used to determine options that provide the best approach for the adoption and practice in terms of benefits in labour, time and cost savings. Like the CEA and CUA, the CBA also compare the costs and the benefits but those are expressed in the same monetary units – as the health project forming part of government policy may take several years, so in the CBA the time value of money take part too. The common basis can provide the comparability: this is the net present value^[32]. Cost-benefit analysis, which used by institutions those operate the total health system, can influence a health policy of government so this analysis used rather in macro level. Therefore, the applied discount rate we should assume that the examined health projects are occurred in the same interest rate environment and because of the dependence of method from the net present value – so from the time value of money – the duration of projects should also be identical.

Consequences^[38-42]

According to our current knowledge there are three different analysis methods used in the health economy: the cost- minimization, the cost-effectiveness – inside of this the cost-utility – and the cost-benefit analysis. Application of all three methods has difficulty because of the effects or benefits of therapies or health projects are estimated hardly. Therefore, it can determine that these methods apply effectively when

the compared therapies treated the same type of diseases, the main health, financial and other economic factors those can impact to the valuation consider equivalent, so these are realized under the same macroeconomic conditions, finally all information should be available for the estimation. However experts formulated several critics against the, in micro level the cost-utility analysis is advisable to apply, since in macro level the use of cost-benefit analysis can contribute mostly to the better operation of health supply system.

MATERIAL

Selection of a Survey Frame: The survey frame provides the means of identifying and contacting the units of the survey population. The frame is in the form of a list, for example.

- Number of TB research Centre
- Route Design
- OPD Timing
- Questions of Survey
- Collecting the Data of Clinical Survey

Questionnaire Design: A questionnaire (or form) is a group or sequence of questions designed to obtain information on a subject from a respondent.

Clinical survey

1. How many TB patients visit to the hospital per day?
2. Which type of TB they suffer?
3. Which drug is most prescribed by you?
4. Which brand drugs shows good effectiveness?

Market Survey

1. Which medicine /Brand frequently prescribed by your Doctor?
2. What Drug shows good efficacy?
3. How many brands you have? What is the cost variation?
4. Which brand is most selling?
5. Substitute of this brand? What are the generic options available in this combination?

Data Collection: Data collection is the process of gathering the required information for each selected unit in the survey.

METHODS

Clinical Survey^[10]: Clinical study design is the formulation of trials and experiments, as well as observational studies in medical, clinical and other types of research (e.g., epidemiological) involving human beings. It involves Communicating, Understanding, note down & analyzing. Communicating– To a large extent, having a High IQ makes communications more sophisticated for better or worse – and increases the de-

sire to participate actively. Understanding – What exactly Physician want to say. Note down & analyzing – Collect the information what Physician share & analyzing that.

Finding a Good Doctor – If you can find a compatible doctor, it's a great foundation. Trust and good communications are essential. if you can find a compatible doctor, it's a great foundation. Trust, mutual respect and tactful communications are essential. It is important to be realistic about the situation and what is possible. Both the patient and the doctor have limited time and energy, so stay focused on the most important aspects. Then persist until you are both clear about what is happening and what you are going to do. Prepare for consultations, make written notes and take care of your own health.

Market Survey^[53]

- Retail outlet in TB center and Outside the Tb center
- Retail Survey
- Questions to retailer, collecting retailer data

Condition for good survey

Suitability survey method

- Targeted TB hospital
- Demand of product
- Physician faith on brand/drug
- Reliable brand as well as low cost brands

Efficient method for research

- Low cost
- Rapid action
- Good stability

Steps of a Survey

It may appear that conducting a survey is a simple procedure of asking questions and then compiling the answers to produce statistics. However, a survey must be carried out step by step, following precise procedures and formulas, if the results are to yield accurate and meaningful information.

The steps of a survey are

- Formulation of the Statement of Objectives
- Selection of a survey frame
- Questionnaire design
- Data collection
- Data capture and coding
- Estimation
- Data analysis
- Documentation.

Formulation of the Statement of Objectives

One of the most important tasks in a survey is to formulate the Statement of Objectives. This establishes not only the survey's broad information needs, but the operational definitions to be used, the specific topics to be addressed and the analysis plan.

Data Capture and Coding

After the data are collected, they are coded and, if a computer-assisted collection method was not used, captured. Coding is the process of assigning a numerical value to responses to facilitate data capture and processing in general.

Estimation

Once the data have been collected, captured, coded, the next step is estimation. Estimation is the means by which the statistical agency obtains values for the population of interest so that it can draw conclusions about that population based on information gathered from only a sample of the population. An estimate may be a total, mean, ratio, percentage, etc.

