Healthcare Acquired Infections: At What Cost?
Dr. Elizabeth Bryce
A Webber Training Teleclass

Healthcare Acquired Infections: At what cost?

Dr. Elizabeth Bryce
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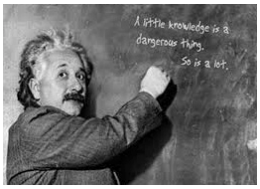
Objectives

- Understand the key principles in calculating the *economic impact* of healthcare acquired infections (HAIs)
- Understand *terminology:* e.g. fixed and variable costs
- Appreciate the overall financial impact of selected HAIs
- Be able to describe key components of a *business case*

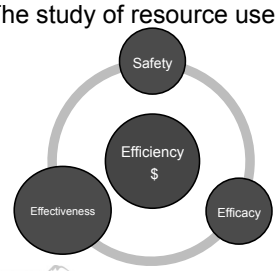
What will not be discussed

- The entire field of Economic Evaluation
- Economic evaluations of complex health system interventions



What is Health Economics?

The study of resource use



Assists with allocating scarce healthcare resources by identifying the potential for greatest financial benefits and further clinical improvements

By choosing to use resources one way; those same resources are not available for other potentially beneficial interventions (opportunity costs)

Different types of Economic Analysis

Cost-effectiveness	Cost Benefit	Cost Minimization	Cost Utility
• Comparative study design by using monetary and non-monetary units expressed as cost per unit of health outcome. • Best suited to measure technical efficiency (e.g. treatments) in a given patient group although can't compare treatments with different outcomes • Consequences e.g. pain reduction; bed days avoided (saved)	• Costs and consequences are expressed usually as $. Compares costs and benefits across programs with different patient groups • Should not exclude other less tangible benefits • Mainly measures allocative efficiency within the health care sector or across other sectors	• Compares costs only and assumes that consequences (outcomes) are equal	• Looks at multi-dimensional health outcomes and reduces them to a single index that combines monetary and non-monetary units e.g. quality adjusted life years • Measures technical and allocative efficiency only within a defined healthcare sector

Assessing Effectiveness and Cost

Effectiveness→ Clinical Studies

Cost:

a) Accurate estimates of the extra cost of a new strategy

b) Accurate assessment of the "cost savings" (including health benefits) associated with a predicted number of prevented cases of HAI

http://www.nlm.nih.gov/nichsr/edu/healthecon/01_he_01.html
(Drummonds Checklist for critical appraisal)

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General problems with costing

a)Partial not full evaluation performed

b)Poor methodological design e.g. overestimation of the costs of an HAI, underestimating cost of implementation

c)Inappropriate generalization of the results

Problems with costing additional days stay

Control studies may not account for bias because

1. unable to match for all the variables that affect length of stay
2. Total length of stay rather than length of stay AFTER the infection has occurred is measured
3. The "cost" of the bed-day is debated

A Matter of Perspective

The Economist

Goal: maximize the amount of health gained from a set resource pool

"The change to cost from a new intervention should be adequately compensated by the change to health benefit"

Cost = $ + **Health benefit** = quality-adjusted life-years or other tangible benefit (e.g. decrease in HAI, bed days)

Opportunity costs important – theoretic decrease in bed days and consumables

The Accountant

Goal: balance the overall budget

Any new intervention must be *at least* "revenue neutral"

Considers the **"fixed"** (infrastructure) (85%) and variable (consumables) costs

Do not consider the **"opportunity costs"**

Let's look at an example

1. Evaluating the impact of an intervention
2. Using an economic evaluation for strategic planning and use of resources

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Major article

Health economic evaluation of an infection prevention and control program: Are quality and patient safety programs worth the investment?

