

# Using knowledge transfer principles in ergonomic tool development for Firefighters and Paramedics

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# Same task = Different mechanics



Ottawa Paramedic Service, 2015



What's the same?



Hamilton Professional Firefighters, 2013



What's different?



Hamilton Professional Firefighters, 2013

# Outline

- Integrated Knowledge Translation (iKT)
  - What is it and Why use it..?
- Firefighter Injury Prevention Research
  - Developing a Firefighter Physical Demands Analysis
  - City of Hamilton; Hamilton Professional Firefighters Association
- Developing a Paramedic Pre-Employment Screen
  - City of Ottawa, CUPE, Ottawa Paramedic Service
- Lessons Learned
  - Considerations when creating an integrated, sustainable, evidence-based injury prevention program

# Research in Work Environments

- Complex process mediated by:
  - Legal, administrative, cultural influences
  - Organizational barriers to change
  - Employee attitudes to workplace interventions (i.e., RTW planning)
- Recommendation...?!
  - Include ALL stakeholders in the research process!
  - Knowledge Translation theory (?)



Hamilton Firefighter Researchers

# Knowledge Translation

- Knowledge Translation *Practice* is about:
  - Making users aware of knowledge and facilitating their use of it to improve health and health care systems
  - Closing the gap what we know and what we do
  - Moving Knowledge into Action
- Knowledge Translation *Science* is about:
  - Studying the determinants of knowledge use and effective methods of promoting the uptake of knowledge

# CIHR and Knowledge Translation

- Knowledge Translation defined by the Canadian Institutes of Health Research:

“..a **dynamic and iterative process** that includes **synthesis, dissemination, exchange** and ethically sound application of knowledge to improve the health of Canadians, provide more effective health services and products and strengthen the health care system.”

# Mode 1 KT: End of Grant (Diffusion)

Activities that tailor a message and medium to a specific/targeted audience.

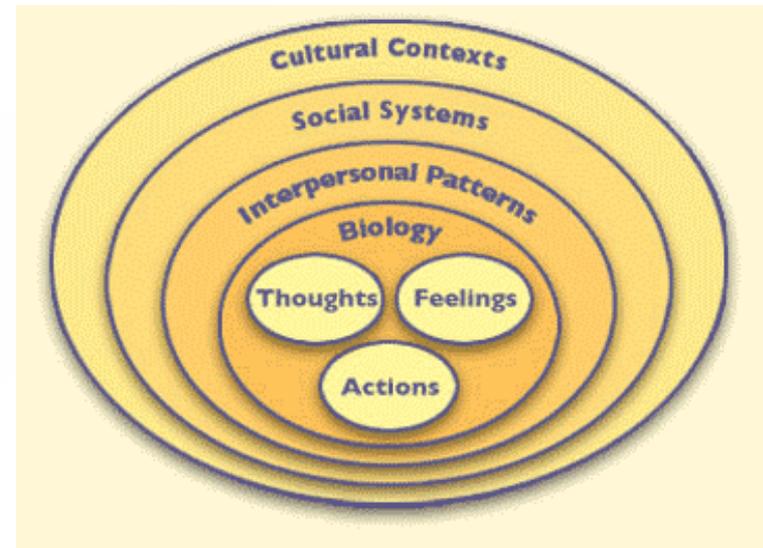
- Conference presentations
- Peer Review publications
- Non-peer reviewed publications
- Website development
- Tools
- Summary briefings to stakeholders
- Educational Sessions with knowledge users
- Use of knowledge brokers to disseminate scientific information

# Mode 2 KT: Integrated Knowledge Translation (iKT)

- Stakeholders or potential research knowledge users are engaged in the entire research process
- Collaborating to shape research process (research questions, methodology, being involved in data collection and tool development, interpreting the results and dissemination)
- Produces research results that are more contextually relevant

# WHY use a theoretical framework in occupational research?

- Models, theories and frameworks frame KT Practice and KT Science



# Theoretical Framework is analogous to a recipe!

## KNOWLEDGE TRANSLATION THEORY

### TIME NEEDED

Depends on what behaviour you are changing

### INGREDIENTS

- Constructs (thoughts, feelings)

