Evaluating IPC Education in the Workplace

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Content

- The evidence for the effectiveness of education in reducing Healthcare-associated Infections
- The importance of evaluation
- Evaluation strategies
- Use of questionnaires
- Use of the Kirkpatrick model of Evaluation
- Education and compliance with practice
- What does training do for your organisation

Introduction

- Staff education and training is widely regarded as a pivotal measure to reduce the risk of healthcare-associated infection
    - Zingg et al, Lancet (2015)
  - Quality of evidence on education and training
    - 2 of 10 key components of hosp-level IPC

- Healthcare providers provide in-service education and training on IPC to their new and existing staff in varying degrees and through various methods
  - Typically has limited or no link to formal tertiary education structures
  - Although IPC programmes and practitioners devote much time and effort to teach HCWs, how effective is this?

What does the literature say about effectiveness of IPC education?

- It's not good..
  - Ward DJ. The role of education in the prevention and control of infection: a review of the literature. Nurse Education Today (2011) 31(1):9-17
- Review of 39 studies
  - no clear evidence of sustained positive effect on compliance with IPC precautions
  - unclear whether education alone has a significant and sustained effect on infection rates, whether it needs to be combined with other interventions or even if education has any role to play at all
  - questionable whether knowledge increase improves practice
- There is no rigorous and convincing evidence that education improves compliance with infection control precautions or reduces rates of infection, particularly in the long-term

Education does not work?

- Effectiveness of educational interventions to reduce use of carbapenems
  - Prospective 17-month three-phase study
- 8-month pre-intervention period; one-month intervention period (intensive education and awareness campaign); 8-month post-intervention period
  - Shashikala, N. (2016) J Hosp Infect **94**(2): 130-131
- Nothing changed
- Intervention was meetings (content not disclosed); Focus group discussions (no detail); Dissemination of published papers (did anyone read them?)
  - All 'one off' events over one month
- Conclusion:
  - short education programmes are ineffective
  - Never evaluated the programme – went straight to outcome

Education does not work?

- Hand hygiene teaching does not improve compliance
  - Dorsey S, et al 1996. Is handwashing teachable? Academic Emergency Medicine 3 (4), 360–5
  - After two weeks, brightly coloured signs with CDC recommendations for handwashing were posted at all sinks and a copy of a related publication on handwashing by medical personnel was distributed to all staff
  - No formal teaching was provided

- Was this 'teaching'?

Effective outcomes

- Effectiveness of training to improve central line care
  - Perez-Granda, M. J et al (2015). "Effectiveness of a training program in compliance with recommendations for venous lines care." BMC Infect Dis **15**: 296
  - Data from 2 point prevalence documentation reviews a year apart
    - Reduction in inappropriate catheterisation (subjective)
    - Improved documentation of insertion and dressing change
    - Non-significant reduction in infection rate (p=0.52) and the population in the second part of the study were significantly younger
  - Programme: interactive on-line teaching component and distribution of pocket leaflets and posters with recommendations on VL care
    - Not compulsory, compliance or completion rates not recorded
    - Never evaluated

Industry does evaluation of training

- Invests millions in training to gain a competitive advantage
  - Training investment is increasing because learning creates knowledge which differentiates between those companies and employees who are successful and those who are not

- Makes large investments in training and education and view training as a strategy to be successful
  - They expect outcomes or benefits to be measurable

- Evaluation provides data to demonstrate that training does provide benefit

What some think about training

- "If we train them they will leave"

- Perhaps more worrying is what happens if we don't and they stay..

- Train people well enough so they can leave, treat them well enough so they don't want to
  - Richard Branson

Education vs. Training

- Education
  - provides HCWs with a knowledge base and insight that act as a driving force behind future activities
    - There is a hugely motivational aspect to this

- Training
  - task-orientated within a specific working environment
  - helps staff to acquire skills to complete a procedure to a set standard
    - Clinical and non-clinical

"Good news, It's Mandatory Training Day"

Confession Time

- I delivered around 1000 in-house training sessions in my NHS Career
  - I have no idea if they were effective

- People seemed to like them
  - So that's OK then

- Did it change anything?
  - I have no clue
  - Or do I?