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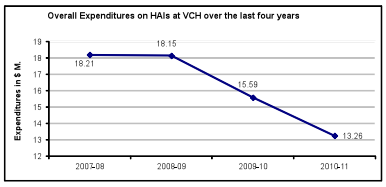
Key Words:
Surveillance
Cost avoidance
Cost-benefit analysis

Background: The effect of regional consolidation of an infection prevention and control (IPC) program on reduction of selected health care-acquired infections (HAIs), the economic burden of these illnesses, and where the potential for greatest financial benefit in reducing infection rates lies was assessed.
Methods: Cost-benefit analysis (in Canadian $) was used to evaluate the effectiveness of a regional IPC program in preventing incident cases of HAIs. The costs of managing these infections, as well as the operational costs of the IPC program were compared against reductions in HAI rates over a 4-year period. Benefits were calculated as cost avoided by reducing HAI cases year over year.
Results: The Health Authority spent more than $66.3 million managing 24,937 HAI cases over the 4-year evaluation period. Urinary tract infections, methicillin-resistant *Staphylococcus aureus*, and bacteremias incurred the greatest costs. A reduction of 4,739 HAI cases led to avoided costs of $91.2 million in 4 years; the IPC program budget was $6.7 million during this period.
Conclusion: Regionalization of the IPC program with standardized policies, procedures, and initiatives led to a 19% reduction in selected HAIs over 4 years and a cost avoidance of at least $9 million. This was particularly evident in years 3 and 4 of the program when $7.2 million (79% of the total) savings were realized.

3. Results
3.1 Evaluation of Costs



VCH spent more approximately $66.3M for the treatment of the selected HAIs over the last 4 years

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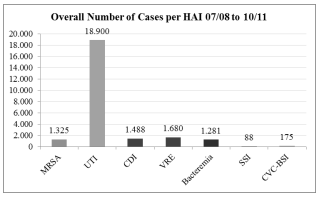
3. Results
3.1 Evaluation of Costs



- UTI is the most common HAI at VCH with 18,900 cases over the last 4 years

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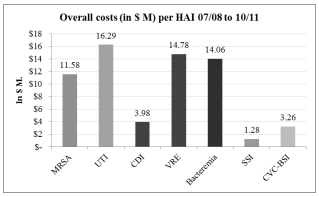
13

3. Results
3.1 Evaluation of Costs



- UTI, VRE, Bacteremia and MRSA are the main cost drivers

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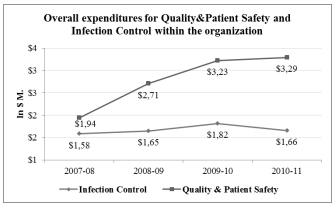
14

3. Results
3.1 Evaluation of Costs



- The total expenditures for the QPS Department were more than **$ 11 M** and **$ 6.7 M** for Infection Control over the last four years
- The increased QPS costs reflect program expansion.

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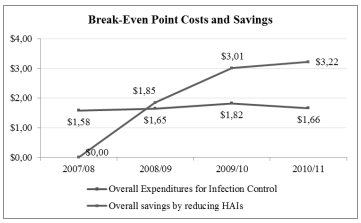
15

3. Results
3.3 Overall Cost-Benefit Analysis



- A break-even point of costs and savings was realized in the second year of evaluation

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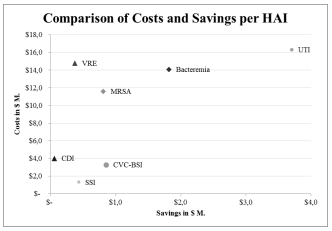
16

3. Results
3.3 Overall Cost-Benefit Analysis



- VRE, MRSA and Bacteremia have the most potential for further benefits

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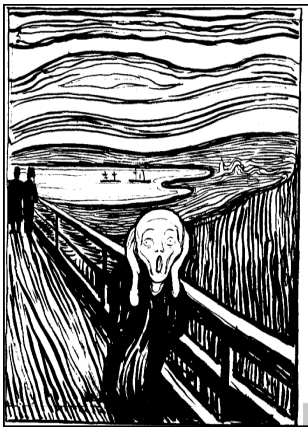

Too much information?

