Evaluation of Behaviour Change Interventions to Increase the Use of Pneumatic Otoscopy in Family Medicine

A Pilot Randomized Trial

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Objectives

- To understand the importance of conducting pilot study of complex behavior change intervention trial
- To highlight the importance of long term follow-up in behavior change intervention
- To discuss the lessons learned and the methodological challenges related to a larger trial
Acknowledgments

• Co-investigators
  • Eva Ouedraogo
  • France Légaré
  • Michel Cauchon
  • Émilie Tardieu

• Sponsors
  • KT-Canada
  • Canada’s Health Research Foundation (HRF)
Plan

• Background
• Preliminary studies
• Development of the interventions
• Pilot study
• Results
• Lessons learned
• Next trial
Background
What is Pneumatic Otoscopy?
Pneumatic Otoscopy

Hamid R Djalilian, MD
Director of Otology and Neurotology
University of California, Irvine
All North-American Guidelines Recommend Pneumatic Otoscopy

• Clinicians should use pneumatic otoscopy as the primary diagnostic method for OME. Strong Recommendation

  AAFP, AAP, AAO-HNS 2004

• To diagnose AOM the clinician should confirm a history of acute onset, identify signs of middle-ear effusion (MEE), and evaluate for the presence of signs and symptoms of middle-ear inflammation.

  AAFP, AAP 2004

• To properly diagnose AOM, there must be fluid behind the tympanic membrane… An immobile tympanic membrane (as demonstrated by pneumatic insufflation…)

  Canadian Pediatric Society 2009

• Clinicians should not diagnose AOM in children who do not have middle ear effusion... (Strong Recommendation) The pneumatic otoscope is the standard tool used in diagnosing OM.

  AAP 2013
Are Family Physicians Using Pneumatic Otoscopy?
Preliminary studies (2011-2012)
ACTION CYCLE
(Application)
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ACTION CYCLE
(Application)

Assess Barriers/Facilitators to Knowledge Use

Select, Tailor, Implement Interventions
Monitor Knowledge Use
Evaluate Outcomes
Sustain Knowledge Use
Adapt Knowledge to Local Context

Identify Problem
Determine the Know/Do Gap
Identify, Review, Select Knowledge

Tailoring Knowledge
Knowledge Synthesis
Knowledge Inquiry
Knowledge Tools/products

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Use and teaching of pneumatic otoscopy in a family medicine residency program

Eva Ouedraogo MD MSc CCFM FCFP  Michel Labrecque MD PhD  Luc Côté MSW PhD  Katerine Charbonneau MD  France Légaré MD PhD CCFP FCFP

Abstract

Objective To determine to what extent FPs teach and use pneumatic otoscopy and to identify the chief influences on this behaviour.

Design  A mixed-method study, using a survey and a qualitative methodology, to examine the uptake and facilitators of and barriers to the use of pneumatic otoscopy.

Participants In total, 211 French-speaking医疗服务 physicians in 12 FPTUs in Quebec, Canada.

Methods The survey was divided into two parts: the first part captured demographic and practice information, the second asked to rate their level of comfort. The qualitative part aimed to delineate the main barriers to teaching and use of pneumatic otoscopy.

Main equipment taught: The residents were asked to rate the equipment on a 1-5 scale (1=lowest comfort level, 5=most comfortable). The mean intention to use was 2.4±1.0.

86% of the residents wanted to learn the technique.

Main barriers

- Equipment
- Clinical utility
- Capacity to perform
- Socio-professional norm/role model

Conclusion Pneumatic otoscopy is minimally used and taught in the family medicine residency program studied. Interventions to increase its use should target identified underlying beliefs and facilitators of and barriers to its use and teaching.

