Advances in measuring the ability of youth to safely access their community after a brain injury: New research on our *Community Mobility Assessment*

Virginia Wright, PT, PhD
Senior Scientist and Professor
Holland Bloorview Kids Rehabilitation Hospital and University of Toronto

Special recognition of my CMA-2 clinician investigator colleagues at Holland Bloorview who inspired the CMA in the first place, and with whom I continue to collaborate and rely on in every stage of the research and knowledge translation: Kelly Brewer, PT, MSc; Trish Geisler OT and Janet Woodhouse OT, MEd

Holland Bloorview Kids Rehabilitation Hospital

Canada’s largest children’s rehabilitation hospital focused on improving the lives of kids with disabilities

A very special thanks to Novita who have generously hosted me once again this year as their Visiting Scholar
Community Mobility in the city – what does it mean for youth?
How might an ABI affect community mobility?

- After an ABI, various sequelae can influence safety as a pedestrian. These may include **physical issues** such as poor balance, coordination issues, restricted walking speed and decreased endurance.

- On their own, these may have a **negative impact** on **basic community mobility activities** such as: stepping off of a curb, getting through a subway turnstile, getting across a street in time, or walking on a bus/train whilst it is moving.

- Amplified by **cognitive impairments** such as impulsivity, inattention to the environment, impaired memory, judgment and problem solving, risk awareness, and social skills.
Let’s think of a 15 year old boy, Marcus, who sustained a closed head injury 5 months ago from a snowboarding accident.

- Marcus was initially unable to walk, but made a strong physical recovery with only mild balance issues remaining.
- A number of cognitive issues remain: memory, problem solving and judgement (some impulsivity), and easily fatigues in concentration.
- Also has some issues with left sided visual neglect though manages well in familiar environments.

Do you think Marcus will be safe if he goes to meet friends at Macca’s?

Should Marcus be going out into the community on his own?
How we might evaluate Max’s community independence before he goes home?

- Aspects of ‘community mobility evaluation’ are embedded within several validated participation or community integration evaluation questionnaires.
- Self-report questionnaires may be problematic for ABI clients since they frequently have poor insight into their abilities and may not accurately report their performance.
- Using a parent as a proxy respondent may also lead to errors in measurement of actual skills and behaviours.
- The actual skills required to get about in the community are only touched upon in these assessments.
An important follow-up to all of this intensive inpatient rehabilitation!

Development of the original CMA (Brewer et al., 1998)

- Performance-based, observational assessment in which youth goes on an **actual** ‘planned’ 90 to 120 minute **outing in the community**
- Designed for youth ages 12 to 19 years with an Acquired Brain Injury. Usually ambulatory, but can be done in a wheelchair if youth is independent in propelling and environment is accessible.
- **17 Physical** items and **23 Cognitive** items
- 40 items divided into 7 **sections**: Outing preparation, Road Safety, Outdoor Groundwork, Indoor Groundwork, Public Transport, Orientation, and Community Activity

*Brewer KM, Geisler PE, Woodhouse J, Moody KD, Wright FV, Add citation here!*
The Development of the original CMA
(Brewer et al., 1998*)

- Performance-based, observational assessment in which youth goes on a planned 90 to 120 minute outing in the community
- Designed for youth ages 12 to 19 years with an Acquired Brain Injury. Can be done in a wheelchair for youth who use one as main means of mobility
- **17 Physical items** and **23 Cognitive items**
- Items divided into **7 sections**: Outing preparation, Road Safety, Outdoor Groundwork, Indoor Groundwork, Public Transport, Orientation, and Community Activity


**EXAMPLES OF SKILLS ASSESSED**

- Brings appropriate amount of $  
- Crosses streets that have a traffic indicator within sufficient time frame  
- Uses landmarks appropriately  
- Manages escalators  
- Self-corrects when off route  
- Exits bus by rear doors  
- Shows social appropriateness (e.g., at restaurant, store)
The CMA …

- **3 point rating scale**: accomplished, partially accomplished and not accomplished
- Focuses on **urban experiences** (small town to large city) but not rural communities
- Youth self-rates fatigue and need for assistance prior to and after the outing (**insight**)
- **Physical** and **cognitive summary scores**
  - **Excellent inter-rater reliability** for physical components
  - **Good reliability** for cognitive components


**Evolution of the CMA-2**

- Our brain injury clinicians were concerned ‘recent’ changes to the **built environment** (e.g., bike lanes to get across, countdown street lights) and advances in **communication technology** (e.g., cell phones)
- Did the **CMA content** really reflect these changes?
Evolution of the CMA-2

- Our brain injury clinicians were concerned ‘recent’ changes to the built environment (e.g., bike lanes to get across, countdown street lights) and advances in communication technology (e.g., cell phones).
- Did the CMA content really reflect these changes? Was the CMA still valid?