18

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Preparing and Implementing a Business Case

19

When do you need a business case

"A business case is a way of presenting a logical and robust justification for a **significant initiative or change project** for which approval at departmental, directorate or board level is required. It must demonstrate that **all the issues have been systematically and objectively considered "**

From the National Health Services UK

Usually involves sig $ or change In practice

20

Topics

- When you need to prepare a business case
- What should be in it
- Who should be involved
- How should it be communicated

21

The Framework

1. **Background** –*current state, problem/opportunity*
2. **Project Description** – *Objectives, scope, deliverables, operational impacts, strategic alignment*
3. **Costs and Benefits** – *resource requirements, costs and benefits and assumptions*
4. **Risk Assessment** – *project risks and risk of not proceeding with project*
5. **Evaluation** – *how will we know the impacts*
6. **Alternative Analysis** – *what other options are there*
7. **High Level Implementation plan** –*what will be done by when*

22

1. Background: Clearly define the problem

An Example

- Healthcare-associated infections (particularly *C.difficile)* need to be improved
- Roles/Responsibilities for cleaning of portable equipment have never been assigned (ward clutter, hoarding, mixing clean and dirty)
- Cleaning of surfaces impeded by clutter, out-dated tools (e.g. cleaning carts, rags), inadequate instructional aids and logistical issues
- Minimal antimicrobial stewardship program, limited accountability for antimicrobial resistance rates, prescribing practices and drug utilization contributes to the problem

23

2. Project Description: Develop the plan

- What are you trying to improve?
- How will you get there?
- What resources do you need?
- What is the ROI (return on investment)
- How long do you need?

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Current Situation

- **Environmental issues**: clutter, hoarding, poorly maintained and inconsistently cleaned equipment, poor separation clean and dirty, no assigned personnel for mobile equipment
- **Antimicrobial use:** no new antibiotics on horizon, emerging resistance in gram negative rods, lack of monitored policies and protocols, accountability re prescribing practices lacking.

Not delivering Best Value

25

Typical ward clutter in a 6 foot wide hallway

Not enough space in combination with hoarding by staff

Mixing clean and dirty

26

No routine maintenance

27

No routine cleaning for all wheeled equipment

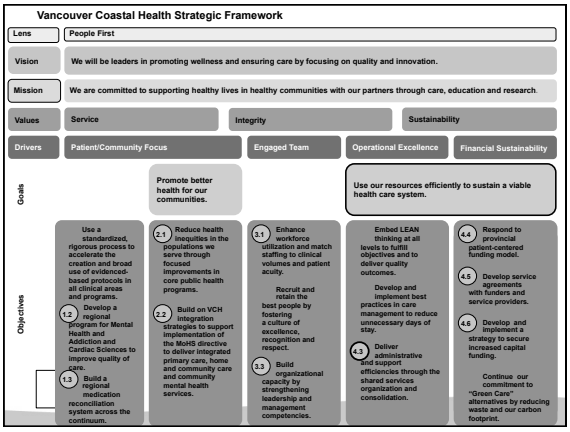
28

The Proposal

- Implement an **environmental program** to improve equipment and surface cleanliness
- Establish a **VCH antimicrobial stewardship** program to ensure appropriate, cost effective antibiotic use
- Implement a **risk-managed approach to the isolation of VRE** positive patients once the two programs are underway.

Decreased healthcare-acquired associated infections following implementation of the two programs

29



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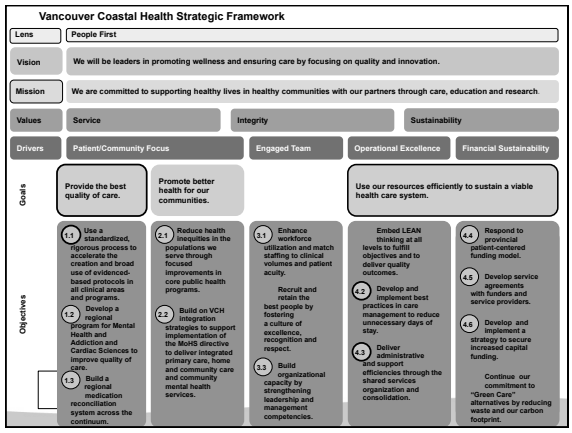