Ouedraogo et al. Can Fam Physician 2013
Select, Tailor, Implement Interventions

Assess Barriers/Facilitators to Knowledge Use

Monitor Knowledge Use

Evaluate Outcomes

Sustain Knowledge Use

Adapt Knowledge to Local Context

Tailoring Knowledge

Tailoring Knowledge

Identify Problem

Identify, Review, Select Knowledge

Determine the Know/Do Gap

Knowledge Synthesis

Knowledge Inquiry

Knowledge Products/Tools

Knowledge Creation

ACTION CYCLE
(Application)
Development of Interventions (2012-2013)

**Development**
- Identifying the evidence base
- Identifying or developing theory
- Modelling process and outcomes

**Feasibility and piloting**
- Testing procedures
- Estimating recruitment and retention
- Determining sample size

**Evaluation**
- Assessing effectiveness
- Understanding change process
- Assessing cost effectiveness

**Implementation**
- Dissemination
- Surveillance and monitoring
- Long term follow-up
Mapping of Theoretically Derived Behavioral Determinants to Behavior Change Techniques

<table>
<thead>
<tr>
<th>Technique for behaviour change</th>
<th>Techniques judged to be effective in changing each construct domain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal/target specified: behaviour or outcome</td>
<td>1</td>
</tr>
<tr>
<td>Monitoring</td>
<td></td>
</tr>
<tr>
<td>Self-monitoring</td>
<td></td>
</tr>
<tr>
<td>Contract</td>
<td></td>
</tr>
<tr>
<td>Rewards; incentives (inc. self-evaluation)</td>
<td></td>
</tr>
<tr>
<td>Graded task, starting with easy tasks</td>
<td></td>
</tr>
<tr>
<td>Increasing skills: problem-solving, decision-making, goal-setting</td>
<td></td>
</tr>
<tr>
<td>Stress management</td>
<td></td>
</tr>
<tr>
<td>Coping skills</td>
<td></td>
</tr>
<tr>
<td>Rehearsal of relevant skills</td>
<td></td>
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<tr>
<td>Role-play</td>
<td></td>
</tr>
<tr>
<td>Planning, implementation</td>
<td></td>
</tr>
<tr>
<td>Prompts, triggers, cues</td>
<td></td>
</tr>
<tr>
<td>Environmental changes (e.g. objects to facilitate behaviour)</td>
<td></td>
</tr>
<tr>
<td>Social processes of encouragement, pressure, support</td>
<td></td>
</tr>
<tr>
<td>Persuasive communication</td>
<td></td>
</tr>
<tr>
<td>Information regarding behaviour, outcome</td>
<td></td>
</tr>
<tr>
<td>Personalised message</td>
<td></td>
</tr>
<tr>
<td>Modelling/demonstration of behaviour by others</td>
<td></td>
</tr>
<tr>
<td>Homework</td>
<td></td>
</tr>
<tr>
<td>Personal experiments, data collection (other than self-monitoring of behaviour)</td>
<td></td>
</tr>
<tr>
<td>Experiential: tasks to gain experiences to change motivation</td>
<td></td>
</tr>
<tr>
<td>Feedback</td>
<td></td>
</tr>
</tbody>
</table>

Techniques judged to be effective in changing each construct domain:

1. Social/Professional role and identity
2. Knowledge
3. Skills
4. Beliefs about capabilities
5. Beliefs about consequences
6. Motivation and goals
7. Memory, attention, decision processes
8. Environmental context and resources
9. Social influences
10. Emotion
11. Action planning

Mapping 1

**Behavioral Determinants**
- Capacity to perform the technique
- Beliefs about the clinical utility
- Socio-professional norm
- Role model
- Environmental context/resources

**Behavior Change Techniques**
- Goals/targets specified
- Graded tasks
- Increasing skills: problem-solving
- Rehearsal of skills
- Social pressure/support
- Modelling/demonstration by others
- Information regarding behavior
- Persuasive communication
- Environmental changes
Mapping 2

- Beliefs about the clinical utility
- Socio-professional norm/Role model
- Persuasive communication
- Persuasive communication
- Equipment
- Hands-on training
- Capacity to perform the technique
Persuasive Communication

• 60-minute workshop
• Based on the Elaboration Likelihood Model (ELM)
  • Central route to persuasion (cognitive)
  • Peripheral route to persuasion (affective)
• Messages
  • Clinical utility, role modelling, socio-professional norm (practice guidelines) and capacity (online training modules)
  • Reviewed by an expert from the Montreal Behavioural Medicine Centre
• Interactive
  • Reinforcement of positive attitude
  • Counter arguments to negative comments
• Action plan to implementation
• Pre-tested in one FTPU (2012)

Grimshaw et al. Health Technol Asses. 2004

• Short
• Small-group
• Interactive
• At lunchtime
• In work setting
Hands-on Training