Evaluations

- Student rating is a traditional approach to the evaluation of education programmes
  - Educators should instead use self, peer, and mentor rating scales in addition to student rating scales to obtain a range of perspectives
    - Berk, R.A. (2013) Medical Teacher, 35:15-26.

  - These ratings will only give partial information

Student ratings vs. multiple sources of evidence

- In healthcare education, ratings have not received the same level of research attention as other fields
  - There are many behaviours and skills defining teaching effectiveness which students are NOT qualified to rate
    - Tutor's knowledge and content expertise
    - Teaching methods
    - Use of technology
    - Course materials
    - Assessment instruments
    - Grading practices

Questionnaires

- Questionnaires do not replace speaking to people and do not replace qualitative methods
  - If you need to ask why they answered a question in that way, you probably are using the wrong method

- The person filling in the form is disinterested, not paying attention, and will rush through it
  - Anything that can go wrong….

- So the design is important

Questionnaires 1

- Question order matters (a lot)
  - Ask the most important question first
    - In one word, how would you describe the session?
  - Limit the number, eventually 'question fatigue' will sink in and answers will become erratic
    - too weak.
- Yes/no
  - only when it is an easy 'yes/no' question
- Ask questions from top to bottom
  - Columns from left to right lead to confusion, vertical responses seem to be better
    - Dillman DA. Mail and telephone surveys: the total design method. New York: John Wiley & Sons, Inc; 1978

Some guidelines for questionnaires 2

- All questions on a 5 (or odd) point scale and symmetrical
  - Best scale (Likert)
    - Strongly agree, agree, Neither agree nor disagree, Disagree, Strongly disagree
    - An alternate is Excellent, Very Good, Good, Fair, Poor (For ratings)
- Question specific 5 point scale
  - How is the tea in Yorkshire?
    - Much too strong, A little to strong, About right, A little too weak, Much too weak

- Don't ask extra questions just because you can, ask only questions you will act on
  - "Now we would like to move on to Q. 618 concerning the health of your pet fish..."

Bias in questionnaire design
Choi B., Pak A. Prev Chronic Dis. 2005;2(1):1-13

- **Ambiguous question**
  - lead respondents to understand the question differently than was intended and so to answer a different question than was intended

- **Double-barrelled question**
  - made up of two or more questions makes it difficult
    - for the respondent to know which part of the question to answer
    - for the investigator to know which part of the question the respondent actually answered

- **Short question**
  - may not be as accurately answered as questions that are longer

How to cheat

- Manipulate
  - Get an answer you want by putting it after a question that has the desired answer in it
  - Bias towards an answer you want by using a 6 point scale
    - If there is an even number, people will deviate towards the positive

- Phrasing is important
  - People may say "yes" if you ask the question this way
    - Do think hand hygiene is important?
  - But probably will say "no" if you ask the question this way:
   - Is hand hygiene a problem for you?

Analysis

- Don't be depressed if everyone doesn't 'strongly agree' that the training was 'excellent'

    - Respondents usually avoid ends of scales, try to be conservative and be towards the middle
        - Foddy W. Constructing questions for interviews and questionnaires: theory and practice in social research. Cambridge (United Kingdom): Cambridge University Press; 1993
    - Respondents are more likely to check "Agree" or "Disagree" than "Strongly agree" or "Strongly disagree
        - Aday LA. Designing and conducting health surveys. 2nd ed. San Francisco (CA): Jossey-Bass; 1996

