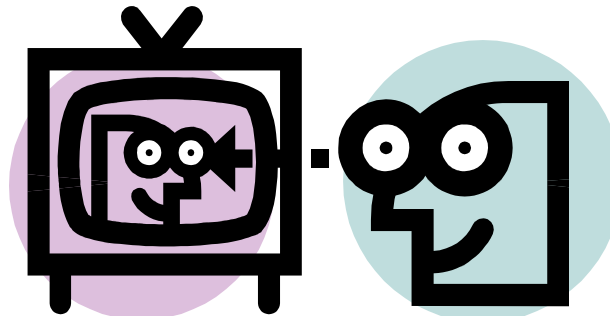


# Telerehabilitation: Is there an Issue Related to Virtual Treatment Without Hands-On Mobilization to Recover Range of Motion After Total Knee Arthroplasty?



**Michel Tousignant, PhD**, Helene Moffet, PhD; Sylvie Nadeau, PhD

Collaborators: Chantal Mérette, PhD, Patrick Boissy, PhD, Hélène Corriveau, PT, PhD,  
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Ronald Dimentberg, MD

Orthopedics & Rheumatology-2014  
San Francisco  
July 2014

# What is Telemedicine, Telehealth, Telerehabilitation...?

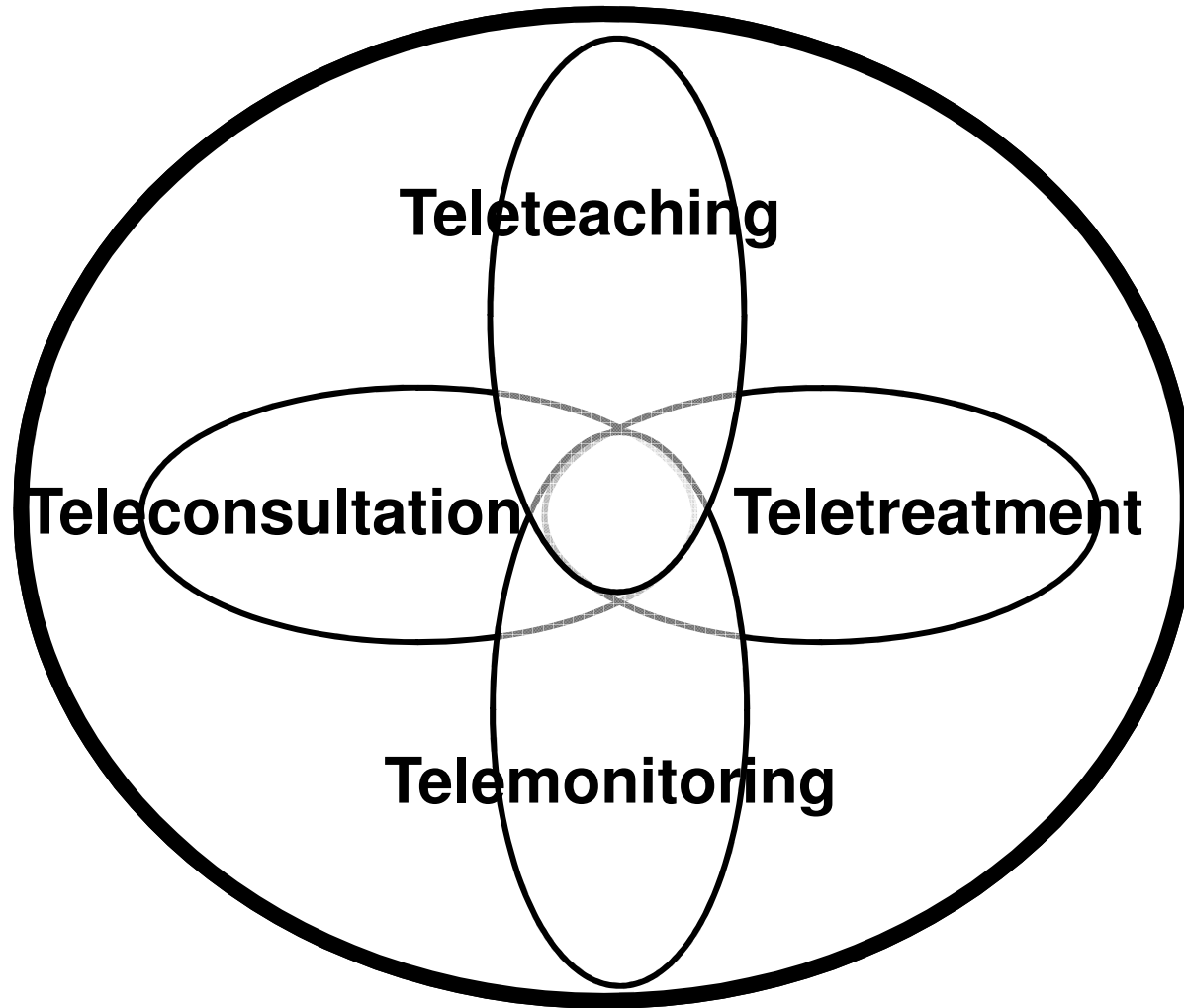
Telemed J E Health. 2011 Jul-Aug;17(6):484-94. doi: 10.1089/tmj.2011.0103. Epub 2011 Jun 30.