• 60-minute workshop
• Brief presentation on how to perform the technique
• Three stations supervised by an expert peer
  • Station 1: between colleagues
  • Station 2: ear simulator (without effusion)
  • Station 3: ear simulator (with effusion)
• Action plan to implementation

Persuasive Communication + Hands-on Training

- 90-minute workshop

**Development**
- Identifying the evidence base
- Identifying or developing theory
- Modelling process and outcomes

**Feasibility and piloting**
- Testing procedures
- Estimating recruitment and retention
- Determining sample size

**Evaluation**
- Assessing effectiveness
- Understanding change process
- Assessing cost effectiveness

**Implementation**
- Dissemination
- Surveillance and monitoring
- Long term follow-up

Peter Craig et al. BMJ 2008;337:bmj.a1655
Pilot Study (2013-2015)
ACTION CYCLE  
(Application)
ACTION CYCLE
(Application)

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Objectives (1)

• To determine **feasibility** and **acceptability** of interventions designed to improve the use of pneumatic otoscopy for the diagnosis of otitis media
  • **Recruitment rate** of FPTUs, healthcare professionals, and patients
  • **Participation rate** of healthcare professionals in workshops and their **assessment**
  • **Reliability of methods to assess use** of pneumo-otoscopy in practice
  • Opinions about the **most appropriate interventions** would be for a larger trial.
Objectives (2)

- To explore the **effect** of the interventions on:
  - **actual use** in practice at 6-8 weeks after the workshops
  - **intention** to use pneumatic otoscopy at baseline, immediately after, 8-11 weeks, and 14-15 months after the workshops
  - **self-reported use** at baseline, at 8-11 weeks, and 14-15 months after the workshops
Study Design

- Clustered randomized trial in 4 FPTUs
- Inspired by $2 \times 2$ factorial design
Study Design

1
2
3
4
FPTUs assessed for eligibility n=9

- Persuasive communication group
  - Eligible health professionals (n=47)
  - Excluded (n=5)
    - Non eligible (n=2)
    - Refused (n=1)
    - Eligible randomly excluded (n=2)

- Hands-on training group
  - Eligible health professionals (n=39)

- Combined group
  - Eligible health professionals (n=13)

- Control group
  - Eligible health professionals (n=43)

Completed survey 1: Baseline measures including intention to use

- Attended workshop (n=33; 70%)
  - Completed survey 2 (post-workshop): satisfaction measures including intention to use
    - n=33 (100%)

- Attended workshop (n=22; 56%)
  - n=22 (100%)

- Attended workshop (n=11; 85%)
  - n=11 (100%)

- Attended information session (n=32; 78%)
  - n=41 (93%)
FPTUs assessed for eligibility n=9

- Persuasive communication group
- Hands-on training group
- Combined group
- Control group

- Eligible health professionals (n=47)
- Eligible health professionals (n=39)
- Eligible health professionals (n=13)
- Eligible health professionals (n=43)

- 6 accepted / 7 eligible (86%)

- Attended workshop (n=33; 70%)
- Attended workshop (n=22; 56%)
- Attended workshop (n=11; 85%)
- Attended information session (n=32; 78%)

- Completed survey 2 (post-workshop): satisfaction measures including intention to use
  - n=33 (100%)
  - n=22 (100%)
  - n=11 (100%)

- Excluded (n=5)
  - Non eligible (n=2)
  - Refused (n=1)
  - Eligible randomly excluded (n=2)

- Physicians, residents and nurse practitioners who intended to work in the participating FPTUs over the next 12 weeks
  - 6 accepted / 7 eligible (86%)
Measures of actual use in practice 6-8 weeks post-workshop

- Persuasive communication group: 10 (21%) HP recruited, 34 patients
- Hands-on training group: 13 (33%) HP recruited, 28 patients
- Combined group: 7 (54%) HP recruited, 18 patients
- Control group: 12 (28%) HP recruited, 37 patients

Completed survey 3: measures of intention to use 8-11 weeks post-workshop

- Persuasive communication group: n=25 (53%)
- Hands-on training group: n=23 (59%)
- Combined group: n=9 (69%)
- Control group: n=34 (79%)