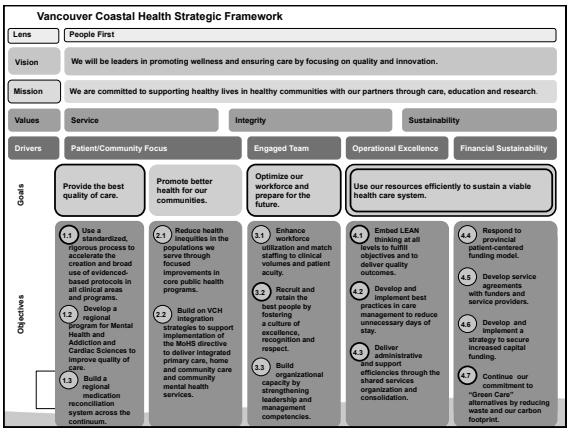

3. Costs and Benefits (Deliverables)

Money, Money, Money…

…is not the only deliverable

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33

Things you may consider

1. Quality Outcomes
- Patient/Employee Satisfaction and Experiences
- ↓ Adverse Events / Occurrences
- ↓ Healthcare Acquired Infections
- Mortality & Morbidity

2. Productivity & Efficiency
- ↓ Length of Stay
- Admissions / Readmissions
- Work Flow / Direct Care Time
- Employee Turnover and Staff Absence
- Reducing Inefficiencies
- Returning time to nursing care

Making Cents

3. Health Economics
- Cost-Benefit Analysis
- Return-on-Investment
- Cost Avoidance
- Access (e.g. additional patient days, beds freed)

4. Program Costs / Investments
- Operational Costs
- Implementation Costs
- Training and Education
- Consultancy Support

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34

1. Evaluating an intervention

Nasal photodisinfection and chlorhexidine wipes decrease surgical site infections: a historical control study and propensity analysis

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Surgical site infections
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SUMMARY

Background: Pre-operative decolonization therapy (DcTx) using chlorhexidine (CHG) body washes and/or intranasal mupirocin can reduce surgical site infections (SSIs), but compliance is often suboptimal.
Aim: To assess the effectiveness of immediate DcTx using a novel approach of intranasal antimicrobial photodisinfection therapy (PDT) combined with CHG body wipes for the reduction of SSIs.
Methods: Between 1st September 2011 and 31st August 2012, 3068 elective cardiac, orthopaedic, spinal, vascular, thoracic and neurosurgical patients were treated with CHG in the 24h preceding surgery, and received intranasal PDT in the pre-operative area. SSI surveillance methodology remained unchanged from previous years and patients were followed for one year. Results were compared with those for a four-year historical control group of 12,387 patients as well as those for a [illegible] matched patients.
Findings: A significant reduction in the SSI rate was observed between DcTx patients and the historical control group [1.68 vs 2.76, $P = 0.0004$, odds ratio (OR) 1.72, 95% confidence interval (CI) 1.2815–2.3453]. This significant reduction was maintained on intent-to-treat analysis ($P = 0.021$, OR 1.37, 95% CI 1.9476–1.7854). Overall compliance with DcTx was 94%. A 1:4 propensity score analysis of matched treated and untreated patients demonstrated that DcTx reduced the risk of SSIs significantly ($P = 0.00026$, [illegible]).
Conclusion: The combination of CHG wipes and PDT immediately before surgery reduced SSIs, achieved [illegible] compliance, and was easily integrated into [illegible] pre-operative routine.

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35

Impact: Financial

Service	Cases Avoided	Case Cost*	Cost Avoidance
Neurosurgery	6	$25,000	$150,000
Cardiovascular	3	$30,000	$90,000
Orthopedics	8	$33,000	$ 264,000
Spine	15	$30,000	$450,000
Vascular	2	$20,000	$ 40,000
Thoracic	1	$10,000	$ 10,000
Total	35**		$1,040,000

*Case Cost provided by A. Karpa Financial Planning and Business Support
**Cases were rounded down by "1"

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Impact: Readmissions

Parameter	Project Period	Average previous two years
Average number of readmissions/Fiscal period	1.25/pd	4.04/pd
Average days stay	16.5	16.5 days
Readmissions/fiscal year	15	48.5
Days Stay x Cost/dy	15 x 16.5 x $500/day = $123,750	48.5 x 16.5 x $500/day = $400,125
Cost Avoidance	$276,375	
Patient Days saved	552	

OPPORTUNITY = 138 additional surgical cases

Impact: Cost Avoidance

1. LPNs able to treat 5176 patients/yr
2. 3608 were cases routinely followed for SSI outcomes
3. *If* remaining 1912 cases had a similar SSI rate reduction (0.016) , 31 additional infections prevented.
4. $20,000/SSI x 31 = **$ 611,840** avoided costs