### STEPS

- How constructs fit together

## THE BEST CHOCOLATE CAKE RECIPE {EVER}

★★★★★  
4.8 from 614 reviews

PREP TIME	COOK TIME	TOTAL TIME
15 mins	30 mins	45 mins

**Chocolate Cake with decadent chocolate frosting that will quickly become your favorite!**

Author: Robyn Stone | Add a Pinch

Cuisine: Dessert  
Serves: 12

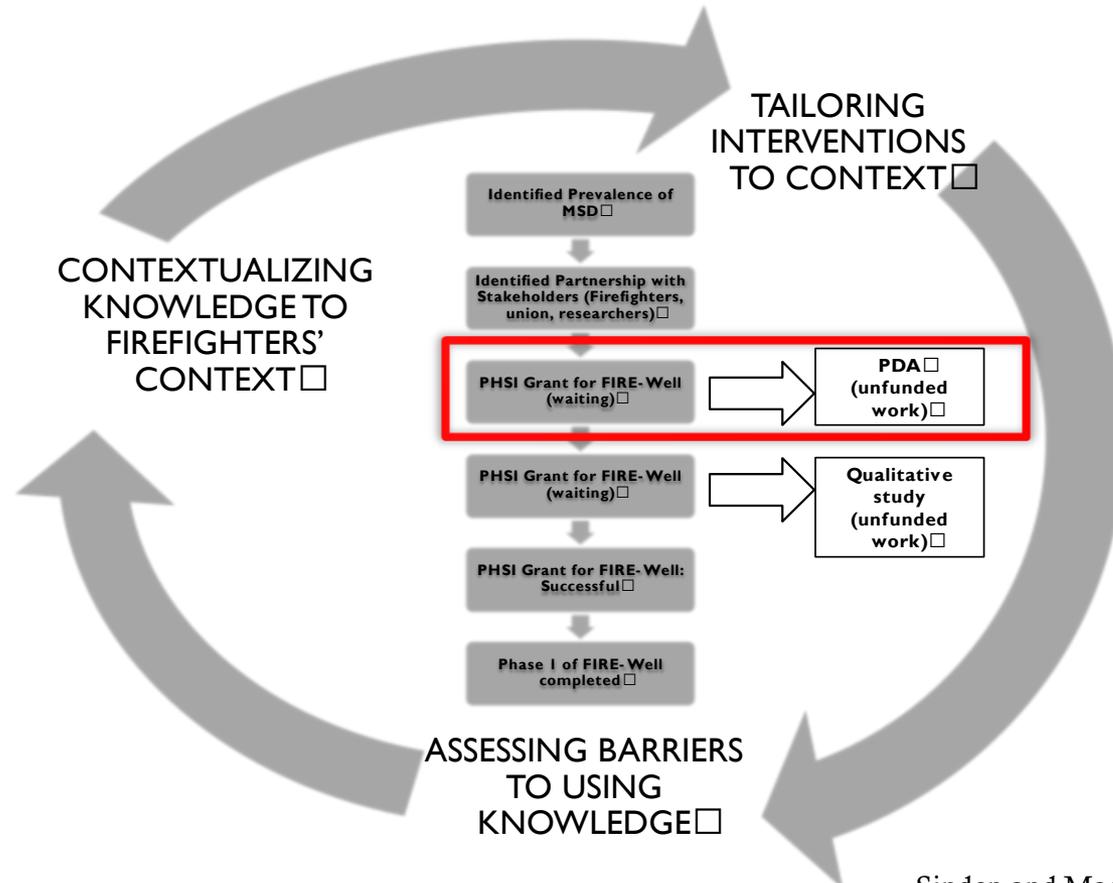
### INGREDIENTS

- **Chocolate Cake**
- 2 cups all-purpose flour
- 2 cups sugar
- $\frac{3}{4}$  cup unsweetened cocoa powder
- 2 teaspoons baking powder
- $1\frac{1}{2}$  teaspoons baking soda
- 1 teaspoon salt
- 1 teaspoon espresso powder
- 1 cup milk
- $\frac{1}{2}$  cup vegetable oil
- 2 eggs
- 2 teaspoons vanilla extract
- 1 cup boiling water