Completed survey 4: measures of self-reported use and intention to use 14-15 months post-workshop

- Persuasive communication group: n=11 with 7 (64%) former participants
- Hands-on training group: n=20 with 12 (60%) former participants
- Combined group: n=13 with 9 (69%) former participants
- Control group: n=22 with 13 (59%) former participants
Measures of actual use in practice 6-8 weeks post-workshop

<table>
<thead>
<tr>
<th>Group</th>
<th>HP Recruited</th>
<th>Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persuasive communication group</td>
<td>10 (21%)</td>
<td>34</td>
</tr>
<tr>
<td>Hands-on training group</td>
<td>13 (33%)</td>
<td>28</td>
</tr>
<tr>
<td>Combined group</td>
<td>7 (54%)</td>
<td>18</td>
</tr>
<tr>
<td>Control group</td>
<td>12 (28%)</td>
<td>37</td>
</tr>
</tbody>
</table>

Completed survey 3: measures of intention to use 8-11 weeks post-workshop

<table>
<thead>
<tr>
<th>Group</th>
<th>Participants</th>
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<tr>
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</tr>
<tr>
<td>Combined group</td>
<td>n=13 with 9 (69%) former participants</td>
</tr>
<tr>
<td>Control group</td>
<td>n=22 with 13 (59%) former participants</td>
</tr>
</tbody>
</table>

Adults or children
- consulting for symptoms compatible with otitis media
- attending HP judged it necessary to diagnose or rule out otitis media
Measures of actual use in practice 6-8 weeks post-workshop

- 10 (21%) HP recruited 34 patients
- 13 (33%) HP recruited 28 patients

Completed survey 3: measures of intention to use 8-11 weeks post-workshop

- n=25 (53%)
- n=23 (59%)
- n=9 (69%)
- n=34 (79%)

Completed survey 4: measures of self-reported use and intention to use 14-15 months post-workshop

- n=11 with 7 (64%) former participants
- n=20 with 12 (60%) former participants
- n=13 with 9 (69%) former participants
- n=22 with 13 (59%) former participants
Measures of actual use in practice 6-8 weeks post-workshop

10 (21%) HP recruited
34 patients

Completed survey 3: measures of intention to use
8-11 weeks post-workshop

n=25 (53%)

Persuasive communication group
Hands-on training group
Combined group
Control group

1. HPs’ questionnaire
2. Patients’ questionnaire
3. Evaluation by research assistant before and after each half-day session of consultations:
   • Picture of pneumatic otoscope
   • Count of speculum tips

Completed survey 4: measures of self-reported use and intention to use
14-15 months post-workshop

n=11 with 7 (64%) former participants
n=20 with 12 (60%) former participants
n=13 with 9 (69%) former participants
n=22 with 13 (59%) former participants
Impact Results
Measures of Actual Use of Pneumatic Otoscopy

<table>
<thead>
<tr>
<th>Measures of actual use</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPs’ questionnaire</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>50 (43)</td>
</tr>
<tr>
<td>No</td>
<td>67 (57)</td>
</tr>
<tr>
<td>Patients’ questionnaire</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>47 (41)</td>
</tr>
<tr>
<td>No</td>
<td>60 (52)</td>
</tr>
<tr>
<td>Don’t know</td>
<td>8 (7)</td>
</tr>
<tr>
<td>Missing values</td>
<td>2 (2)</td>
</tr>
<tr>
<td>Pictures + counts</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>77 (66)</td>
</tr>
<tr>
<td>No</td>
<td>36 (31)</td>
</tr>
<tr>
<td>Don’t know</td>
<td>4 (3)</td>
</tr>
</tbody>
</table>

Agreement

- **HPs-patients:**
  - 90%
  - Kappa 0.8 (95% CI 0.7-0.9)

- **HPs-pictures:**
  - 72%
  - Kappa 0.5 (95% CI 0.3-0.6)

- **Patients-pictures:**
  - 70%
  - Kappa 0.4 (95% CI 0.3-0.6)
Actual Used of Pneumatic Otoscopy

Chi-square df=3, p=0.01
Intention to use pneumatic otoscopy in patients with suspicion of otitis media