Data Analysis

Data analysis involves summarizing the data and interpreting their meaning in a way that provides clear answers to questions that initiated the survey. Data analysis should relate the survey results to the questions and issues identified by the Statement of Objectives. It is one of the most crucial steps of a survey since the quality of the analysis can substantially affect the usefulness of the whole survey.

Documentation

Documentation provides a record of the survey and should encompass every survey step and every survey phase. It may record different aspects of the survey and be aimed at different groups, such as management, technical staff, designers of other surveys and users. For example, a report on data quality provides users a context for informed use of the data. A survey report that includes not only what decisions were made, but also why they were made provides management and technical staff with useful information for future development and implementation of similar surveys. During implementation, documentation of procedures for staff helps to ensure effective implementation.

RESULT AND DISCUSSION

Hospital name: Govt. TB treatment unit (UPSC)

Address: Charminar, Hyderabad.

Doctor name: Dr. Hema Bindu

OPD timing: 10am-2pm

Sno.	Answer	Conclusion	Adr's
1	15-18	Rifampicin is Prescribed	Head-ache, Stomach upset Nausea
2	Pulmonary TB		
3	INH, Rifampicin, Ethambutol		
4	Lupin Ltd		

Hospital name: Princess Esra Hospital (Owaisi Group of Hospital)

Address: Mughalpura, Charminar

Doctor name: Dr. Aleemuddin Naveed

OPD timing: 9am-1pm

Sno.	Answer	Conclusion	Adr's
1	7-10	Rifampicin is Prescribed	Head-ache, Stomach upset Nausea
2	Extra pulmo-nary		
3	INH, Rifampicin, Ethambutol		
4	Lupin Ltd		

Hospital name: Osmania General Hospital
Address: Afzal gaunj, Hyderabad
Doctor name: Dr. Dorai raja David
OPD timing: 9:30am-1pm

Sno.	Answer	Conclusion	Adr's
1	150-200	Rifampicin is prescribed	Headache, Stomach upset Nausea
2	Pulmonary, extra pulmonary		
3	Rifampicin, Ethambutol, Pyrazinamide, INH		
4	Lupin		

Hospital name: Govt. TB Treatment Unit
Address: Dabeerpura, Hyderabad
Doctor name: Dr. Anuradha
OPD timing: 9am-12:30pm

Sno.	Answer	Conclusion	Adr's
1	100-110	Rifampicin is prescribed	Headache, Stomach upset Nausea
2	Pulmonary, extra pulmonary		
3	Rifampicin, Ethambutol, pyrazinamide, INH		
4	Sun Pharma		

Hospital name: Princess Durrushevar Childrens and General Hospital
Address: Purani Haveli, Hyderabad
Doctor name: Dr. Ajaz
OPD timing: 10am- 11am

Sno.	Answer	Conclusion	Adr's
1	3-6	Rifampicin is prescribed	Headache, Stomach upset Nausea
2	Pulmonary TB		
3	Rifampicin, ethambutol, INH		
4	Sun Pharma		

Hospital name: Mahavir Hospital & Reaserch Hospital
Address: Masab tank, Hyderabad
Doctor name: Dr. Sohaib Ansary
OPD timing: 10am-11am

Sno.	Answer	Conclusion	Adr's
1	10-15	Rifampicin is prescribed	Headache, Stomach upset Nausea
2	Pulmonary,		
3	Rifampicin, Ethambutol, Pyrazinamide, INH		

4	Themes.pharma		
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Hospital name: Star Hospital
Address: Banjara Hills, Road No-10, Hyderabad
Doctor name: Dr. Anuradha T
OPD timing: 1pm-4pm

Sno.	Answer	Conclusion	Adr's
1	10-20	Rifampicin is prescribed	Headache, Stomach upset Nausea
2	Pulmonary, Extra pulmo-nary		
3	Rifampicin, ethambutol, pyrazinamide INH		
4	Themes.pharma		

Hospital name: Alpha Super speciality hospital
Address: Mughalpara, Hyd
Doctor name: Dr. Nishath
OPD timing: 11am -2pm

Sno.	Answer	Conclusion	Adr's
1.	20-30	Rifampicin is pre-scribed	Head-ache, Stom-ach up-set Nausea.
2.	Pulmonary- cox		
3.	Rifampicin, Etham-butol, pyra-zinamide, INH		
4	Macleods		