PRINT

# Developing Collaborative Research: A Work-Health Context



# Developing a Firefighter PDA

*Two Primary Project Goals:*

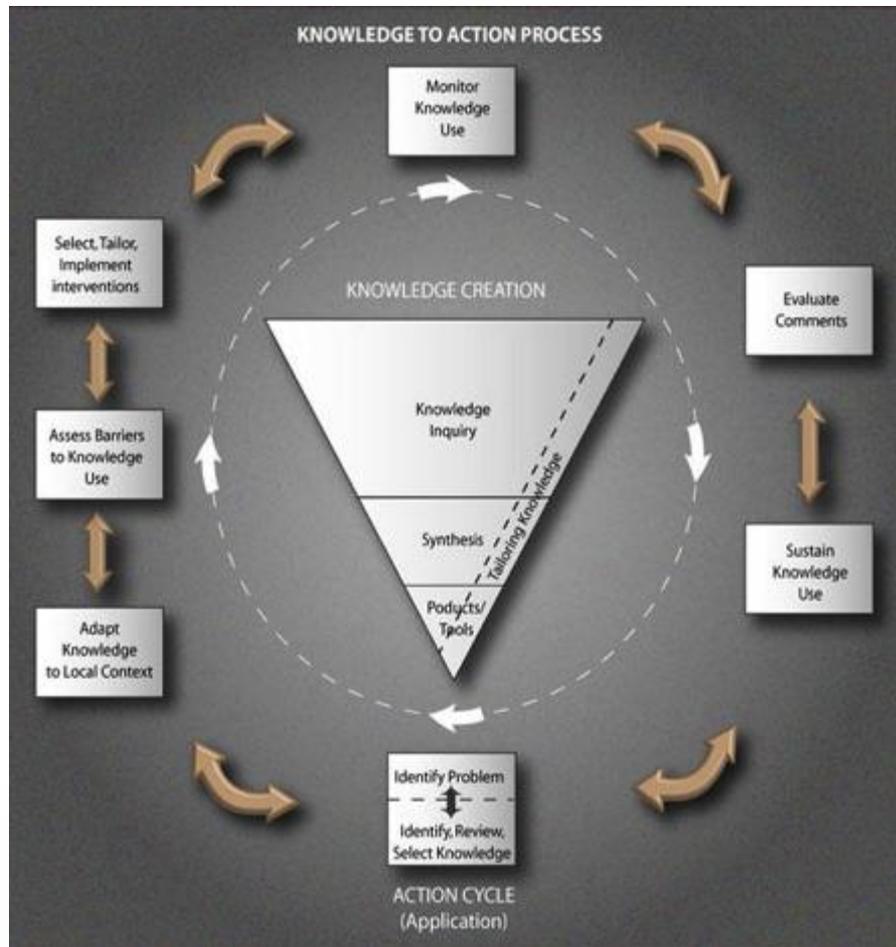
## **1. Inform KT Science**

- What are the ‘key ingredients’ to operationalizing iKT in an occupational research context?
- Does the KTA Framework (as a ‘recipe’) identify ‘key ingredients’ of collaboration and knowledge synthesis during PDA development ?

## **2. Develop an evidence-based Physical Demands Analysis**

- Use evidence-based guidelines (i.e., OHCOW, IAPA)
- Develop a PDA that meets identified needs of the firefighter and relative stakeholders

# Collaboration Research and the Knowledge-to-Action (KTA) Framework



Graham et al., 2006, 2007

# Why the KTA...?

1. Assumes that collaboration between knowledge “creators” and knowledge “users” is critical to knowledge exchange.
2. Allows integration of knowledge from multiple sources including empirical and tacit knowledge.
3. KTA and dynamic; process boundaries within and between knowledge creation and action cycle are fluid
4. KTA was developed and applied primary to facilitate KE in health contexts – anticipated to have equal relevance in occupational context

# Methodological Approach

## Setting with multiple, complex barriers

- Schedule 2 employer (individual vs. collective liability)
- Strong union representation (IAFF Local 288)
- High physical demands
- High injury rates
- Labour vs. Management
- Qualitative case study methodology (QCSM)
  - Enable understanding of a complex issue within real-life context
- Analysis: Directed Content Analysis
  - Data from meeting minutes, individual reflections and observations coded to constructs as themes within the KTA framework

# Stakeholders

- Firefighters

- Health and Safety representatives

- Union Representatives

Knowledge Users

- Return-to-Work (RTW) Specialists

- Management (i.e., fire chiefs, deputies and fire captains)

- On-site Health Care Professionals



Sinden and MacDermid, 2014

# Developing the PDA

- 4 semi-structured participatory stakeholder meetings
- 7 months
- Meetings 1 and 2 = “Knowledge Creation”
  - Participants reviewed, selected, synthesized existing knowledge sources
    - Existing PDAs, PDA guidelines
- Meetings 3 and 4 = “Action Cycle” – Identifying Barriers and Facilitators; Contextualizing Knowledge

# OHCOW PDA Guidelines: Direct the Action Cycle

Physical Demands Analysis Criterion / Guideline	Task Components
1. Determine Job Task	Review existing information about job to be analyzed (i.e., job description, PDAs of similar jobs)
2. Verifying Job Tasks within context of Job Objectives	Obtain understanding of the work flow and context of job being analyzed to other jobs in work area  Analyst discusses and verifies existing job information with employer.
3. Determining Job Function	Identify tasks that are essential and non-essential  Determining the frequency of tasks and sub-tasks performed per day, week, month or shift
4. Quantifying the Physical Demands of each job task	Measurements include the frequency, intensity and duration of job tasks  Physical elements to quantify for each task include: <ul style="list-style-type: none"> <li>- Mobility (sitting, standing, walking, stooping, kneeling, crouching, climbing)</li> <li>- Manual material handling (lifting, pushing / pulling, carrying)</li> <li>- Reaching</li> <li>- Handling and fingering</li> <li>- Proprioception</li> </ul> Identify whether the physical demand is an essential element of the job task
5. Preparing the Report	Develop a report that includes the information collected including identification of essential and non-essential job tasks  Review with the Employer and stakeholders involved in PDA development  Sign-off of the PDA by the employer and worker representatives to confirm accuracy of the PDA of the job