## **The taxonomy of telemedicine.**

Bashshur R, Shannon G, Krupinski E, Grigsby J.

“...Telemedicine is a multidimensional concept, and it can mean different things to different people, depending on the context in which it is used, as well as the combinations of clinical and health applications, technological configurations, human/technological interfaces, organizational structures, and human resource mixes.”

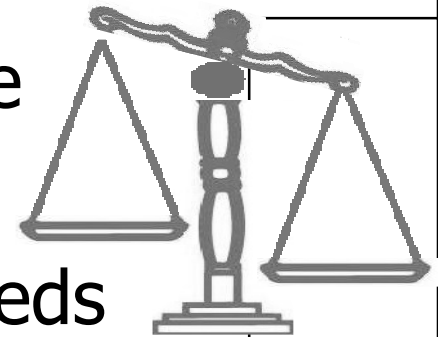
# Telehealth Applications



## Context: Why Should We Use Telehealth in Orthopedics?<sup>2</sup>

- Consultation
  - No resources in rural areas
    - Can increase accessibility to specialists
- Treatment
  - ↓ length of stay in hospital after orthopedic surgery
  - ↑ the need of health services at home

Health care system cannot meet these needs



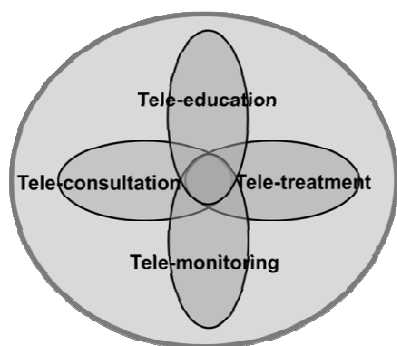
## Slide 4

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2

est-ce-que c'est bien 'orthopaedy' et non 'orthopedics' ou 'orthopaedics'?

Amy Bouchard, 7/27/2014



# Example of Teleconsultation in Orthopedics

## The Diagnostic Accuracy of Telerehabilitation for Nonarticular Lower-Limb Musculoskeletal Disorders

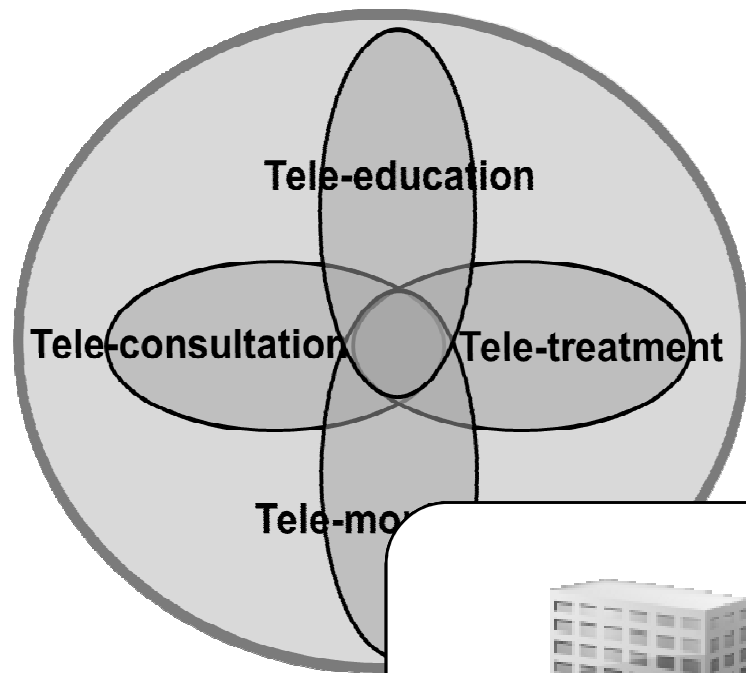
*Trevor Russell, Ph.D., B.Phty., Piers Truter, B.Phty. (Hons),  
Robert Blumke, B.Phty. (Hons), and Bradley Richardson,  
B.Phty. (Hons)*