Hospital name: DR VRK Teaching Hospital & Reasearch Hospital
Address: Aziz Nagar, Moinabad
Doctor name: Dr. Sreedhar Reddy K
OPD timing: 10:30am-1:30pm

Sno.	Answer	Conclu-sion	Adr's
1	15-20	Rifampicin is pre-scribed	Head-ache, Stom-ach up-set Nausea.
2	Pulmonary		
3	Rifampicin, Etham-butol, pyrazinamide, INH		
4	Sun.pharma		

Hospital name: Govt. General Hospital
Address: Afjal gaunj, Hyd
Doctor name: Dr. Chettra
OPD timing: 1pm-4pm

Sno.	Answer	Conclu-sion	Adr's
1.	20-25	Rifam-picin is prescribed	Headache, Stomach upset, Nau-sea.
2.	Pulmonary		
3.	Rifampicin, Eth-ambutol, pyra-zinamide, INH		
4	Cadila		

Clinic name: City Clinic & Diagnostic Centre
Address: Mughalpara, Hyderabad
Doctor name: Dr. Omar Farooq
OPD timing: 3pm-6pm

Sno.	Answer	Conclusion	Adr's
1.	5-10		

2.	Pulmonary	Rifampicin is pre-scribed	Headache, Stomach upset Nausea.
3.	Rifampicin, Ethambutol, pyrazinamide, INH		
4	LUPIN		

Hospital name: Golconda TB unit
Address: Golconda, Hyderabad
Doctor name: Dr. Maroof
OPD timing: 10:00Am-1:00Pm

Sno.	Answer	Conclusion	Adr's
1.	100-110	Rifampicin is prescribed	Head-ache, Stomach upset Nausea.
2.	Pulmonary		
3.	Rifampicin, Ethambutol, pyrazinamide, INH		
4	Sun.pharma		

Hospital name: Nampally TB Unit
Address: Nampally Market, Bazar Ghat
Doctor name: Dr. Sai Praveen
OPD timing: 10:00Am-1:00Pm

Sno.	Answer	Conclu-sion	Adr's
1.	20-25	Etham-butol is pre-scribed	Heart Burn, Loss of Appetite, Menstrual Changes, Discol-our of Urine
2.	Pulmonary cox		
3	Ethambutol, Pyra-zinamide, Ri-fampicin		
4	Macloid		

Hospital name: Shrestha Hospital
Address: Ameerpet
Doctor name: Dr. Shyamsundar Raj
OPD timing: 10:00Am-1:00Pm

Sno.	Answer	Conclu-sion	Adr's
1.	100-110	Ethambu-tol is pre-scribed	Heart Burn, Loss of Appetite, Men-strual Changes, Discolour of Urine
2.	Pulmo-nary		
3.	Rifam-picin, Ethambu-tol, pyra-zinamide, INH		
4	Sun pharma		

Hospital name: MM Hospital
Address: Kishanbag
Doctor name: Dr. Roshan lal
OPD timing: 10:00Am-1:00Pm

Sno.	Answer	Conclusion	Adr's
1.	7-10	Ethambutol is prescribed	Heart Burn Loss of Ap-petite
2.	Pulmonary		
3.	Ethambutol,		

	INH, Pyra-zinamide		Menstrual Changes Discolour of Urine
4.	LUPIN		

MARKET SURVEY

Pharmacy Name: Deluxe Medical and General Store
Address: Dabeerpura, Hyd
Pharmacist Name: Mohd. Mustafa

Sno.	Answer	Conclusion
1.	Cap R-cin 450mg	As per the pharmacist Cap. R-cin is the most selling brand and Ri-fampicin is most pre-scribed drug by physi-cian
2.	Rifampicin	
3.	Approximate 4	
4.	brand	
5.	R-cin 450mg Coxid-450mg, Famcin 450mg	

Pharmacy Name: AK Prince Pharmacy
Address: Dabeerpura, Hyd
Pharmacist Name: Abdul Bari

Sno.	Answer	Conclusion
1.	Cap. R-cin 450mg	As per the pharmacist Cap. R-cin is the most selling brand and Ri-fampicin is most pre-scribed drug by physi-cian
2.	Rifampicin	
3.	Approximate 4	
4.	brand	
5.	R-cin 450mg Coxid-450mg, Famcin 450mg	

Pharmacy Name: Charminar Medical and General Store
Address: Charminar, Hyd
Pharmacist Name: Mohd. Sajjad