Donald Kirkpatrick

- Kirkpatrick developed a model of training evaluation in 1959
- Arguably the most widely used approach
  - Simple, Flexible and Complete
  - 4-level model
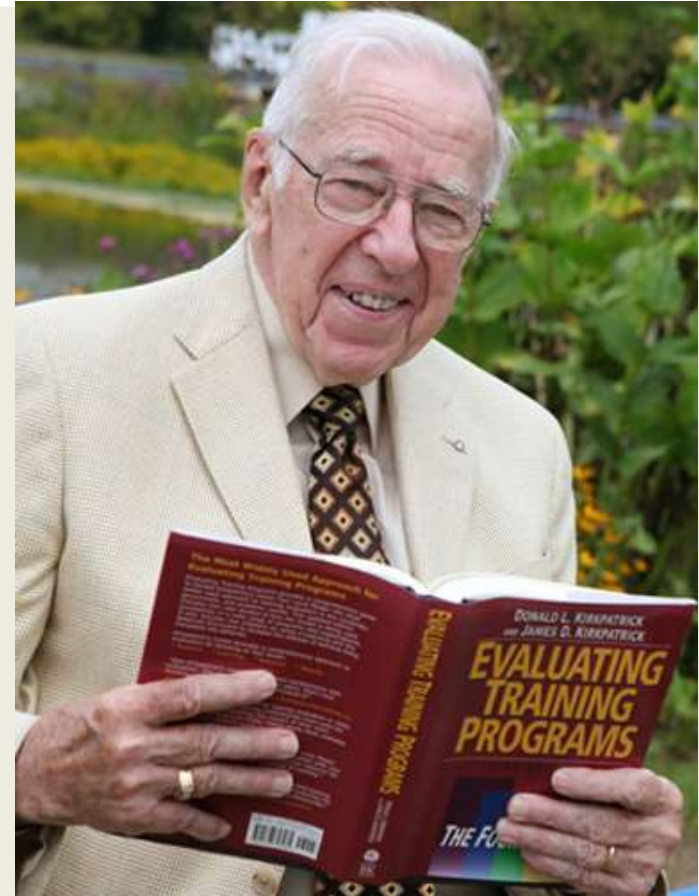
Why Evaluate?

- Should the program be continued?
- How can the program be improved?
- How can we ensure regulatory compliance?
- How can we maximise training effectiveness?
- How can we be sure training is aligned with strategy?
- How can we demonstrate the value of training?

Model of Evaluation Kirkpatrick (1967)

- Industry expects good outputs from sales and manufacturing however make no effort to discover whether training depts are effective

- Proposed 4 levels of outcome evaluation
  - Level 1 – Reaction
  - Level 2 – Learning
  - Level 3 – Behaviour
  - Level 4 – Results
    - Assumption that each level will affect the subsequent level

- Has been criticised for not distinguishing between education (learning) and training (skill)
  - Can be overcome by the selection of appropriate tools

Kirkpatrick
Level 1 - Reaction

- A participant satisfaction measure
  - Were the participants pleased with the program
  - Perception of if they learned anything
  - Likelihood of applying the content
  - Effectiveness of particular strategies and the packaging of the course

- Measures participants reactions to the training program, including:
  - reactions to the overall program (outcomes)
    - "To what extent did you find the training useful?"
  - reactions to specific components of the program (processes) e.g.,
    - What aspect(s) did you most appreciate and find useful and what did you least appreciate and feel is most in need of improvement?
- Consider looking for delayed reactions

Example of Level One

- How much did you know about this subject before taking this training?

Nothing		Some		A lot
1	2	3	4	5

- How much do you know about this subject after this training?

Nothing		Some		A lot
1	2	3	4	5

- Measures intent
  - The question does not assess actual learning, it assesses perceived learning

More Level One

- How likely are you to use some or all of the skills taught in this training in your work?