*Division of Physiotherapy, School of Health and Rehabilitation  
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Australia.*

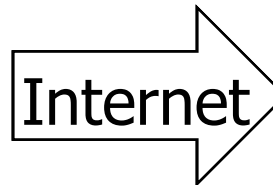
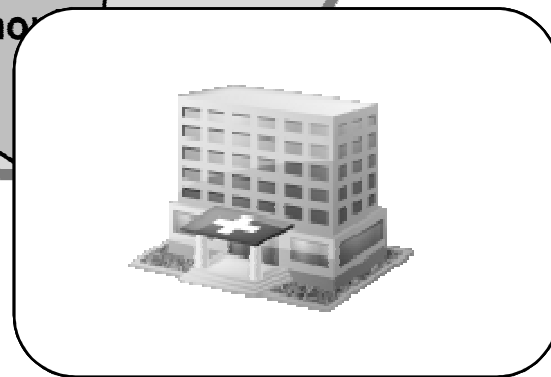
*(0.81 < κ < 1.00) in the intrarater and interrater reliability studies.  
Conclusions: Using telerehabilitation for musculoskeletal physical  
therapy assessment of nonarticular lower limb conditions was found  
to be valid and reliable. Existing diagnostic reasoning can be applied;  
however, new methods of patient self-examination are needed to  
enable differential diagnosis.*