Sno.	Answer	Conclusion
1.	Cap. R-cin 450mg	As per the pharmacist Cap. R-cin is the most selling brand and Ri-fampicin is most pre-scribed drug by physi-cian
2.	Rifampicin	
3.	Approximate 4	
4.	brand	
5.	R-cin 450mg Coxid-450mg, Famcin 450mg	

Pharmacy Name: Sunrise Medical
Address: Mughal pura, Hyd
Pharmacist Name: Ibrahim Khan

Sno.	Answer	Conclusion
1.	Cap R-cin 450mg	As per the pharmacist Cap. R-cin is the most selling brand and Ri-fampicin is most pre-scribed drug by physi-cian
2.	Rifampicin	
3.	Approximate 4	
4.	brand	
5.	R-cin 450mg Coxid-450mg, Famcin 450mg	

Pharmacy Name: Nizam Medical Hall Chemist & Druggist
Address: Mughal pura, Hyd

Pharmacist Name: Fahad

Sno.	Answer	Conclusion
1.	Cap R-cin 450mg	As per the pharmacist Cap. R-cin is the most selling brand and Rifampicin is most prescribed drug by physician
2.	Rifampicin	
3.	Approximate 4 brand	
4.	R-cin 450mg	
5.	Coxid-450mg, Famcin 450mg	

Pharmacy Name: Ikram Medical & General Store

Address: Etebar Chowk, Hyd

Pharmacist Name: Syed Ikram

Sno.	Answer	Conclusion
1.	Tab. Combutil 450mg	As per the pharmacist Tab. Combutil is the most selling brand and Ethambutol is most prescribed drug by physician
2.	Ethambutol	
3.	Approximate 4 brand	
4.	Combutil 450mg, Albutol 450mg,	
5.	Anbutol 450mg	

Pharmacy Name: Azam Medical Hall & General Store

Address: Fateh Darwaza, Hyd

Pharmacist Name: Abrar Ali

Sno.	Answer	Conclusion
1.	Tab. Combutil 450mg	As per the pharmacist Tab. Combutil is the most selling brand and Ethambutol is most prescribed drug by physician
2.	Ethambutol	
3.	Approximate 4 brand	
4.	Combutil 450mg, Albutol 450mg,	
5.	Anbutol 450mg	

Pharmacy Name: Pat Medical & General Store

Address: Bahadur Pura, Hyd

Pharmacist Name: Sai Ram

Sno.	Answer	Conclusion
1.	Tab. Combutil 450mg	As per the pharmacist Tab. Combutil is the most selling brand and Ethambutol is most prescribed drug by physician
2.	Ethambutol	
3.	Approximate 4 brand	
4.	Combutil 450mg, Albutol 450mg,	
5.	Anbutol 450mg	

RIFAMPICIN

Sno.	Brand (company)	Cost	Generic (company)	Cost
1.	R cin 450mg (Lupin)	Rs-50/-	Coxid-450mg (Aristo)	Rs-16/-
2.	Macox 450mg (Macleods)	Rs-55/-	Famcin 450mg (IDPL)	Rs-17/-
3.	Risorine 450mg (Cadila)	Rs-60/-	Rifacept 450mg (Concept)	Rs-20/-

4.	Rilfect 400mg (Sun.Pharma)	Rs-49/-	Rifacilin 450mg (PCI)	Rs-19/-
5.	Eufacin 450mg (Euphoric)	Rs-47/-	Coxkit-3 450mg (Cipla)	Rs-12/-

ETHAMBUTOL

Sno.	Brand (company)	Cost	Generic (company)	Cost
1.	Combutil 450mg (Lupin)	Rs-75/-	Albutol 450mg (Alkem)	Rs-25/-
2.	Mycobutil 450mg (Cadila)	Rs-86/-	Anbutol 450mg (Psychorem)	Rs-40/-
3.	Themibutil 450mg (Themis Pharm)	Rs-80/-	Bicox 450mg (Bio E)	Rs-42/-
4.	ETOL (sun Pharma)	Rs69/-	Becox forte 450mg (Panjon)	Rs-30/-
5.	ECONEX (Macleod)	Rs-70/-	Caviter-FD 450mg (Wockhardt)	Rs-35/-

DISCUSSION

Cost effect analysis is the study for providing good therapy less adverse effect at low price, We choose TB for Pharmacoeconomic study because TB need long term drug treatment approximately for 2 years it is expensive for patient, TB is the most infectious disease killer in the world, We conducted clinical and market survey, As per clinical survey 69% of physicians have faith on Rifampicin and 20% on Ethambutol and Remaining 11% are multidrug therapy.