Total Cost Avoidance: $1,040,000 + $276,375 + $611,840 = $1,928,215

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38

4. Risk Analysis

SWOT ANALYSIS

	Helpful to achieving the objective	Harmful to achieving the objective
Internal origin (attributes of the organization)	Strengths	Weaknesses
External origin (attributes of the environment)	Opportunities	Threats

Strengths:
- Integrated expert infection control team
- A recognized patient priority
- Surveillance system in place
- Strong ties with Patient Safety, Finance, Pharmacy Housekeeping and local Operations

Weaknesses
- No assigned responsibilities for cleaning mobile equipment
- Increasing clutter
- No regional plan for environmental cleanliness
- No regional plan for antimicrobial stewardship
- No infrastructure for either initiative
- No monitoring of outcomes

Opportunities
- Partnerships with industry to assess new cleaning technologies
- Partnerships for student practicums
- PhD health economist for the next two years

Threats
- Inability to transfer "savings" to other cost centres
- Inability to sustain program due to shifting priorities with SET/MOR
- Renegotiation of cleaning contract within next two years

A Practical Example

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39

5. Evaluation: Measureable deliverables

- Identify indicators for each projected benefit
- This comes from being able to define and link each benefit "cause" to an "effect"
- Examples:
  - Improved environmental cleaning will show a change in spot UV audit results
  - Switching to less costly generic drugs that have the same efficacy will ↓overall drug costs

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40

Our deliverables

1. Implement an environmental program to improve equipment and surface cleanliness
2. Establish a VCH antimicrobial stewardship program to ensure appropriate, cost effective antibiotic use
3. Decrease healthcare-associated infections following implementation of the two programs
4. Implement a risk-managed approach to the isolation of VRE positive patients

Metric
↓ Equipment management
↓ Isolation Management Costs
Isolation Cost Avoidance
Product Replacement
↓ Critical incident Reports
Improve use of antibiotics
Decrease costs of antimicrobials
↓ Antibiotic resistance
Decreased rates of: UTIs, MRSA, VRE, VAP, BSI, SSI
Staff Satisfaction
↓ Lab costs

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41

The Budget of Course

- Include both the capital and the operating costs
- Clearly show where financial "savings" or "cost avoidance" will occur
- Be conservative in your estimates of savings!

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Capital
Yr 1 $817,700
Yr 2: $28,575

Operating
Yr 1: $1,485,742
Yr 2: $1,365,742

The program will be self-sustaining by year two

COSTS				
	Year 1 - Request	Year 2 - Sustainment	Year 3 - Sustainment	Comments
Capital Costs				
Renovations	-$ 450,000	$ -	$ -	For centralized space at LGH, VGH and RH
Buckets	-$ 5,700	-$ 575	-$ 575	Separate cloths for toilets, surfaces etc
Microfibre Cloths	-$ 230,000	-$ 16,000	-$ 10,000	Better cleaning and IC (research)
PPE Carriers	-$ 120,000	-$ 10,000	-$ 10,000	To clear the floors for better IC
Bar Coding	-$ 10,000	-$ 2,000	$ -	For software and scanners
Sub-Total	-$ 815,700	-$ 28,575	-$ 20,575	
Operating Costs				
MPs/EAs	-$ 1,000,000	-$ 1,000,000	-$ 1,000,000	To move and clean equipment
1 FTE Project Manager	-$ 120,000	$ -	$ -	To manage and implement the project
Sub-Total	-$ 1,120,000	-$ 1,000,000	-$ 1,000,000	
Antimicrobial Stewardship Costs				
0.5 FTE pharmacist	-$ 64,046	-$ 64,046	-$ 64,046	VGH and program development
0.25 + 0.25 FTE pharmacists for VGH & LGH and RH	-$ 64,046	-$ 64,046	-$ 64,046	VGH and program development
1.0 FTE programmer/data analyst	-$ 73,800	-$ 73,800	-$ 73,800	For data analysis
0.5 FTE Microbiologist/ID specialist	-$ 163,850	-$ 163,850	-$ 163,850	To manage the program
Software Costs	-$ 2,000	$ -	$ -	To manage the program electronically
Sub-Total	-$ 367,742	-$ 365,742	-$ 365,742	
Total	-$ 2,303,442	-$ 1,394,892	-$ 1,386,317	
Potential Annual Cost Avoidance				
PPE Supply Savings (20% error; ALOS 13.7 days; 55% reduction)	$ -	$ 124,000	$ 124,000	No longer spending this money to isolated VRE patients
Wasted Supplies Savings (20% error; 3 transfers; 55% reduction)	$ -	$ 269,650	$ 269,650	Decreased hoarded supplies in isolate VRE rooms
Equipment Savings	$ -	$ 300,000	$ 300,000	No longer need to order as much equipment
Laundry Savings (curtains + gowns)	$ -	$ 148,000	$ 148,000	No longer need to change curtains after each use and use as many isolation gowns
Cleaning Savings (terminal cleans)	$ -	$ 53,000	$ 53,000	ARAMARK savings
ABx AS Savings per 12 months	$ -	$ 636,000	$ 636,000	Antibiotic Savings
Cost Reduction in use of Lab Supplies	$ -	$ 62,000	$ 62,000	Decrease in lab supplies
Sub-Total	$ -	$ 1,592,650	$ 1,592,650	
Total	-$ 2,303,442	$ 1,592,650	$ 1,592,650	
Annual Cost Avoidances		-$ 198,333	$ 206,333	By the 3rd year the project will pay for itself