<table>
<thead>
<tr>
<th>Intention</th>
<th>Study groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Persuasive Communication</td>
</tr>
<tr>
<td><strong>Before workshop</strong></td>
<td></td>
</tr>
<tr>
<td>Mean ± sd (on 7)</td>
<td>3.7 ± 1.5</td>
</tr>
<tr>
<td>Yes n/N (%)</td>
<td>19/35 (54)</td>
</tr>
<tr>
<td><strong>After workshop</strong></td>
<td></td>
</tr>
<tr>
<td>Mean ± sd(on 7)</td>
<td>5.4 ± 1.4</td>
</tr>
<tr>
<td>Yes n/N (%)</td>
<td>30/32 (94)</td>
</tr>
<tr>
<td><strong>8-11 weeks</strong></td>
<td></td>
</tr>
<tr>
<td>Mean± sd (on 7)</td>
<td>5.0 ± 1.7</td>
</tr>
<tr>
<td>Yes n/N (%)</td>
<td>19/22 (79)</td>
</tr>
<tr>
<td><strong>14-15 months</strong></td>
<td></td>
</tr>
<tr>
<td>Mean± sd (on 7)</td>
<td>3.4 ± 1.9</td>
</tr>
<tr>
<td>Yes n/N (%)</td>
<td>3/11 (27)</td>
</tr>
</tbody>
</table>
Mean Score of Intention to use Pneumatic Otoscopy

Before workshop  | After workshop  | 8-11 weeks  | 14-15 months
--- | --- | --- | ---
Persuasive Communication | Hands-on training | Combined | Control

0 | 1 | 2 | 3 | 4 | 5 | 6 | 7
Proportion of HPs who Intend to Use Pneumatic Otoscopy

Participation to workshop
Yes = 37% vs. No = 28%
p = 0.51
Reported Use of Pneumatic Otoscopy Before and 6-8 Weeks After the Workshops...

- **Before (n=114)**
- **After (n=88)**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>Rarely</td>
<td>10%</td>
<td>0%</td>
</tr>
<tr>
<td>Half the time</td>
<td>20%</td>
<td>0%</td>
</tr>
<tr>
<td>Often</td>
<td>30%</td>
<td>0%</td>
</tr>
<tr>
<td>Always</td>
<td>40%</td>
<td>0%</td>
</tr>
<tr>
<td>Don't know PO</td>
<td>50%</td>
<td>0%</td>
</tr>
</tbody>
</table>
... and 14-15 Months After the Workshops

Bar chart showing the percentage of people who never, rarely, half the time, often, always, or don't know PO before and after workshops. The chart includes data for 14-15 months (n=63) and before (n=114) and after (n=88) workshops.
Reported Use of the Pneumatic Otoscopy
Why?

- No compliance with action plan
  - To complete online course on OM: 5%
  - To get further training: 0%
  - To practice on normal adults: 14%
  - To ask residents to do it: 22%
Why?

• Same barriers as in 2011 study…
  • Equipment
  • Clinical utility
  • Capacity to perform
  • Socio-professional norm/role model
And if we were to conduct another RCT...

- Preferred workshop for themselves or for colleagues
  - Combined workshop: 76%
  - Hands-on training: 21%
  - Persuasive communication: 3%
Lessons Learned
Main Lessons Learned

• RCT feasible… at least in FPTU settings
• Interventions all effective on short term
• None of the interventions effective on the long run
• But enough to get early adopters on board…?
Main Lessons Learned

INNOVATION ADOPTION LIFECYCLE

- Early Adopters: 13.5%
- Innovators: 2.5%
- Early Majority: 34%
- Late Majority: 34%
- Laggards: 16%

Next Trial
Population
Intervention
Control
Outcome
Population

- Further interventions in the same cohort?
- Different cohort
  - Teaching/non-teaching units?
  - Family medicine/pediatrics?
- Pilot/larger trial?
Interventions

• Combined workshop
  • Persuasive communication + Hands-on training

• Add other interventions to sustain use?
  • Contracts
  • Audits and feedback
  • Reminders
  • Rehearsal of workshops/practice
  • Opinion leaders/champions (early adopters)
  • Others?
Outcomes

- Confirm short term use
- Measures of long term use?
  - Actual use
    - HP-patient questionnaires
  - Self-reported
  - Intention
- Qualitative data to better understand the results