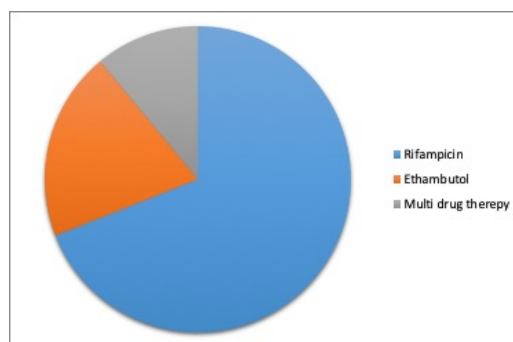


Figure 1: Pie diagram for clinical survey of TB drugs

SUMMARY

Pharmacoeconomic study means cost effective analysis, TB is a top infectious disease, killer in the world, 10.4 million people suffer from TB every year, 1.7 million people die from TB, Each day 4700 people lose their life and 28500 people fall ill due to TB, Cost to cost, efficacy to efficacy in between most popular

anti-tubercular brands present in market, For Pharmacoeconomic study we have done clinical survey as well as market survey.

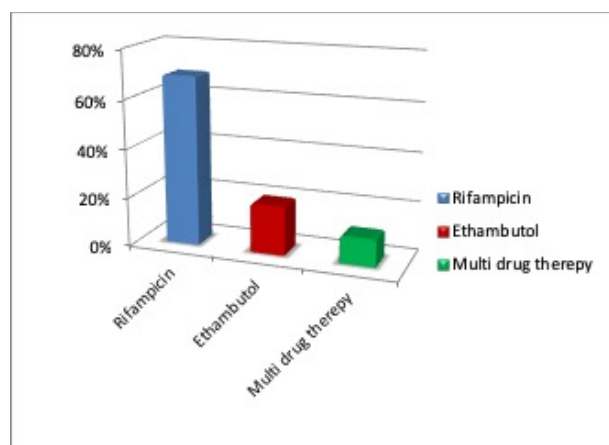


Figure 2: Bar diagram for clinical survey of TB drugs

Clinical survey: Targeted TB hospitals, Demand of product, Physician faith on brand/drug

Approximately per week 240 TB infected patients are diagnose in TB center in which pulmonary TB patient 80% and 20% of patient with extra pulmonary.

Market survey: Retail outlet in TB center and Outside the TB center, Reliable brands as well as low cost brands, Questions to retailer, collecting retailer data

CONCLUSION

As we know that TB is most infectious disease cause by Mycobacterium Tuberculosis it mainly affects the respiratory tract. As per clinical and market survey we found that Rifampicin is most trusted anti-TB drug and R-cin450 was found to be most prescribed and selling brand in the market. Rifampicin occupies 69% in the market. Ethambutol occupies 20% in the market. Other anti-TB drug occupy 11% in the market. Rifampicin has less ADR and it is most prescribed drug as compared to Ethambutol. We can minimize the cost by prescribing generic drug. Rifampicin has less ADR (headache, stomach upset, nausea, vomiting, dizziness) as compare to Ethambutol ADR (heart burning, loss of appetite, menstrual changes, urine discolour). We can change reduce the cost of anti-TB therapy by using generic drugs at the place of prescribed brand. Because generic drug are approximately 60% less in cost than other branded drugs.

REFERENCES

1. Soniya Scaria, Pharmacoeconomics: Principles, Methods and Indian Scenario. *Int. J. Pharm. Sci. Rev. Res.*, 34(1), September – October 2015; Article No. 08, Pages: 37-46
2. Daniel G. Datiko, Cost and Cost-Effectiveness of Treating Smear-Positive Tuberculosis by Health Extension Workers in Ethiopia: An Ancillary Cost-Effectiveness Analysis of Community Randomized Trial, Centre for International Health,

University of Bergen, Overlege Danielsens Hus, Bergen, Norway.