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6. Analysis of Alternatives

- Be honest and objective about what these are and what the impacts might be
- Illustrate these clearly and logically e.g. use a Pro/Con matrix
- Include the alternative of "doing nothing" and it's impact

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This proposal…

- Is fundamental to quality patient care
- Will decrease healthcare acquired infections
- Will prevent spread of resistant organisms
- Will be self-sustaining
- Will *significantly* improve patient flow
- Will require executive support for change management and sustainment

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7. High Level Implementation Plan

- Who does what and when
  - Think Departments, Clinical areas not people
  - Be sure to include both clinical and operational teams
- Gant charts/timelines
- Communication plan

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The Communication Process

- Start early
- Communicate at all levels
- Include both notification and feedback loops
- Be sure to include both clinical and operational teams
- Ensure that business case teams reports back to their relevant areas

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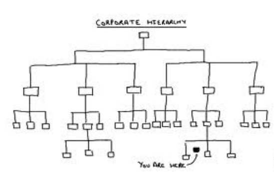
Leadership support is the key

- When we think of leadership we need to think of in context of the layers within the organization
  - Senior Leadership
  - Project Leadership
  - Front Line Leadership



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The Business Case is Accepted!

6. Share the results early and often

1. Regular reporting and updates to leadership team(s)
2. Show them the results early
3. Look for low hanging fruit early
4. Remain focused
5. No surprises – if something goes sideways, must report
6. Spend the money early!

Speak the same language

Be Flexible

- You may have to change your plan along the way
- You may have to play many different roles:
  ... bookkeeper, labour lawyer, coach and expert

stay calm and
REMAIN FOCUSED!

About working together

- Goals have to resonate with the team
- Acknowledge and recognize team effort
- Thank team members
- Report on successes
- Share successes

Conclusions

- Economic Evaluations can provide context and relevance for projects/business cases
- Consider the perspective of the key decision makers in framing your proposal/evaluation
- Be objective in ascertaining costs and benefits
- Ensure "the plan or vision" is relevant, implementable and outcomes are measurable
- Communicate early, broadly, and honestly

Questions

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Coming Soon

September 29 (Free Teleclass ... Broadcast Live from IPS Conference)
THE TIMES THEY ARE A CHANGING
Dr. Evonne Curran, Health Protection Scotland

October 1 (Free Teleclass ... Broadcast Live from IPS Conference)
INFECTION CONTROL IN THE 21ST CENTURY
Dr. Stephanie Dancer, NHS Lankashire

October 2 **INFECTION PREVENTION & CONTROL IN CYSTIC FIBROSIS**
Prof. Lisa Saiman, Columbia University Medical Center, New York

October 8 (Free WHO Teleclass – North America)
PUBLIC REPORTING AND DISCLOSURE OF HAI RATES: POSITIVE IMPACT OR CONFUSION?
Dr. Marianne McGuckin and John Govednik, McGuckin Methods International
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