**Key words:** *telerehabilitation, physical therapy, musculoskeletal,  
validity, reliability, lower limb*

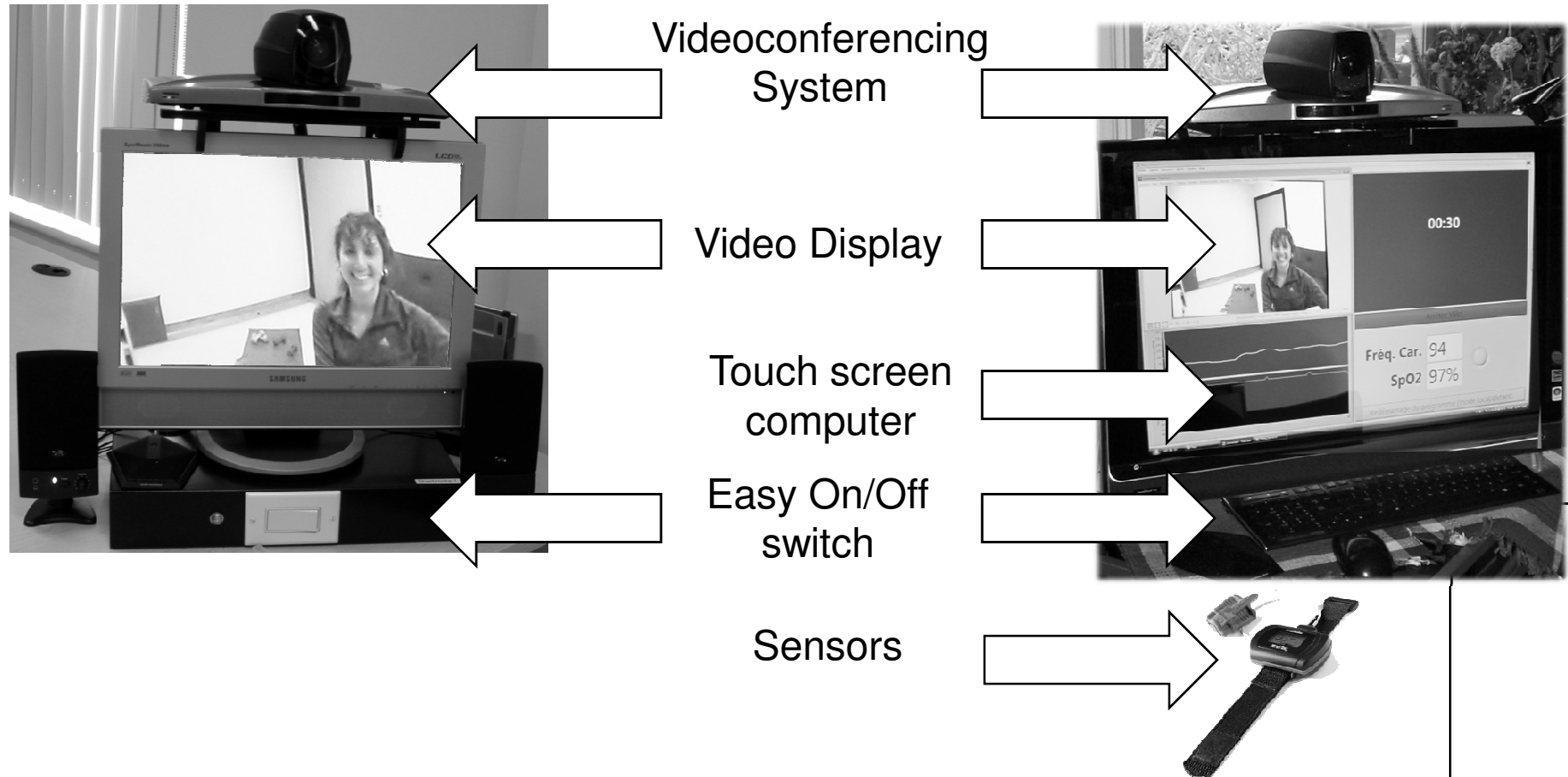
# Our Expertise in Telerehabilitation



- Teletreatment
- Health care center to patient's home



# In-Home Telerehabilitation Systems





# Strengths & Weaknesses of “Virtual Sessions”

- Strengths
  - Allow direct interactions between patients & Health professionals
  - Allow direct supervision and feedback
- Weaknesses
  - There is no hands-on contact with the patients
    - Visual assessment
    - With captors
      - Allow the assessment of physiological data like cardiac rhythms, ECG, O2, strength, etc.)