3. Ricardo Steffen, Patients’ Costs and Cost-Effectiveness of Tuberculosis Treatment in DOTS and Non-DOTS Facilities in Rio de Janeiro, Brazil, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil,
4. Marcos Abdo Arbex, Antituberculosis drugs: Drug interactions, adverse effects, and use in special situations. Part 1: First-line drugs
5. Ozian Z Wubshet, Rifampicin-Versus Ethambutol-Based Continuation Phase Anti Tuberculosis Treatment Regimen is among Factors Associated with Treatment Outcomes in Patients Treated at Six Health Facilities in Southern Ethiopia, *Quality in Primary Care* (2017) 25 (1): 1-6 Research Article 2017 Insight Medical Publishing Group
6. Sulochana Somasundaram, Isoniazid and Rifampicin as Therapeutic Regimen in the Current Era: A Review, *Journal of Tuberculosis Research*, 2014, 2, 40-51 Published Online March 2014 in SciRes. <http://www.scirp.org/journal/jtr> <http://dx.doi.org/10.4236/jtr.2014.21005>
7. PhD; Carolyn Brown, The State of Health Economic and Pharmacoeconomic Evaluation Research in Zimbabwe: A Review, The University of Texas at Austin, College of Pharmacy, Austin, Texas
8. Elvis Gama, Economic evaluation of a shortened standardised treatment regimen of antituberculosis drugs for patients with multidrug-resistant tuberculosis (STREAM): study protocol, Gama E, et al. *BMJ Open* 2016;6:e014386. [doi:10.1136/bmjopen-2016-014386](http://dx.doi.org/10.1136/bmjopen-2016-014386).
9. Amritpal Singh, Antituberculosis Drugs: Drug Interactions, Adverse Effects, *Journal Of Medical And Health Research* 2016 (1):1
10. Surendra g. Gattani, pharmacoeconomics: a review, *asian journal of pharmaceutical and clinical research* vol.2 issue 3, july-september 2009 issn 0974-2441
11. A. Zwerling, A simplified cost-effectiveness model to guide decision-making for shortened anti-tuberculosis treatment regimens, *INT J TUBERC LUNG DIS* 20(2):257–260 Q 2016 The Union <http://dx.doi.org/10.5588/ijtld.15.0415>
12. James C. Scott, Cost Resulting from Anti-Tuberculosis Drug Shortages in the United States: A Hypothetical Cohort Study, *PLOS ONE* | DOI: 10.1371/journal.pone.0134597 August 18, 2015
13. Jonathan P. Owens, Cost-Effectiveness of Novel First-Line Therapeutic Regimens for Tuberculosis, NIH Public Access Author Manuscript *Int J Tuberc Lung Dis*. Author manuscript; available