  Not Very Likely   Likely   Very Likely

 1   2   3   4   5

- Intent
  - Determine participants perceived relevance of the training
  - May correlate with the satisfaction learners feel

Reaction: Relationship to Other Levels

- Positive - can ask trainees if they:
  - Will use new skill(s) or information (Level II)
  - Plan to change behavior (Level III)
  - Expect improvements in results (Level IV)

- Negative - does not:
  - Measure what was learned (Level II)
  - Guarantee behavioural change (Level III)
  - Quantify results from learning (Level IV)
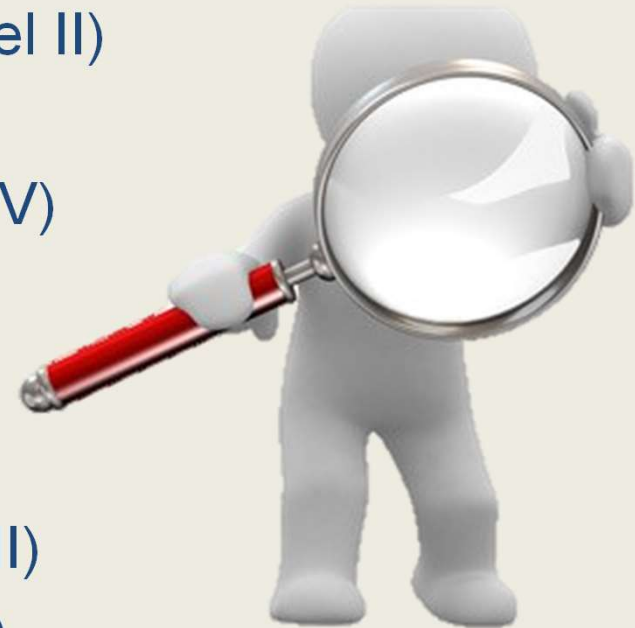
Level 2 - Learning

- Measures what participants have learned from involvement in the program
  - What is measured needs to relate to what was covered in the program, e.g., learning objectives

- Typically covers knowledge, skills, or attitudes
  - Needs to include both rating scales & open-ended questions
  - Can include self-report & tests of actual knowledge

- Use a control group if possible

Level Two Alternative Strategies

- Consider using scenarios, case studies, sample project evaluations, etc, rather than test questions
  - What would you do if.. Etc

- Develop a rubric of desired responses
  - Develop between 3 and 10 questions or scenarios for each main objective.

Learning: Relationships to Other Levels

- Positive - people who learn can:
  - Experience pride (Level I)
  - Experiment with new behaviors (Level III)
  - Achieve better results (Level IV)

- Negative - It does not ensure that they:
  - Liked training program (Level I)
  - Will behave differently (Level III)
  - Will get expected results (Level IV)

Level 3 - Behaviour

- Measures transfer of knowledge, skills & attitudes from the training context to in-vivo or real-life contexts
  - Evaluate both before & after the program if practical
  - Can use survey, focus groups, interviews with students, mentors, staff

- Survey is a practical method
  - Self and peer are both valid

Evaluating Behaviour

- Measure on a before/after basis
  - Otherwise how will you know if a change has taken place?
  - Use a control group if practical
- Allow time for behaviour change to take place & embed
- Survey or interview those who are in the best position to see change
  - Participant/learner
  - Supervisor/mentor
  - Subordinates or peers
  - Others familiar with the participants actions

Behavior: Relationships with Other Levels

- Positive - Can determine:
  - Degree to which learning transfers to the post-training environment (Level II)

- Negative - Cannot determine whether:
  - Participants like the training (Level I)
  - Participants understand (Level II)
  - Behaviors accomplish results (Level IV)

Measurement of Intent

- Comparison of the perception of safety culture and intention to comply with IPC guidelines in professionals who were required by their supervisors to take the course, and those who did so voluntarily
  - Yassi, A et al Can J Infect Dis Med Microbiol 2009;20(1):15-19
  - Those required to take the course had a significantly better perception of the institutional safety climate (P<0.001), and had a higher reported intention to comply with infection control guidelines (P=0.040) than those who took the course voluntarily

Comparison of the mean rank* in the two groups: Voluntary (n=105) and supervisor-required (n=148)