# Possible Problems of Teletreatment in Orthopedic Rehabilitation

- Example in post knee arthroplasty
  - The clinical challenge
    - Increase ROM in flexion and extension
  - Conventional therapy:
    - Mobilization: manual therapy
    - Very “hands-on”
- Virtual teletreatment
  - No possibility to have hands-on mobilization

**Considering that therapists cannot have hands-on mobilization IN “virtual treatment” as opposed to face-to-face therapy,  
Is there an issue With not having a “hands-on” approach to mobilization with teletreatment?**



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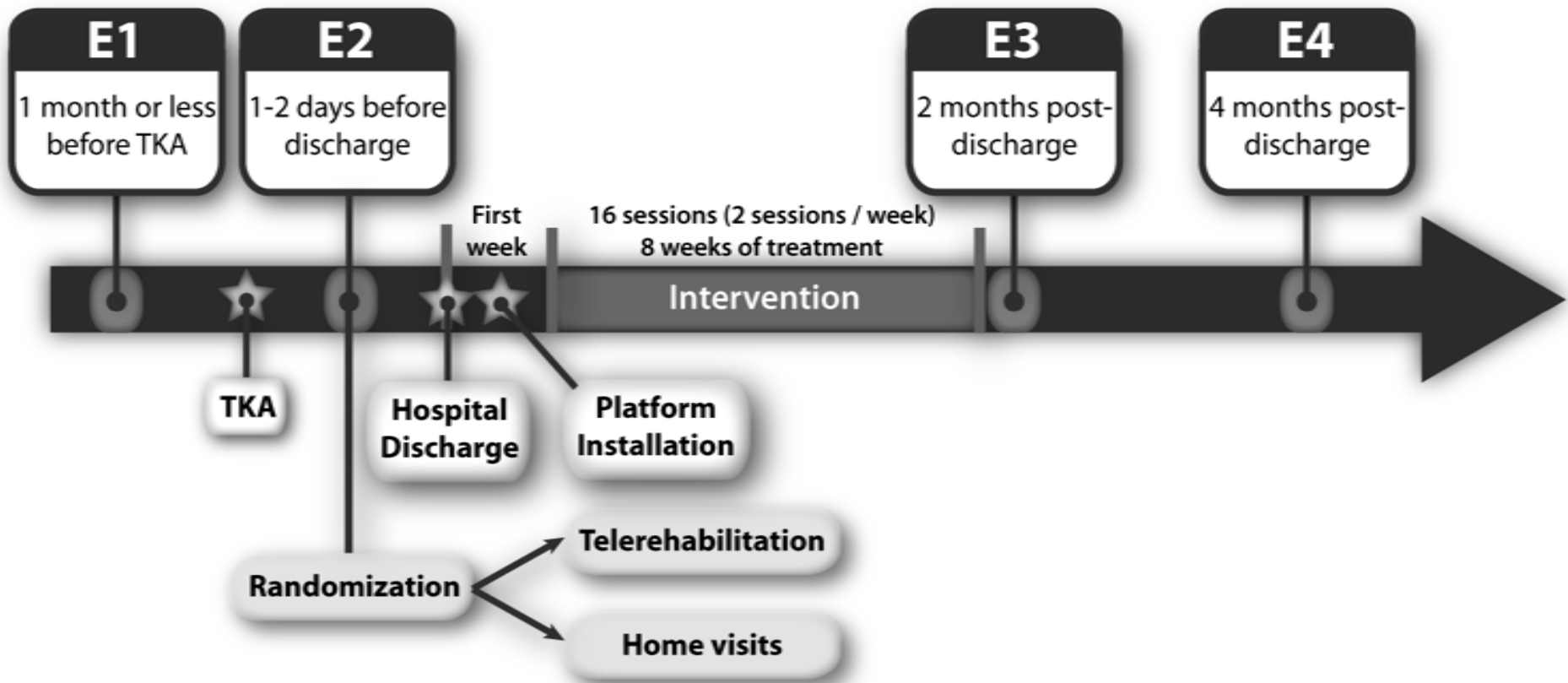
# Research Question