- in PMC 2013 December 01. Published in final edited form as: Int J Tuberc Lung Dis. 2013 May; 17(5):. doi:10.5588/ijtld.12.0776.
14. Gwenan M. Knight, The Impact and Cost-Effectiveness of a FourMonth Regimen for First-Line Treatment of Active Tuberculosis in South Africa, PLOS ONE | DOI:10.1371/journal.pone.0145796 December 30, 2015, (<http://www.tballiance.org/>)
 15. Ozian Z Wubshet, Background Methods for the Economic Evaluation of Health Care Programmes. 3rd ed. Oxford, UK: Oxford University Press; 2005.
 16. Laavanya Sankaranarayanan, Cost-utility in practice: A policy maker's guide to the state of the art. Health Policy. 1992;21:249-279.
 17. Paul Gavaza, MS, Cost-effectiveness and cost-benefit analyses in the medical literature. Are the methods being used correctly? Ann Intern Med. 1992;116:238-244.
 18. Adams ME, McCall NT, Gray DT, Economic analysis in randomized control trials. Med Care. 1992;30:231-243.
 19. Elvis Gama, Problems with the interpretation of pharmacoeconomic analyses: A review of submissions to the Australian Pharmaceutical Benefits Scheme. JAMA. 2000;283:2116-2121.
 20. Marcos Abdo Arbex, Quality of clinical and economic evidence in dossier formulary submissions. Am J Manag Care. 2007;13:401-407.
 21. Daniel G. Datiko, Economic evaluation of communicable disease interventions in developing countries: A critical review of the published literature. Health Econ. 2000;9:681-698.
 22. Lee KS, Brouwer WB, Introducing economic evaluation as a policy tool in Korea: Will decision makers get quality information? A critical review of published Korean economic evaluations. Pharmacoeconomic. 2005;23:709-721.
 23. Treatment of Tuberculosis: guidelines.4th ed. Geneva, World Health Organization, 2010 (WHO/HTM/TB/2009.420).
 24. Raviglione MC WHO's new stop TB strategy Lancet 2006, 367, 952-955.
 25. WHO model formulary 2008, www.who.int/selection_medicines/list/en.
 26. Menzies D Effect of duration and intermittency of rifampicin of tuberculosis treatment outcomes, a systematic review and metaanalysis. PloS medicine, 2009, 6:e 1000146.
 27. Judy W. Cheng, PharmD, MPH, Pharmacoeconomic Analysis of Clopidogrel in Secondary Prevention of Coronary Artery Disease
 28. Thomas L. Gift, Ph.D., and Jeanne Marrazzo, M.D., M.P.H. Cost-Effectiveness Analysis
 29. Chesson HW, Greenberg JB, Hennessy MH. The cost-effectiveness of the WINGS intervention: a program to prevent HIV and sexually transmitted diseases among high-risk urban women. BMC Infect Dis. 2002;2:1-11.
 30. Gift TL, Malotte CK, Ledsky R, Hogben M, Middlestadt SE, VanDevanter NL, et al. A cost-effectiveness analysis of interventions to increase repeat testing in patients treated for gonorrhoea or chlamydia at public sexually transmitted disease clinics. Sex Transm Dis. 2005;32:542-549.
 31. Gold MR, Siegel JE, Russell LB, Weinstein MC, eds. Cost-effectiveness in Health and Medicine, 1st ed. New York: Oxford University Press; 1996.
 32. World Bank. World Development Report. New York: Oxford University Press; 1993
 33. Patni Kalyani N. Pharmacoeconomic Evaluation, Cost Minimization Analysis of Anti-Diabetic Therapy in Gujarat, ISSN No: 2319-5886 International Journal of Medical Research & Health Sciences, 2016, 5, 3:34-43, www.ijmrhs.com
 34. Huifen Ma, PhD Quality of pharmacoeconomic research in China A systematic review, Systematic Review And Meta-Analysis Medicine
 35. Drummond MF, Sculpher MJ, Torrance GW, Methods for the Economic Evaluation of Health Care Programmes. 3rd ed. Oxford, UK: Oxford University Press; 2005.
 36. Gerard K. Cost-utility in practice: A policy maker's guide to the state of the art. Health Policy. 1992;21:249-279.
 37. Udvarhelyi IS, Colditz GA, Rai A, Epstein Cost-effectiveness and cost-benefit analyses in the medical literature. Are the methods being used correctly? Ann Intern Med. 1992;116:238-244.
 38. Adams ME, McCall NT, Gray DT, Economic analysis in randomized control trials. Med Care. 1992;30:231-243.
 39. Hill SR, Mitchell AS, Henry DA. Problems with the interpretation of pharmacoeconomic analyses: A review of submissions to the Australian Pharmaceutical Benefits Scheme. JAMA. 2000;283:2116-2121.
 40. Colmenero F, Sullivan SD, Palmer JA, Quality of clinical and economic evidence in dossier formulary submissions. Am J Manag Care. 2007;13:401-407.
 41. Walker D, Fox-Rushby JA. Economic evaluation of communicable disease interventions in developing countries: A critical review of the published literature. Health Econ. 2000;9:681-698.

