L14: Health Economics of Genetic Testing

Chronic Diseases are mostly incurable (creating financial restraint; as ability to cure people improves, more people in the population has chronic disease and need on-going care, e.g. diabetes). They are often life-long (long durations of having disease), and accumulates among older people- fewer children being born, more diseases in older population.

Healthcare in the 21st Century: PREDISPOSITION = **targeted prevention > cure**

Potential pitfalls of Prevention

- 'prevention paradox': great benefit to community, little benefit to individual, e.g. seat belts, bicycle helmets. The many need to undergo preventive intervention to prevent ill-health in the few
- Problems arise when there are adverse effects and/or high costs associated with preventive interventions. E.g. targeted prevention in chemotherapy (for around 1 month prolonged life) cannot be federal funded because it is very expensive. Hence, drugs and therapies are funded for instead, as generic medicine reduces side-effects.

Preventive Clinical Intervention: A finer Balance (vs. Curative)

BENEFITS – treating healthy people (preventing diseases);

RISKS COSTS – more people to test and heal, more money and resources needed = unfavourable balance

Challenges to the Healthcare System

- limited resources
- increasing demand - ageing pop, chronic diseases, technology, higher expectations
- quality and safety
- Efficiency
- Workforce
- Need to 'rank' cost effectiveness across different conditions

SOLUTION => Evidence-based practice (the conscientious, explicit and judicious use of current base evidence in making decisions about the care of patients; involves the integration of clinical expertise with the best available evidence from systematic research)

Diagnostic Framework

1. Analytic validity
   Genetic testing - work out basic parameters by how you access tests (different labs for same results)
   Some genetic variants are difficult to determine whether fatal, etc. Every lab tests for variants the same way (analytical)

2. Clinical Validity
   - same effect on patient (reduces diagnosis in predictive testing)

3. Clinical Utility
   Utility- is there any benefit in knowing this patient has this variation? May there be any clinical utility- e.g. what if they don't have children, may change the way they live their life. From medical perspective, there is no clinical utility, but from psychological perspective, there is utility.
   - Precision medicine has medical utility (can precisely identify a diagnosis)
   - But if there is no cure available, there is no possible medical utility.

4. SLE (and Behavioural change)
   SLE socially ethical (what diseases to screen for) appropriate for children /adult screening.
   How much of tax payers' money should go prevent cancer? Or should that money go to treat those who already have cancer?

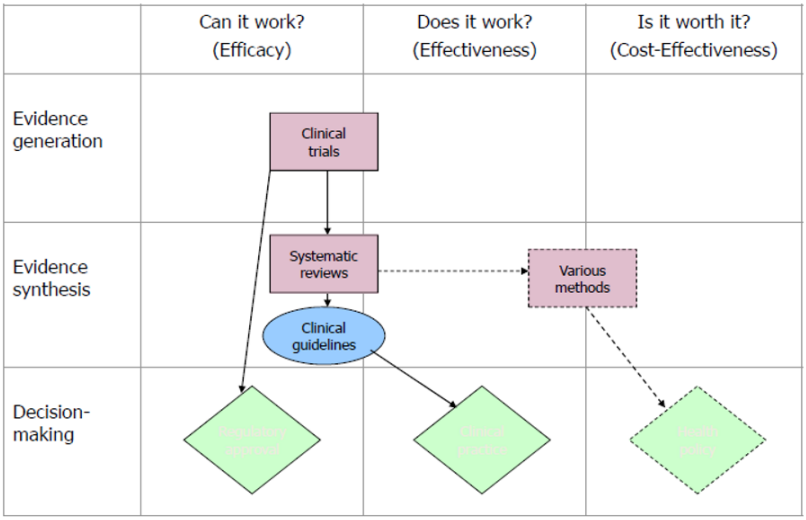
EBP – Current View

Efficacy: (in best scenarios, does it work)

- Patients are randomized (allows for confounding factors) so there is no bias
- Along with systematic reviews, there are studies based in different ethnic groups & health services (which may have different implications depending on public or private health sector)

Effectiveness: Does it have any use & does it actually work in CLINICAL use?

- If efficacy works, does it work in clinical setting? (often a large gap in setting)
- Clinical utility here drops considerably.



Modified from: Luce BR et al. *Milbank Q.* 2010;88:256-76.

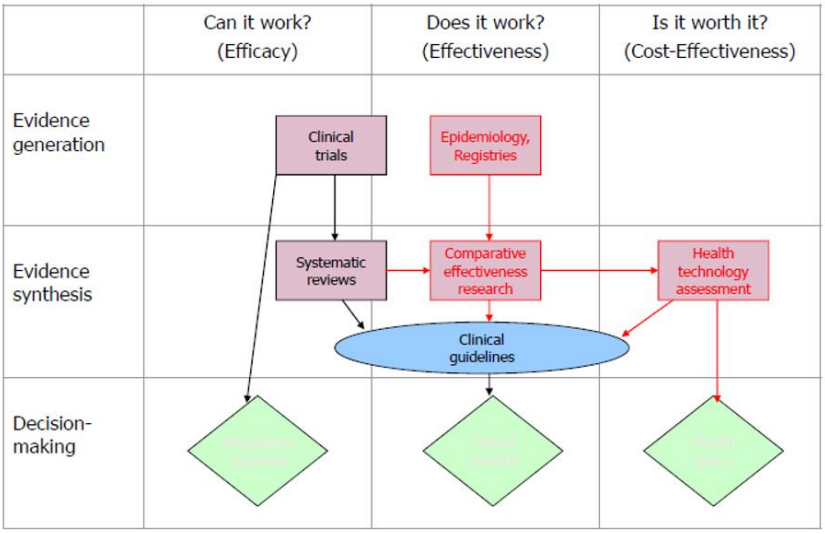
Cost-Effectiveness: Is it valuable for money?