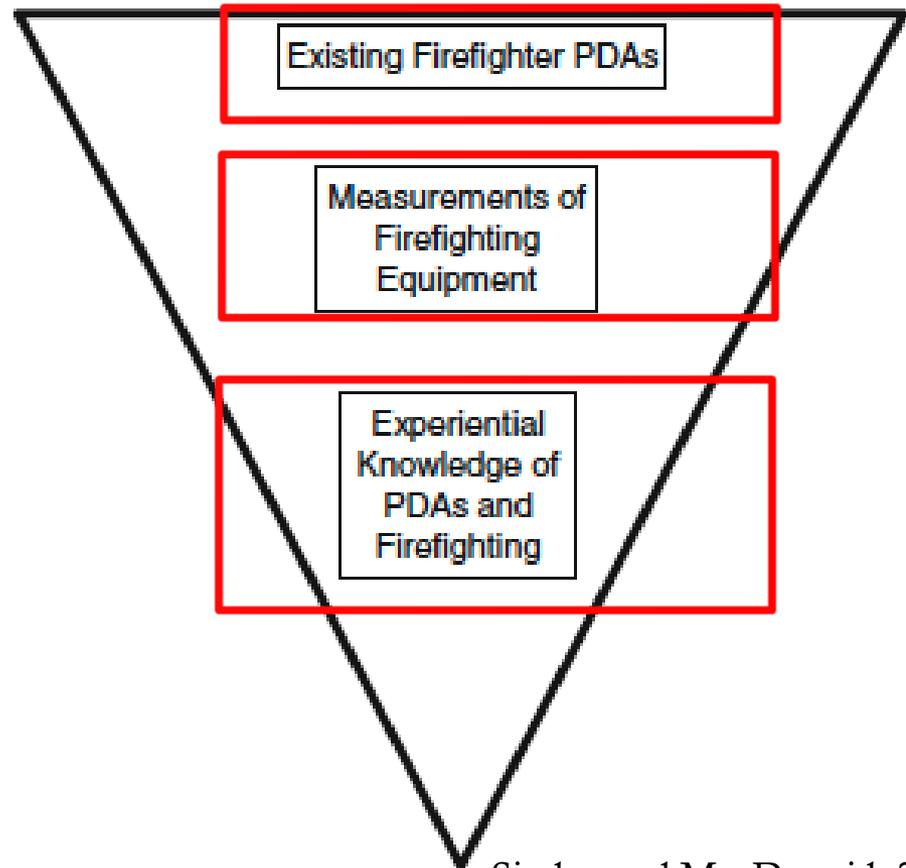
Adapted from OHCOW  
Physical Demands Analysis  
Guidelines

