Effectiveness of Customized Rehabilitation for Adults with Post-Concussion Syndrome -

A Randomized Controlled Crossover Trial

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Overview

What is the problem with current Post-Concussion Management?

How did we try to help bridge this gap?

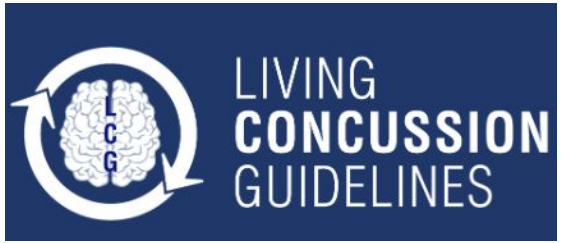
What did we find?

WHAT's the problem?

- 1 in 3 concussion patients report persistent symptoms
- Earlier access to care associated with faster recovery
- Avg. **>100 days** for general practitioner
- Avg. **204 days** for specialists
- Conservative estimates for annual cost to manage **>$110 million**

Cancelliere et al., 2023; Langer et al., 2024; Hunt et al., 2016

WHAT's the problem?



- Ministry of Health published guidelines on best practice
- "Low level exercise ***may*** be of benefit"
  - **Timing, intensity and dose uncertain**
- Advised to direct assessment / management towards **symptoms**
  - Cognitive, physical and mood/emotional

Marshall et al., 2023

Rivermead Post Concussion Symptoms Questionnaire

Headaches	RPQ-3 - out of 12 **MCID = 2 points**
Feelings of dizziness	
Nausea and/or vomiting	
Noise sensitivity (easily upset by loud noise)	RPQ-13 - out of 52 **MCID = 8 points**
Sleep disturbance	
Fatigue, tiring more easily	
Being irritable, easily angered	
Feeling depressed or tearful	
Feeling frustrated or impatient	
Forgetfulness, poor memory	
Poor concentration	
Taking longer to think	
Blurred vision	
Light sensitivity (easily upset by bright light)	
Double vision	
Restlessness	

Scored:
0 - Not experienced
to
4 - Severe problem

Leddy et al., 2015

Bridging the gap

Does ***customized*** rehabilitation based on ***subgroups*** lead to superior clinical outcomes as compared to standard care in ***adults with persistent post-concussion symptoms***?

Moser et al., 2024

Exam Overview: Usual Care

Symptom-based treatment

Symptoms:	***Treatment:***
Headaches/intolerance to activities	***Symptom-limited*** exercise
Dizziness	General vestibular (balance) therapy
Neck pain	General neck stretching and strengthening exercises
Visual symptoms	General visuo-motor habituation exercises

Exam Overview: Customized Care

Sub-group determination following standardized exam

Exam finding	**Subgroup**	**Treatment**
Failed BCTT	Autonomic disorder	***Sub-symptom*** aerobic exercise & breathwork
Abnormal neck exam	Cervical disorder	Manual therapy & neck strengthening
Positive VOMS or abnormal balance exam	Vestibulo-ocular disorder	Tailored vestibular & visuo-motor habituation exercises