- No funding from government unless companies show how much it costs to make it.
- Need proof to show which drug / medication is more effective.

EPB – Ideal View

Study vs. Real-life Setting

- circumscribed populations
- focus: benefit >> harm
- artificial environment
- short-term
- little consideration of competing morbidity and mortality



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Quality Adjusted Life Years

Increasing life expectancy may be associated with decrease in quality of life…

Many interventions allow you to determine quality of life, e.g. physical state, mental state, access to education and access to community issues, stress and anxiety levels.

Measuring QoL population standardised

Most people adapt to situations, so individuals with a disorder often report a higher quality of life than the average person without the condition would expect.

Controversy as to whose measure is the most important, the average person, or the person with the condition.

Measure will also capture QoL <0- would prefer to be dead (self determined argument for euthanasia.)

E.g. If intervention allows you to live 5 years longer, those 5 years should give you a better quality of life. How many ears of life x quality of life gained = helps people decide on purely pragmatic test on which medicine to use (need to have this test and provide evidence to receive funding).

Costs

1. Direct Costs
    - Costs , some more acceptable than orders.
    - E.g. Surgery, anaesthetics, bandages, nursing care, medicines
1. Indirect Costs
    - Indirect (not in hospital, e.g. GP)- making GP more reliable for chronic diseases
    - E.g. Hospital cleaning, heating, lighting, food, receptionists

2. Societal Costs
    - Society lost (if people die at age 30) as they are at an age where they can potentially contribute to society. Is this ethical ? How much will those with disabilities cost society? Not ethical, but factors can be considered if people are unable to work.
    - E.g. Loss of earning whilst ill
3. Personal Costs
    - Private sector not funded by medicare
    - Often people with chronic conditions have spent a lot of money on continuous treatment (governments make a cap for people to pay a certain amount then it pay for the rest)
    - E.g. Travelling, childcare, prescription costs, out of pocket costs, loss of earnings

*Time scale is important

Cost- Effectiveness – principles of economics
- Dominated (no health gain) - will not receive funding
- Dominant (health gain vs cost for drug)

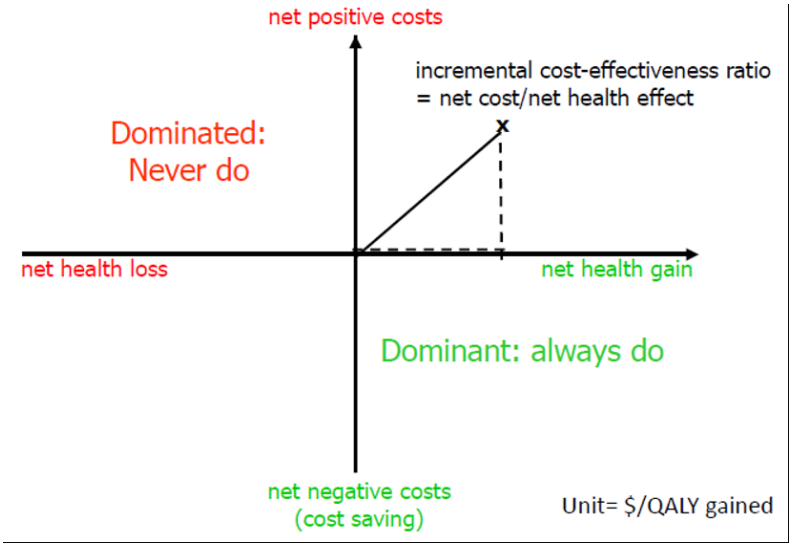
*Appropriate: $50,000 per quality gained

E.g. Costs associated with Breast Cancer

Person/ family
- Psychological cost on diagnosis
- wages if unable to work during treatment
- Cost of transport/treatment/ support
- Cost of years not lived

Healthcare service
- Cost of treatment/medical/nursing/drugs

Society
- Productively costs to the workforce
- Humanitarian costs



WHO Principles of Early Disease Detection

Condition

The condition should be an important health problem.
- There should be a recognisable latent or early symptomatic stage.
- The natural history of the condition, including development from latent to declared disease should be adequately understood.

Test
- There should be a suitable test or examination.
- The test should be acceptable to the population.

Treatment
- There should be an accepted treatment for patients with recognised disease.

Screening Program
- There should be an agreed policy on whom to treat as patients.
- Facilities for diagnosis and treatment should be available.
- The cost of case-findings (including diagnosis and treatment of patients diagnosed) should be economically balanced in relation to possible expenditure on medical care as a whole.
- Case-findings should be a continuing process and not a ‘once and for all’ project.