Survey answer	Voluntary	Supervisor-required	P†
Module is applicable to work	125.03	128.40	0.166
Module is satisfactory	132.82	122.87	0.133
Have previous knowledge of infection control	124.24	126.41	0.869
Learning environment exists	109.95	130.87	0.135
Learning opportunities are available	104.12	135.16	0.059
Safety climate exists	97.23	140.22	<0.001
Coworkers encourage infection control practice	115.13	127.06	0.065
Infection control is important in the workplace	108.04	132.27	0.040
The facility ensures staff safety	108.82	131.70	0.021
The facility ensures patient safety	109.25	131.38	0.047
Intend to comply with infection control guidelines	105.49	129.21	0.040

Level 4 - Results

- Nirvana – but not easy

- Measures "return-on-investment", or the extent to which the training/education has produced results

- Some examples include –
  - Hard outcomes
    - Hard data for what was addressed during the training
  - Soft outcomes
    - Staff job satisfaction
    - Staff self-reporting of behaviour change

Measurement of Effectiveness

- Outcome measures
  - Infection rates
    - (CLABSI, SSI, Transmissions etc etc)
  - Product usage (more or less)
    - Reduced (or increased) costs
  - Cleanliness assessment via quantitative methods
- Process measures
  - Adherence to standards; Compliance with interventions (and bundle)
- Many studies report these as positive following educational interventions
  - Majority do not look at whether this was sustained

Results: Relationship to Other Levels

- Positive
  - Positive Levels 1, 2, 3 evaluations results can provide positive Level 4 evidence.
- Negative - Does not:
  - Tell if participants liked training (Level I)
  - Prove trainees understand (Level II)
  - Prove use of preferred behaviors (Level III)

- Positive results at Level Four does not always directly correlate to desired behaviours. It can be easy to attribute 'success' to your efforts but check for other/external factors

Summary of Tools to Purpose

	Level 1	Level 2	Level 3	Level 4
Continue the programme	X		X	
Improve the programme	X	X	X	
Ensure compliance		X		
Enhance effectiveness of training			X	
Align training with strategy			X	X
Demonstrate the value of training	X	X	X	X

Evaluation Techniques

Methods	Evaluation Levels			
	1 Reaction	2 Learning	3 Behaviour	4 Results
Survey	●	●	●	●
Questionnaire/Interview	●	●	●	●
Focus Group	●	●	●	●
Knowledge Test/Check		●		
Skills Observation		●	●	
Presentations		●	●	
Action Planning		●	●	●
Action Learning			●	
Key organisational Metrics				●

Criticism of Kirkpatrick

- Assumption of growing significance from the first to the last level

- Oversimplification of relevant influences on training success

- Unclear cause–effect relations between levels
  - Bates, R. A. (2004), 'A critical analysis of evaluation practice: the Kirkpatrick model and the principle of beneficence', Evaluation and Program Planning, 27, 341–7

Is Evaluation Linked to Transfer of Training?

- Study relationship between training evaluation and the transfer of training
  - Saks, A. M. and L. A. Burke (2012) "An investigation into the relationship between training evaluation and the transfer of training" International Journal of Training and Development **16**(2): 118-127

- Organisations reporting evaluation of training programs more often have a higher rate of transfer of training

- Relationship between training evaluation and transfer stronger immediately after training than 6 months and 1 year after training

Does teaching increase compliance?

- Effectiveness of a nursing IPC educational program presented to nursing students before graduation
  - Al-Hussami M, Darawad M. (2012) AJIC 41(4) 332-6
  - Students randomly assigned to receive defined IPC education
  - All had received some basic IPC in medical and surgical sessions
    - Pretest scores 12.45/30 (range 4-16)

- Hypotheses
  - When compared with a control group, nursing students who complete an infection prevention educational program will demonstrate
    - Increased knowledge of IPC precautions
    - better attitudes toward IPC precautions
    - increased compliance with IPC precautions

Does teaching increase compliance?