Determine if teletreatment  
is **as effective as** face-to-face therapy

**to recover ROM**

following total knee arthroplasty (TKA)

# Study Design: TelAge Randomized Clinical Trial



# Population



## Total knee arthroplasty patients

<b>Inclusion Criteria</b>	<b>Exclusion Criteria</b>
1) Being operated for a primary TKA after being diagnosed with osteoarthritis	1) Having health conditions that could interfere with tests or a rehabilitation program
2) Returning back home after hospital discharge	2) Planning a second lower limb surgery within the next 4 months
3) Having access to a high-speed Internet connection	3) Having cognitive or collaboration problems
	4) Having post-operative major complications
	5) Having weight bearing restrictions for a period longer than 2 weeks

# Independent Variable

- Standardized Functional Exercise Program:
  - ROM recovery
  - Muscular strengthening
  - Functions (walking, stairs, balance)



# Outcomes



Variables	Measured instrument
Extension/Flexion Range of Motion (ROM)	Conventional goniometer (Norkin & White, 1995)

- Measured in face-to-face evaluations by a **blind evaluator in both groups**

<sup>1</sup> Guyatt, 1985; <sup>2</sup> Bellamy, 1993



# RESULTS



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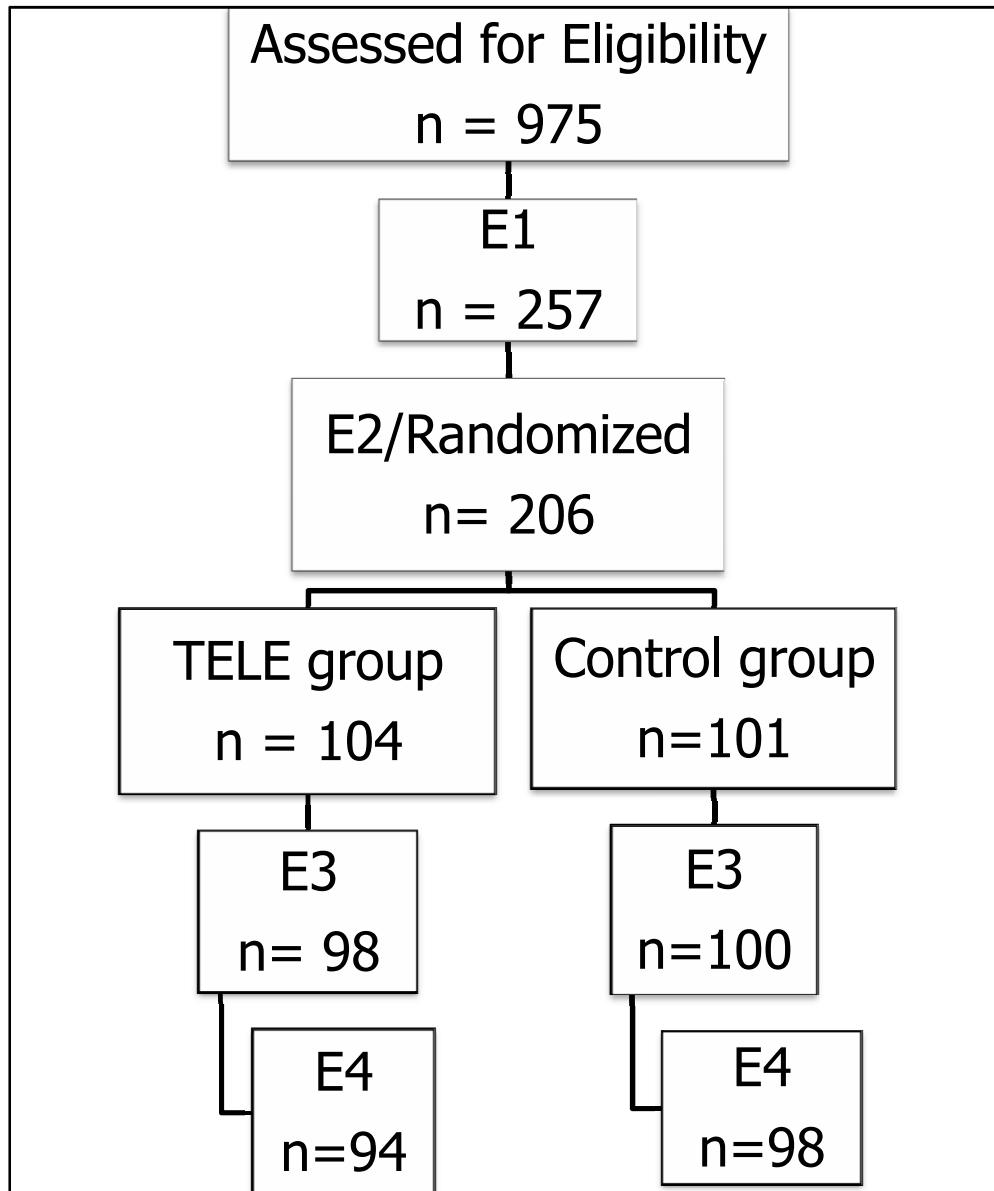
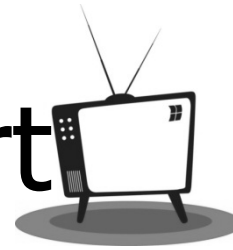


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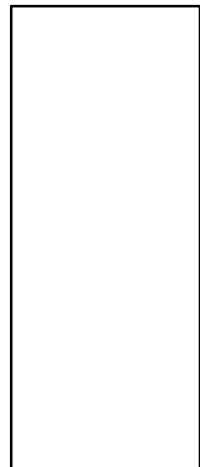


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du Montréal métropolitain

# Flow Chart



❖ Intention to-treat analysis:  
n = 198



# Sample Characteristics



Variables	Tele group n = 104 Mean $\pm$ SD	Home visits group n = 101 Mean $\pm$ SD	p-value
Age (yrs)	65 $\pm$ 8	67 $\pm$ 9	0.12
BMI (kg/m <sup>2</sup> )	35 $\pm$ 7	35 $\pm$ 7	0.13
Comorbidity index (%)	0.2 $\pm$ 0.1	0.2 $\pm$ 0.1	0.15
Functional ability before TKA (WOMAC in %)	53 $\pm$ 19	54 $\pm$ 17	0.73
Sex (% men)	42	55	0.06
Operated knee (% right)	48	52	0.63
Previous lower limb surgery (%)	54	52	0.73
Living alone (%)	21	10	0.03

# Compliance



	Target value	Telegroup n = 104 (Mean ± SD)	Home visits group n = 101 (Mean ± SD)
Sessions (number)	16	15 (2)	15.9 ± 0.2
<75% of planned sessions		16*	1
≥75% of planned sessions		88	100
Duration of sessions (min)	60	48 (10)	54 (12)
First session (nb of days post-discharge)	[0-7]	6 (4)	4 (2)
Last session (nb of days post-discharge)	60 ± 7	57 (7)	57 (5)