# The KTA and Developing the PDA

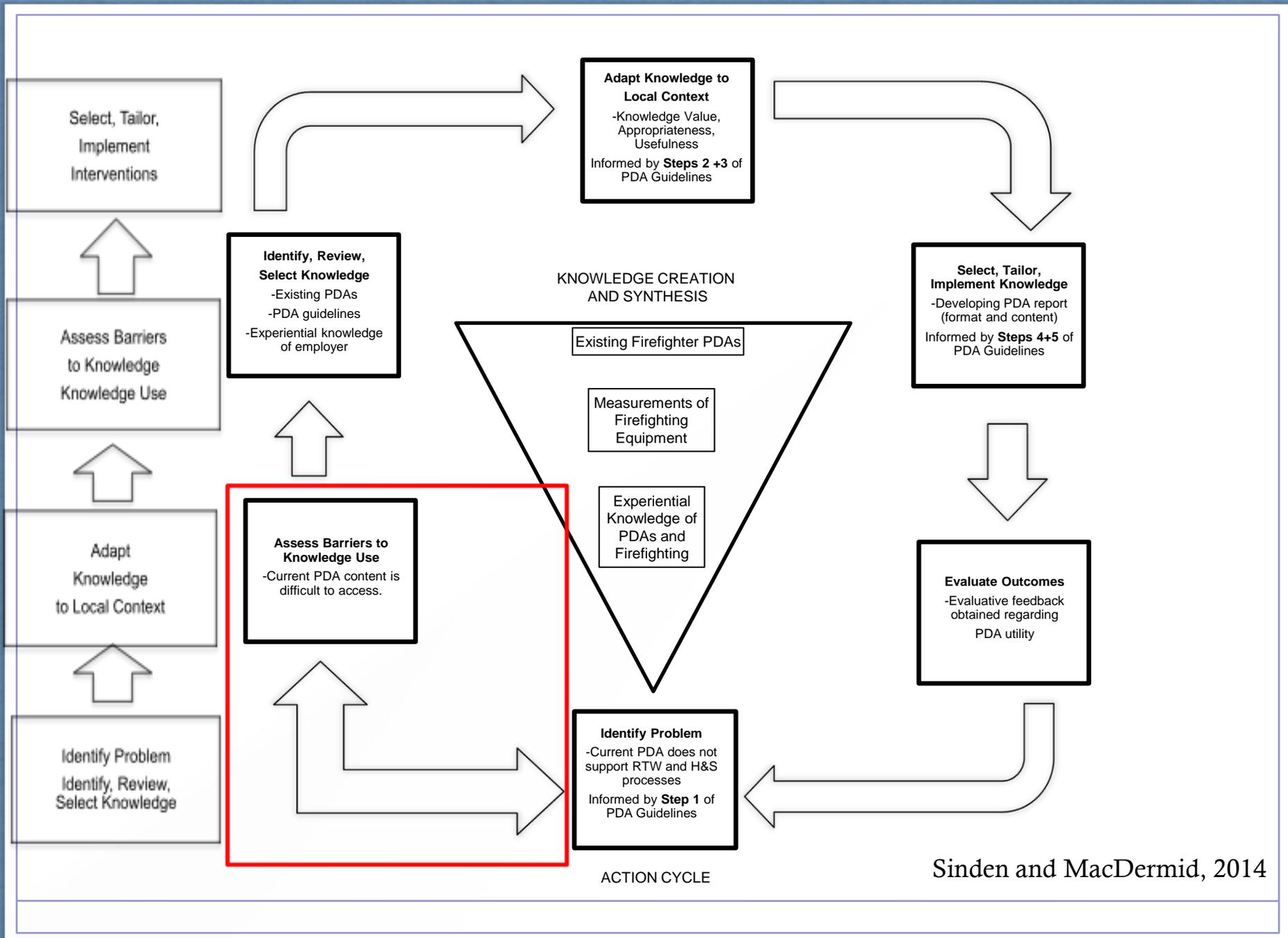
KNOWLEDGE CREATION

Knowledge Synthesis and Tool  
Development

KNOWLEDGE CREATION  
AND SYNTHESIS



Sinden and MacDermid, 2014



# Format of the Current Firefighter PDA

- Adapted version of the recommended OHCOW format
- Electronic hierarchical format
- Allows the end-user to custom “build” the PDA with level of content necessary to address application
  - For example a comprehensive format is available if WSIB has requested a PDA
  - A more specific output with high level of task specific information is available if identifying options for RTW planning
- Limitation: More “specific” job information is required

# Implications and Take-Home Messages

- KTA framework provided a collaborative focus engaging multiple stakeholders, multiple knowledge sources and varying project goals
- “Assessing Barriers to Knowledge Use” and “Adapting Knowledge to Local Context” = critical steps in PDA development
- Strength of using the KTA Framework:
  - Flexibility of conceptual boundaries between knowledge creation and the action cycle enabled modifications to process components
- Action Cycle included processes for developing the PDA as well as to implementing and evaluating the PDA
  - PDA guidelines were important for both phases
- Although processes in the action cycle needed to be modified – constructs of the KTA framework were reflected in this occupational context

# Developing a Pre-Employment Screen for Paramedics

## Some relevant background information!

- Previous Pre-Employment screen administered by a third-party
- Issue: Questionable protocol!
  - Components of the test couldn't be validated to the job
- Arbitrator agreed that test was unconstitutional based on the "Unified Test" established by the 1999 Supreme Court of Canada Meiorin Case

# Developing a Pre-Employment Screen for Paramedics

- 5 semi-structured participatory stakeholder meetings
  - 1 meeting with all stakeholder present
- 10 months
- Meetings 1 and 2 = “Knowledge Creation”
  - Reviewed goal / approach
  - Review of existing sources of pre-employment screens
  - Review of Paramedic Physical Demands Analysis  
(Coffey et al., in revision. IJIE-14-267).
- Meetings 3, 4 and 5 = “Knowledge Creation and Action Cycle”
  - Identifying Barriers and Facilitators; Contextualizing Knowledge

Sinden, MacPhee and Fischer, in progress

# Stakeholders

- **Researchers**

- Dr. Steven Fischer R.Kin. – Queen's University
- Dr. Renée MacPhee – Wilfrid Laurier University
- Dr. Kathryn E. Sinden R.Kin. – Queen's University

- **Paramedic RA's**

- Paolo Bottiglia
- Monica Di Iorio
- Michelle Farragher
- Amanda MacIvor
- Sylvie Rochon

Target Audience?

- **Management**

- Peter Kelly (Chief)
- Jeremy Doherty (Deputy Chief)

- **Union**

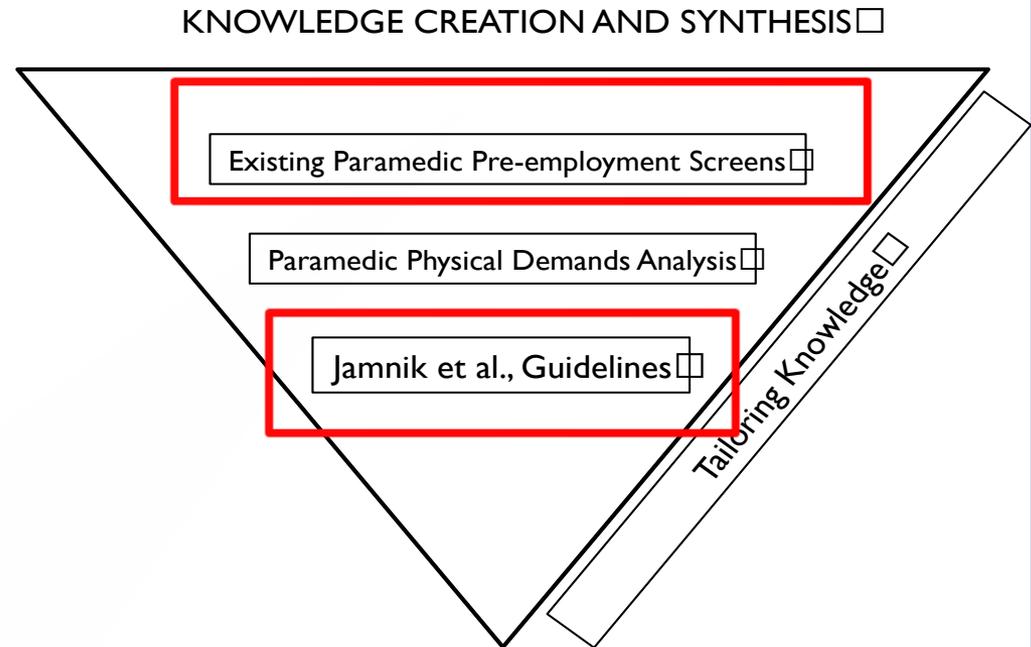
- John McLuckie (Union Lawyer)
- Brian Moloughney (Shop Steward)