- Knowledge
  - Assessed by test
    - 9 true/false and 21 multi-choice questions
- Attitude
  - 11 questions measuring attitudes toward choosing personal protective equipment (PPE), donning PPE and high-risk procedures
  - Responses used a 5-point Likert scale, ranging from 1, "strongly disagree" to 5, "strongly agree"
- Results
  - Participants in the experimental group demonstrated significantly better knowledge ($t = 19.15$; $df = 95$; $P = .000$) and attitude scores ($t = 2.29$; $df = 46$; $P = .04$) than in the control group

Does teaching increase compliance? – 2

- Compliance
  - cross-sectional survey was conducted to investigate the nurses' knowledge of and compliance with Universal Precautions (UP) in an acute hospital in Hong Kong
    - Chan R et al.. Int J Nurs Stud 2002;39:157-63
  - Self-evaluated using a tool containing 15 items scored on a 4-point Likert scale, ranging from 1 "never," to 4 "always", with higher scores indicating better compliance with standard precautions
    - areas related to the use of PPE, disposal of sharps, disposal of waste, decontamination, prevention of cross infection
  - no significant relationships between the nurses' knowledge and compliance with UP

- Spot the flaw?

Sustainability

- "He that complies against his will,
Is of his own opinion still;
Which he may adhere to, yet disown,
For reasons to himself best known"
    - *'Hudibras'* (1678) poem by Samuel Butler (1612-80)

- Trying to find out why the opinion has not changed is vital

Competency-based training
Salaripour & Perl (2013) CJIC 28(1) 13-16

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- Evaluation of mandatory training
  - Random professionals from various occupations and a mixture of hospital units
- Pre and post-training short questionnaires
  - new employees before and after IPC orientation sessions
  - Examined knowledge retention, included elements that captured knowledge, practice of and attitude to IPC
  - retention questionnaire given to staff employed at least one year and up to three years from initial employment
  - Both surveys included five multiple-choice questions
    - Each question was given one point
    - Points were added to give a maximum score of five

Results

- 86% of hospital staff trained by Sept 2007
  - 207 pre-test and 244 post-test surveys were completed
  - 93 retention surveys
- Correct answers to all questions
  - Pre-test 32.8%
  - Post-test 53.6%
    - A significant difference between the knowledge level of the two stages of the surveys taken before and after the workshop was identified ($P< 0.0001$)
- Sustained?
  - Knowledge at one year was actually lower than pre-testing
  - Retention test 0.03%

Discussion

- Knowledge gained was very short-term
  - retention drop in health workers that were tested at least a year after initial training is suggestive of the need for re-education at shorter intervals

- Nurses find that educational modules are more effective when nurses' needs are included in structuring their components
    - Cheng SM, et al Can J Infc Control, (2008) 23(3): 165-71

Effect of Training

Ineffective (or no) training	Effective training
• Organisational ○ Poor job performance ○ Low job satisfaction ○ Safety hazards and injuries ○ Lower patient satisfaction ○ Legal repercussions ○ Waste of resources • For IPC ○ Infections ○ Transmission ○ Increased length of stay ○ Increased cost	• Organisational ○ Improved Quality of Work ○ Better Team Performance ○ Increased Productivity ○ Improved employee health and Org. safety record ○ Increased patient satistaction ⚹ Don't forget patient 'choice' ○ Staff Retention ○ Increased morale • And some for IPC..

Maybe the tide is turning

- Hours of infection prevention education received significantly associated with student nurses' self-reported ability to comply with infection prevention practices

  - Carter, E. J. et al Nurse Education Today (2017) In Press doi:10.1016/j.nedt.2017.02.021

  - Unevaluated, but related to the amount of time exposed to IPC education

- Quality vs. quantity argument still must be addressed

Don't be afraid to evaluate!

- You may be pleasantly surprised
  - You will never be the worst evaluated part of Mandatory Training
    - That is the role of 'Data Protection' and others

- You will be able to demonstrate the value of training and of your team
  - and maybe it will help you argue for more access to training

- All training provided in the organisation should be evaluated in some form
  - that includes training provided by external providers