Overview

Adults with Persistent Concussion Symptoms Referred to KITE

Inclusion Criteria

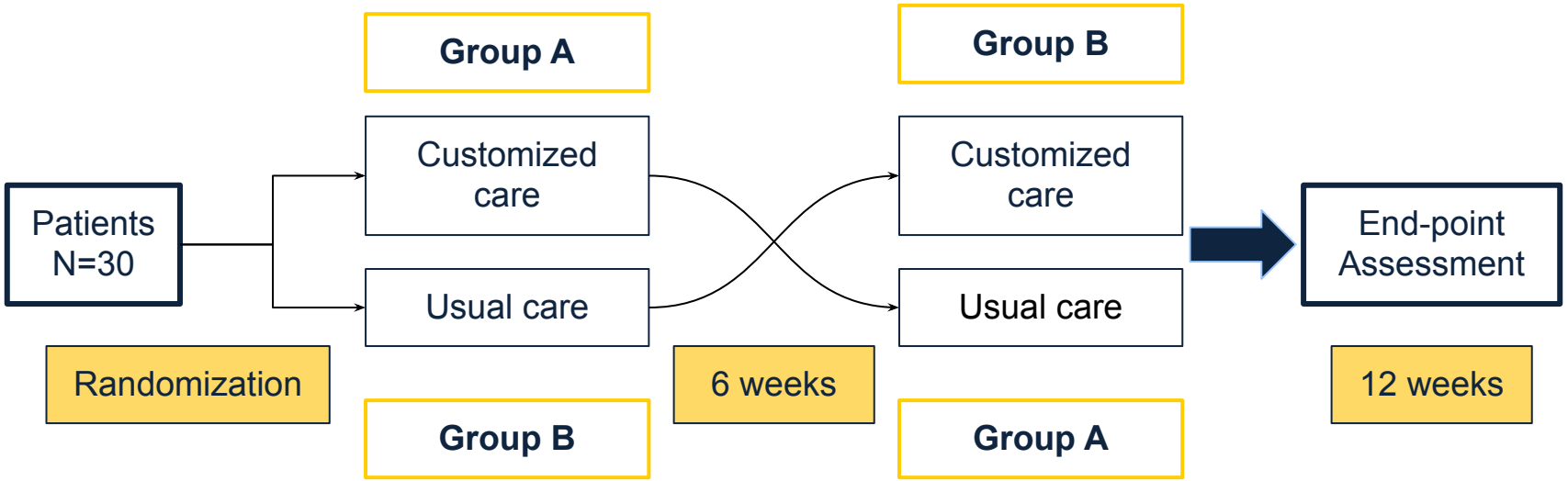
- **≥21 years of age**
- **Symptoms: ≥ 4 weeks ≤ 1-year**
- **Dominant somatic symptoms**

BASELINE ASSESSMENT

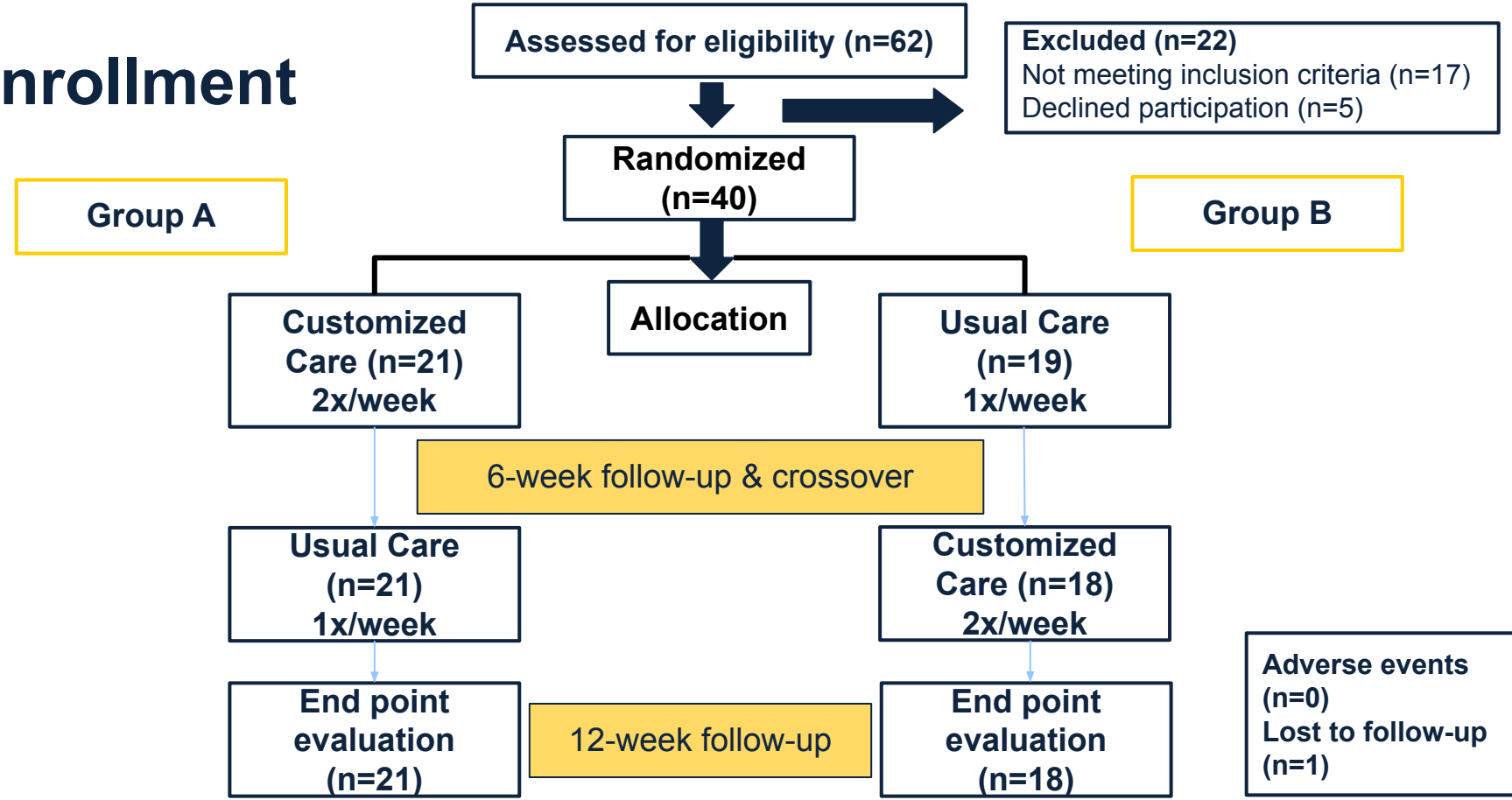
1. Standardized physical examination + cardiovascular fitness test
2. Rivermead Post-Concussion Questionnaire (Primary outcome)