Sinden, MacPhee and Fischer, in progress

# The KTA and Developing the OPPAT

## KNOWLEDGE CREATION

## Knowledge Synthesis and Tool Development



Sinden, MacPhee and Fischer, in progress

# Existing Paramedic Pre-Employment Screens

- The Paramedic Candidate – Physical Abilities Test (PC-PAT) -(for Emergency Medical Care Inc. - Nova Scotia)
  - Clinic Based Test
- Pre-Placement Screening Testing Protocol (for County of Frontenac)
  - Paramedic Service
- Physical Evaluation Test (PET) - Calgary
  - Gymnasium
- DC - Paramedic Test (YouTube)  
<http://www.youtube.com/watch?v=m9sSRJHDaOg>
  - Gymnasium

Sinden, MacPhee, Fischer and the Ottawa Paramedic Service Research Team. OPPAT Administrator and Resource Manual, 2015.

# Identified Barriers and Strengths

## Barriers

- Equipment (except for Frontenac) used barbells / simulations of activities
- Static push / pull components
- Evidence for time-based pass/fail criteria wasn't provided / evident
- Physiological pass / fail criteria

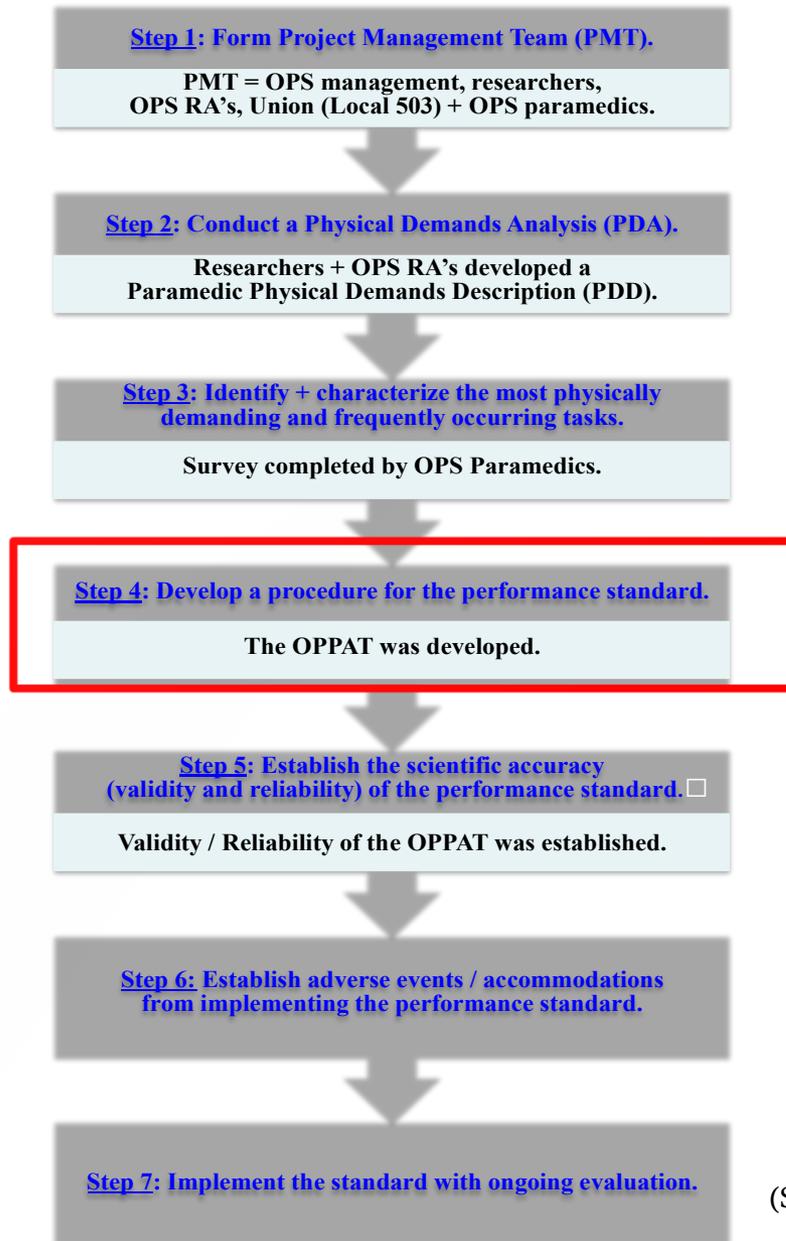
## Strengths

- Applied contexts / manipulating equipment
- Time based pass/fail criteria

Sinden, MacPhee, Fischer and the Ottawa Paramedic Service Research Team. OPPAT Administrator and Resource Manual, 2015.