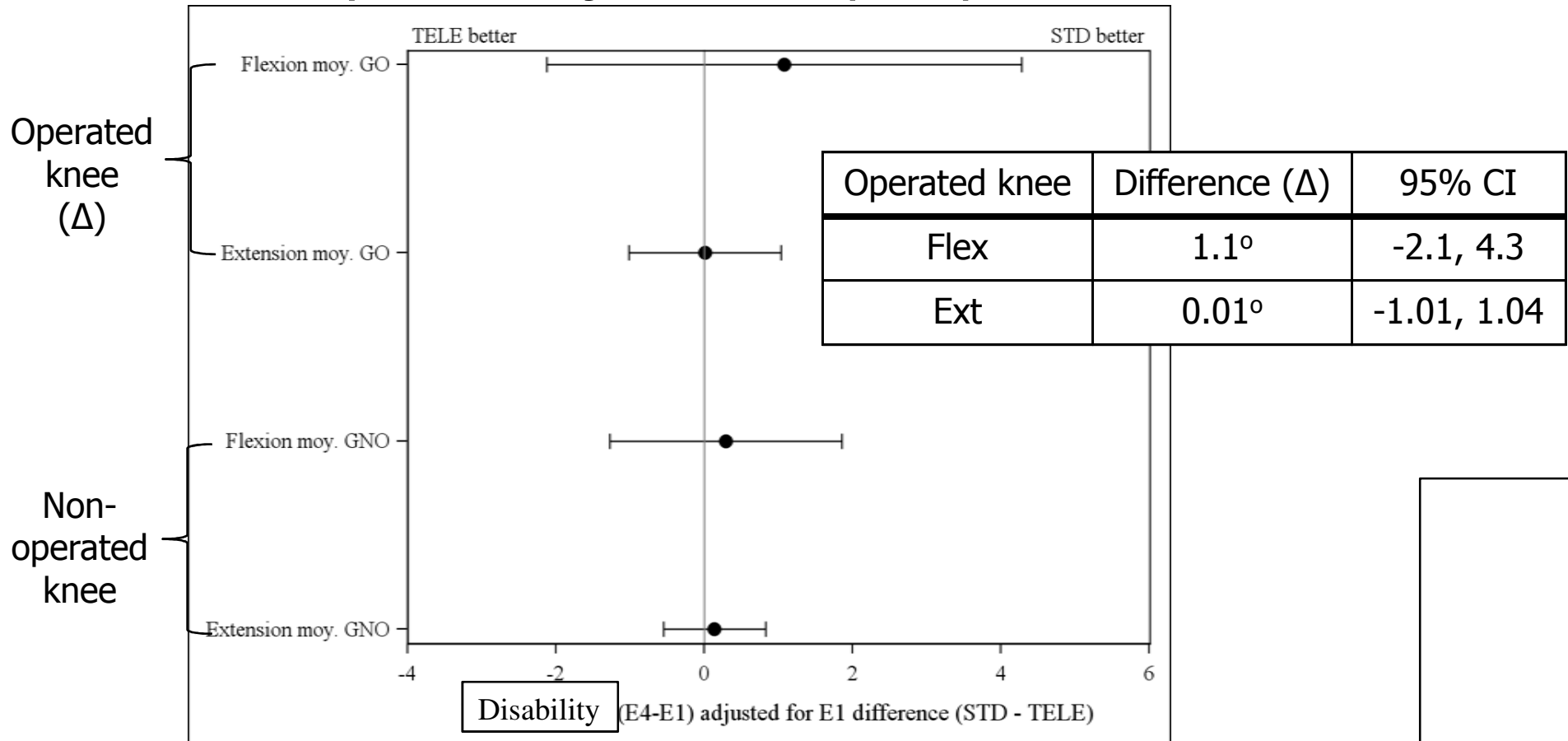
\* 4 refused to continue after randomization; 2 had major problems with internet connection; 10 received between 5 to 11 TELE sessions