- Autonomic/ Physiological
- Cervical Disorder
- Vestibulo-Ocular Disorder
- Affect / Mood Disorder **[Excluded]**

Study Design



Enrollment


Assessed for eligibility (n=62)
Excluded (n=22)
Not meeting inclusion criteria (n=17)
Declined participation (n=5)
Randomized (n=40)
Group A
Group B
Allocation
Customized Care (n=21) 2x/week
Usual Care (n=19) 1x/week
6-week follow-up & crossover
Usual Care (n=21) 1x/week
Customized Care (n=18) 2x/week
End point evaluation (n=21)
12-week follow-up
End point evaluation (n=18)
Adverse events (n=0)
Lost to follow-up (n=1)

Baseline demographics

Characteristics	Group A Customized Program Group (n= 21)	Group B Usual Care Group (n= 19)
Age, years, mean ±SD	40.7 ± 11.2	38.1 ± 15.8
Sex (Female/Male)	15/6	16/3
Duration of symptoms (months), mean ± SD	4.8 ± 2.8	5.3 ± 3.5
Number of prior conucssions, mean ± SD	1.7 ± 2.5	2.5 ± 2.6
Mechanism of injury (MVA/sport/other)	3/5/13	3/5/11

Mean baseline, 6- & 12-week follow-up outcomes

Group	Baseline (SD)	6-week FU (SD)	12-week FU (SD)
Group A ***(Customized followed by Usual)***	• RPQ3: 7.4 (±1.7) • RPQ13: 29.1 (±10) • RPQ Total: 12.5 (± 3.1) • Fail BCTT (%): 82	• RPQ3: 2.2 (±2.3) • RPQ13: 15.1 (±10.1) • RPQ Total: 7.7 (±4.6) • Fail BCTT (%): 17	• RPQ3: 1.5 (±2.1) • RPQ13: 13.5 (±12) • RPQ Total: 6.2 (±5.1) • Fail BCTT (%): 11
Group B ***(Usual followed by Customized)***	• RPQ3: 6.1 (±2) • RPQ13: 31 (±8.9) • RPQ Total: 12.6 (±2.5) • Fail BCTT (%): 70	• RPQ3: 5.7 (±2.6) • RPQ13: 23.5 (±10.8) • RPQ Total: 11.1 (±3.9) • Fail BCTT (%): 54	• RPQ3: 2.1 (±1.2) • RPQ13: 12 (±8.1) • RPQ Total: 6 (±3.6) • Fail BCTT (%): 0

Summary

What is the problem with current Post-Concussion Management?

- Significant minority continue to report symptoms
- Delays in proper assessment and rehabilitation
- Advice is non-specific with many uncertainties

Summary

How did we try to help bridge this gap?

- 12-week randomized case-crossover clinical trial
- New treatment modality based on phenotyping concussion
- Compared new treatment modality to current standard of care

Summary

What did we find?

- Customized rehabilitation lead to clinically and statistically significant changes
- Changes only occurred following customized care
- Exercise is medicine but requires prescription
- Results supportive of moving away from symptom-based care

Thank you

STUDY PROTOCOL

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