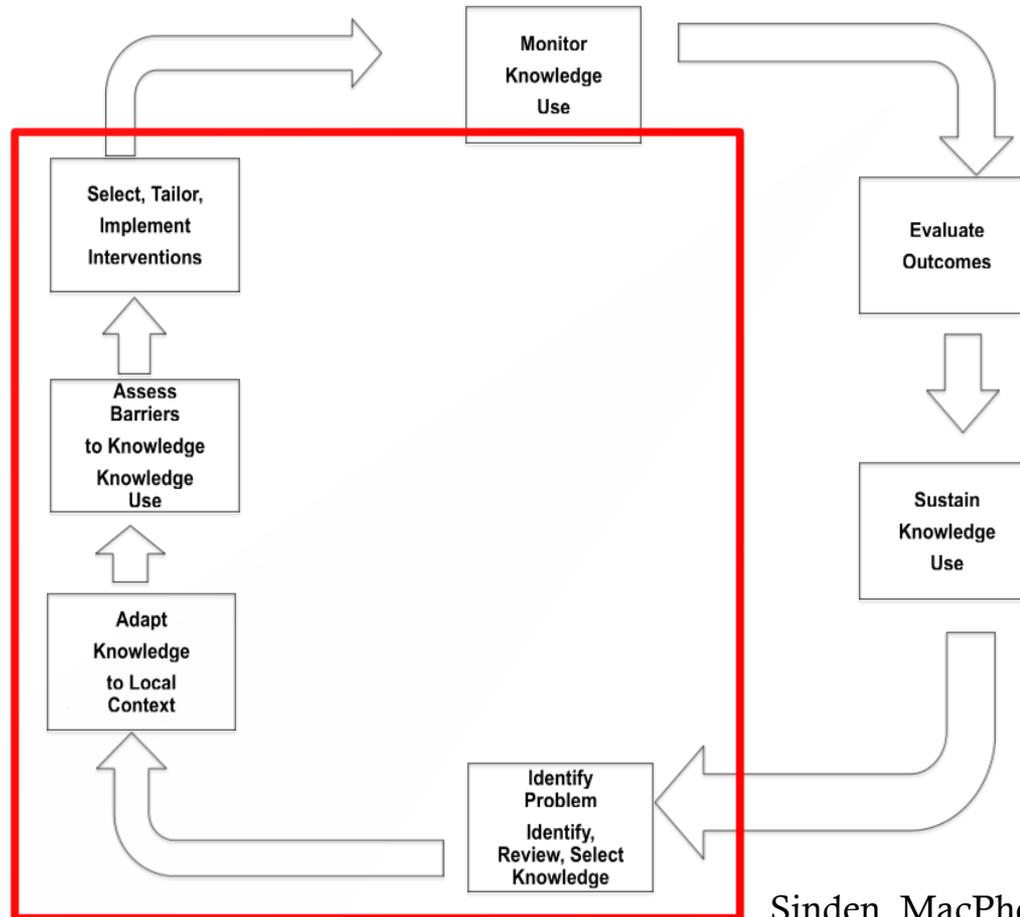
# Process for Developing the OPPAT

Developed based on an adaptation of Jamnik et al ., 2013's Consensus Forum Research Process Template for developing a BFOR



(Sinden et al., 2015)

# The Action Cycle: Developing the OPPAT



Sinden, MacPhee and Fischer, in progress

ACTION CYCLE

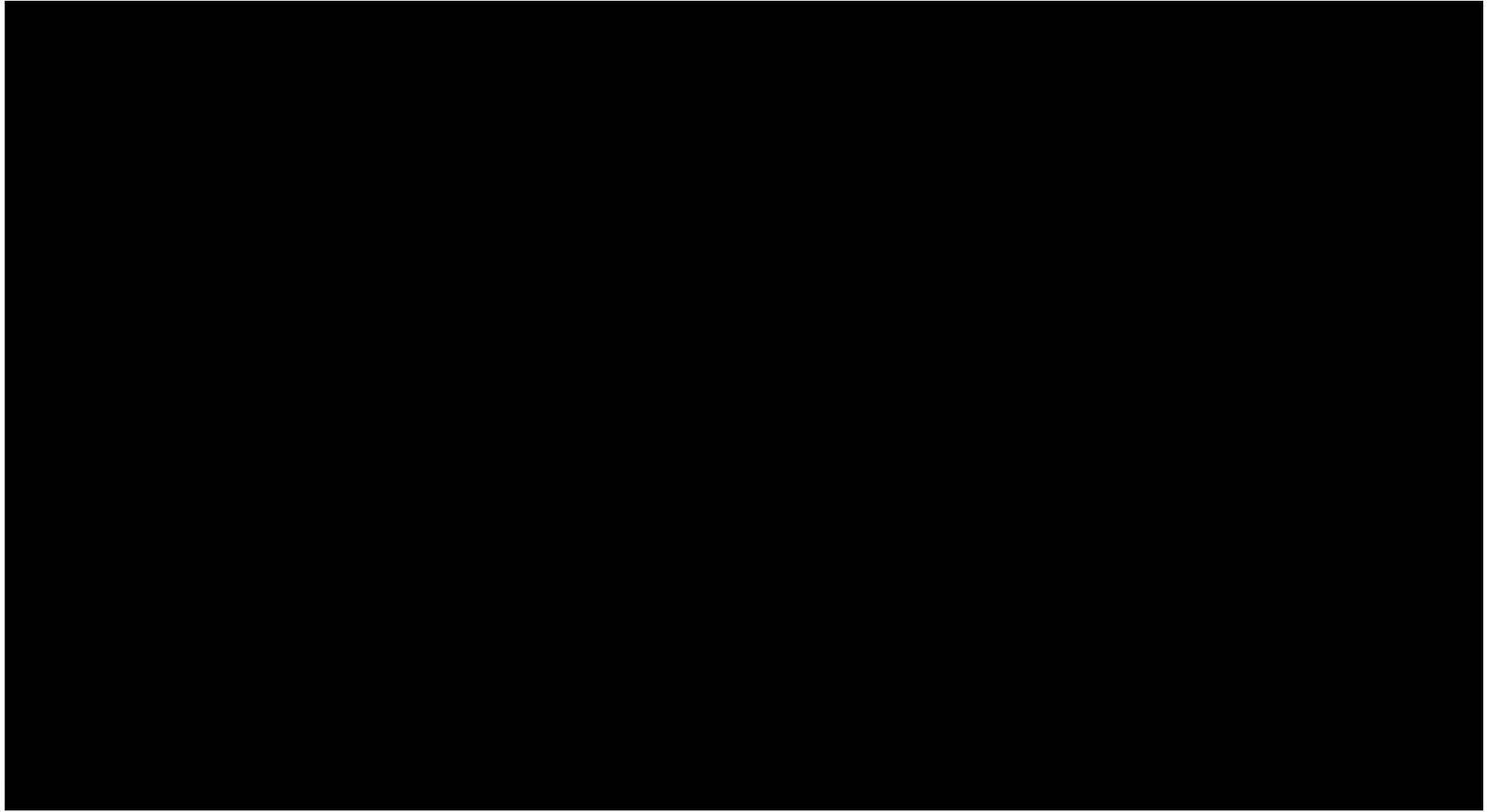
# Introducing the “OPPAT”!