# Results

## Disability - ROM



### Noninferiority tests adjusted for preoperative measures

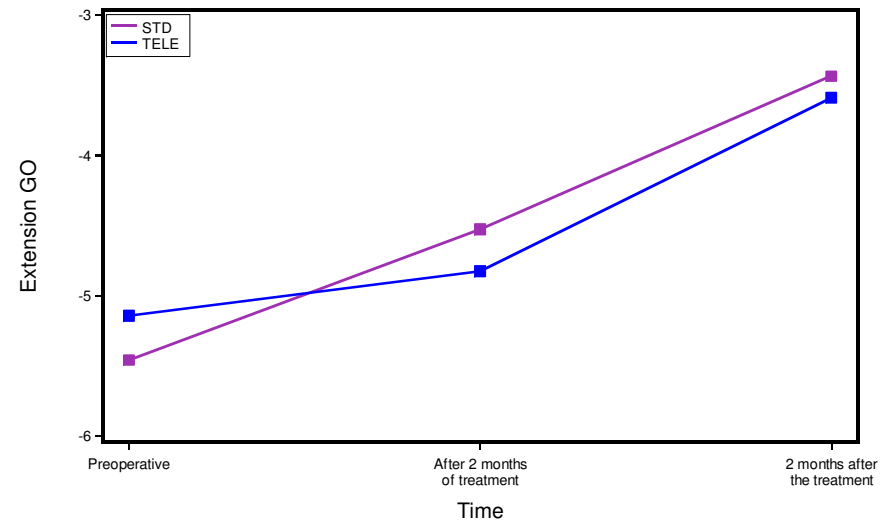
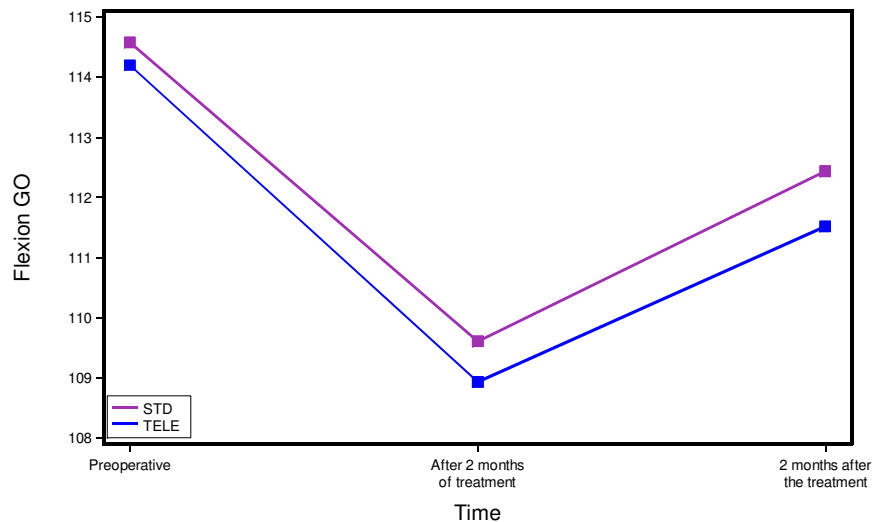


# Results

## Disability- ROM



### Repeated measures ANOVA



Effect	Prob
Group effect	ES = -0.09
	p-value = 0.54
Time effect	p-value < 0.0001

Effect	Prob
Group effect	ES = 0
	p-value = 0.98
Time effect	p-value < 0.0001

# DISCUSSION



# Discussion



We confirmed the hypothesis that the hands-on possibility in the face-to-face approach, as compared to a virtual session

did not have an effect on ROM recovery after TKA



# Discussion



## Internal Validity

<b>Selection bias</b>	<b>Information bias</b>
1) Randomization	1) Standardized measures
2) No statistical changes in the descriptives variables at T0	2) Training of assessors

# Discussion



## External Validity

- Sample size gives excellent statistical power
- All patients with knee arthroplasty are able to return home rapidly

# Discussion



## Clinical Implications

- Hands-on mobilization is an excellent option to deal with ROM recovery, but it does not seem essential
- The patient's empowerment seems to counter-balance the "hands-on" effect
  - More creative to find options to "put pressure" on joint peri-articular tissues

# Discussion



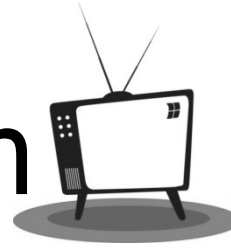
## Other Applications

- Post-stroke: Tai Chi balance retraining
- COPD

# CONCLUSION

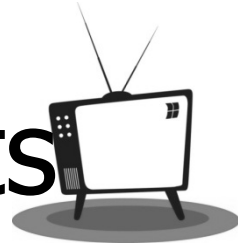


# Conclusion



- ❖ This study:
  - Confirms the non-inferiority of the in-home telerehabilitation as compared to home visits.

# Acknowledgements



- ❖ We would like to thank all of the participants, the research personnel, the physiotherapists and the orthopedic surgeons involved in this research project.
- ❖ This project was supported by a grant from:
  - Canadian Institutes of Health Research
- ❖ This trial is registered at [www.controlled-trials.com](http://www.controlled-trials.com):
  - ISRCTN66285945