42. Lee KS, Brouwer WB, Lee SI, Introducing economic evaluation as a policy tool in Korea: Will decision makers get quality information? A critical review of published Korean economic evaluations. *PharmacoEconomics*. 2005;23:709-721.
43. Raviglione MC WHO's new stop TB strategy *Lancet* 2006, 367, 952-955.
44. WHO model formulary 2008, www.who.int/selection_medicines/list/en.
45. Menzies D Effect of duration and intermittency of rifampicin of tuberculosis treatment outcomes, a systematic review and metaanalysis. *PloS medicine*, 2009, 6:e 1000146.
46. Bernard M. Rapid Molecular screening for multi-drug resistance tuberculosis in a high volume public health laboratory in South Africa. *American Journal of Respiratory and Critical care medicine*, 2008, 177: 787-792.
47. WHO: Global tuberculosis control: epidemiology, strategy, financing. WHO document WHO/CDS/TB;
48. WHO: An expanded DOTS framework for effective tuberculosis control. Stop TB Communicable Diseases. WHO document WHO/CDS/TB;
49. Xianyi C, Fengzeng Z, Hongjin D, Liya W, Lixia W, Xin D, Chin DP: The DOTS strategy in China: results and lessons after 10 years. *Bull World Health Organ* 2002, 80(6):430-436
50. Sanchez LA. Expanding the pharmacist's role in pharmacoeconomics: How and why? *Pharmacoeconomics* 1994;5:367-375.
51. Townsend RJ. Post-marketing drug research and development. *Ann Pharmacother* 1987;21:134-136.
52. Drummond M, Smith GT, Wells N. *Economic Evaluation in the Development of Medicines*. London: Office of Health Economics, 1988:33.
53. Lee JT, Sanchez LA. Interpretation of "cost-effective" and soundness of economic evaluations in the pharmacy literature. *Am J Hosp Pharm* 1991;48:2622-2627.
54. Bootman JL. Pharmacoeconomic and outcomes research. *Am J Health Syst Pharm* 1995;52(Suppl 3):S16-S19.
55. Hepler CD, Strand LM. Opportunities and responsibilities in pharmaceutical care. *Am J Hosp Pharm* 1990;47:533-543.
56. Bungay KM, Sanchez LA. Types of economic and humanistic outcomes assessments. In Grauer D, Lee J, Odom T, et al., eds. *Pharmacoeconomics and Outcomes*, 2nd ed. Kansas City, MO: American College of Clinical Pharmacy, 2003:18-60.
57. Draugalis JR, Bootman LJ, Larson LN, McGhan WF. *Current Concepts: Pharmacoeconomics*. Kalamazoo, MI: Upjohn, 1989.
58. Drummond MF, Stoddart GL, Torrance GW. *Methods for the Economic Evaluation of Health Care Programmes*, 2nd ed. Oxford: Oxford University Press, 1997.
59. McGhan WF. *Pharmacoeconomics and the evaluation of drugs and services*. *Hosp Formul* 1993;28:365-378.
60. Rice DP, Fox PJ, Max W, et al. The economic burden of Tuberculosis disease care. *Health Affairs* 1993;12(2):164-176.
61. Ernst RL, Hay JW. The U.S. economic and social costs of Tuberculosis disease revisited. *Am J Public Health* 1994;84:1261-1264.
62. American Tuberculosis Association. *Tuberculosis Care* 2003;26:917-932.
63. PFW Chien, et al. Surveying clinical surveys Department of Obstetrics and Gynaecology, Ninewells Hospital and Medical School, Dundee, UK Correspondence: Dr PFW Chien, Department of Obstetrics and Gynaecology, Ninewells Hospital and Medical School, Dundee, DD1 9SY, UK. DOI: 10.1111/j.1471-0528.2009.02281.x
64. Vernon A. *A Quaker Businessman: Biography of Joseph Rowntree (1836-1925)*. London: Allen & Unwin, 1958.
65. Boormans EMA, Birnie E, Bilardo CM, Oepkes D, Bonsel GJ, van Lith JMM. Karyotyping or rapid aneuploidy detection in prenatal diagnosis? The different views of users and providers of prenatal care. *BJOG* 2009;116:1396-9.
66. Habiba M, Da Fre` M, Taylor DJ, Arnaud C, Bleker O, Lingman G et al. Late termination of pregnancy: a comparison of obstetricians' experience in eight European countries. *BJOG* 2009;116:1340-9.
67. Burns K, Duffett M, Kho M, Meade M, Adhikari N, Sinuff T, et al. A guide to the design and conduct of self administered survey of clinicians. *CMAJ* 2008;179:245-52.
68. Kelley K, Clark B, Brown V, Sitzia J. Good practice in the conduct and reporting of survey research. *Int J Qual Health Care* 2003;15:261-6.
69. Altman DG, Schulz KF, Moher D, Egger M, Davidoff F, Elbourne D, et al. The revised CONSORT statement for reporting randomized trials: explanation and elaboration. *Ann Intern Med* 2001;134:663-94.
70. von Elm E, Altman DG, Egger M, Pocock SJ, Gotsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines

for reporting observational studies. *Ann Intern Med* 2007;147:573-7.

71. Bossuyt PM, Reitsma JB, Bruns DE, Gatsonis CA, Glasziou PP, Irwig LM, et al. Towards complete and accurate reporting of studies of diagnostic accuracy: the STARD initiative. *Standards for Reporting of Diagnostic Accuracy. Clin Chem* 2003;49:1-6.
72. Moher D, Cook DJ, Eastwood S, Olkin I, Rennie D, Stroup DF. Improving the quality of reports of meta-analyses of randomised controlled trials: the QUOROM statement. *Quality of Reporting of Meta-analyses. Lancet* 1999;354:1896-900.
73. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J Qual Health Care* 2007;19:349-57.
74. Siegel JE, Weinstein MC, Russell LB, Gold MR. Recommendations for reporting cost-effectiveness analyses. Panel on Cost-Effectiveness in Health and Medicine. *JAMA* 1996;276:1339-41.
75. Vintzileos AM, Beazoglou T. Design, execution, interpretation, and reporting of economic evaluation studies in obstetrics. *Am J Obstet Gynecol* 2004;191:1070-6.