## (The Ottawa Paramedic Physical Ability Test)

- 3 consecutive circuits that involve a series of job simulation tasks
- Current primary pass/fail criterion for the OPPAT is a 20-minute total circuit completion time
- Candidates are required to perform all tasks without committing an “uncontrolled lowering” of any equipment utilized during the OPPAT.
- 2 x 2 minute breaks are allowed

Sinden, MacPhee, Fischer and the Ottawa Paramedic Service Research Team. OPPAT Administrator and Resource Manual, 2015.

# The OPPAT



# Outcomes

1. The OPPAT
2. The OPPAT Administrator and Resource Manual
  - *Section 1: Development Process*
  - *Section 2: General information and protocol*
    - Equipment, facility guidelines, protocol set-up, protocol, instructions for both the administrator and the paramedic lifting partner, script for administration
  - *Section 3: Supporting Evidence*
  - Appendices
    - Physical Demands Analysis, Review of existing screening tools; Workload comparison; Sample Report

# Lessons for Future Collaborative, Occupational Research Partnerships

## 1. Take Time to Build Relationships

- Collaborative research requires trust between researchers and employers
- Trust develops over time
- Start small and build to bigger projects

# Lessons for Future Collaborative, Occupational Research Partnerships

## 2. Keep the Working Groups Small and Meet Often

- Maintained a regular meeting cycle with firefighters and paramedics
- Firefighter meeting groups varied from 8 to 11; Paramedics 3-12
  - Recommended that a smaller group (4-5 participants) facilitates communication and maintains group focus on the project goal
  - logistics of conducting a meeting with multiple stakeholders can often complicate progress
- Challenging when stakeholders are represented at different meetings to retain transparency

Sinden and MacDermid, 2014

Sinden, MacPhee and Fischer, in progress

# Lessons for Future Collaborative, Occupational Research Partnerships

## **3. Allow Design of Protocol to be Collaborative**

- Ensures outcomes are relevant to the stakeholders and knowledge users
- Allow collaborators to “drive” research agenda
- Strength of both firefighter and paramedic research

Sinden and MacDermid, 2014

Sinden, MacPhee and Fischer, in progress

# Lessons for Future Collaborative, Occupational Research Partnerships

## 4. Engage intermediaries in research

- During Paramedic work, multiple stakeholders with very strong union presence
- Contentious issue with significant implications for paramedics and management
  - A Neutral Facilitator to mediate meetings / discussions might have been helpful to facilitate objectivity in research agenda

Sinden, MacPhee and Fischer, in progress

# Lessons for Future Collaborative, Occupational Research Partnerships

## **CONTEXT MATTERS!!!!**

- Similarities between cases (firefighting and paramedicine)
  - Stakeholders
  - Very specific ergonomic tool
  - Iterative process
  - Produced an evidence-based injury management tool
  - Informed KT Science
- Differences between cases (firefighting and paramedicine)
  - Research process operationalized
  - Engagement



**IF YOU WANT TO GO  
FAST, GO ALONE.  
IF YOU WANT TO GO  
FAR, GO TOGETHER.**

**AFRICAN PROVERB**

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  - Dr. Julie Côté, McGill University
- Dr. Renée MacPhee – Wilfrid Laurier University
- The Hamilton Professional Firefighters Association
  - Rob D'Amico, Colin Grieve, Karen Roche (now City of Burlington)
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  - Paolo Bottiglia, Monica Di Iorio, Michelle Farragher, Amanda MacIvor, and Sylvie Rochon
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- City of Hamilton
- Hamilton Professional Firefighters' Association

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## **Paramedic Research**

- Mitacs
- City of Ottawa
- CUPE Local 503

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