We updated the CMA’s content - became the CMA-2 in 2015

- Mixed methods approach to creation
- Quantitative web-based clinician surveys were used after item-generation focus groups with youth and clinicians to determine pertinent items.

- Shenstone, Rodak, Brewer, Geisler, Woodhouse, Wright, unpublished paper, 2015)
The CMA-2

- **26 new items!** 9 existing items modified

  Of the **new** items:
  
  - 5 items were technological
  - 5 related to the built environment
  - 7 related to transportation
  - 9 were classified as ‘other’

- None of the CMA’s original items were removed

- **62 items in total** – 21 **Physical** and 41 **Cognitive**

**DIVISION OF CMA-2’S 62 ITEMS**

- Outing Preparation: 18
- Road Safety: 6
- Outdoor Groundwork: 5
- Indoor Groundwork: 7
- Public Transport: 7
- Orientation: 10
- Community Activity: 9
CMA-2 Revised Rating Scale

- Changed to a **4 point rating scale**:
  - 3 points - Accomplished independently
  - 2 points - Asks for confirmation/assistance
  - 1 point – Single prompt/assistance required
  - 0 points – Multiple prompts/not accomplished

*6. Remains attentive to surroundings and avoids distractions (e.g., phones, music, unfamiliar people) across multiple circumstances*

3. Remains attentive to the surroundings and does not get distracted by music, phones or unfamiliar people (e.g., does not walk and use phone, does not engage in conversation in inappropriate places)

2. Therapist provides one prompt to attend to the surroundings and no further concerns:

1. Therapist provides one prompt to attend to the surroundings, but client does not change behavior. A second prompt is required, and client then remains attentive to the surroundings.

0. Requires at least three prompts across multiple circumstances while on the outing and/or therapist must intervene to ensure client’s safety.

---

The flow of an outing

**1. PLANNING**
The actual outing. Have to move it!!!!! This is a light by the hospital!
Barriers: Sidewalk construction. Bins and uneven walk. Narrow sidewalk
Non-signalled crossing with a ‘safety island

Destination reached: Prospect Theatre Snack Bar
(for ‘best’ choc top ice cream)
Which items in the CMA-2 would we score with this outing section?

- Brings appropriate transit pass/ticket/token or change and can locate it when required
- Brings map/directions (paper or on phone) for outing (includes memorizing directions if preferred)
- If using a device, ensures device is sufficiently charged (e.g., phone, power chair, scooter)
- Crosses intersections with countdown lights
- Walks/stands a safe distance from hazards (e.g., curbs, construction equipment)
- Adapts to unforeseen circumstances on the route (construction, sidewalk closures, parking lots)

Which items in the CMA-2 …?

- Manages escalators
- Walks within bus while it is moving
- Pays for transportation accurately depending on method chosen
- Advocates for one’s self regarding safety, accessible seating and appropriate location
- Manages personal belongings across multiple circumstances
- Self-corrects when off route
- Remains attentive to surroundings and avoids distractions (e.g., phones, music, unfamiliar people) across multiple circumstances
CMA-2 Validation Study Was Essential
Funded by the Holland Bloorview Centres for Leadership 2016-17

- Single group measurement study design to assess inter-rater reliability and construct validity of the CMA-2

- Inclusion criteria:
  - 11-19 years with an acquired brain injury
  - Inpatient, day-patient or out-patient
  - Walks more than >750 metres in 25 minutes
  - Scored >95% on our topographical orientation test

- Exclusion criteria:
  - Behavioral issues precluding safe community assessment

Study Process

- Two trained assessors (PT and OT pair) accompanied youth on CMA-2 outing
  - one administered CMA while other observed
- Scoring completed independently by each assessor post outing
- Separate assessment by an independent OT assessor with validity measures:
  - 6 minute walk test
  - PEDI-CAT (mobility, social/ cognitive/ responsibility domains)
  - Behavioural Assessment of Dysexecutive Syndrome (BADS - Child version)
For further information on our validation work, please contact vwright@hollandbloorview.ca

Sharing CMA-2 results with Marcus and his parents

- **Mobility score** – 93%
- **Cognitive score** – 52%
- Got to his destination with redirection help from assessor
- No issues with fatigue for physical challenges of the outing
- Challenges with attending to everything in a busy intersection
- Often failed to turn head to look to the left when crossing even though he had managed well at this within the hospital
- Over reliance on written instructions. Not able to commit things to memory
- Was not able to use the google map on his phone when he missed the bus stop and got off course
Sharing CMA-2 results with Marcus and his parents

- **Mobility score** – 93%
- **Cognitive score** – 52%
- Got to his destination with redirection help from assessor
- No issues with fatigue for physical challenges of the outing
- Challenges with attending to everything in a busy intersection
- Often failed to turn head to look to the left when crossing even though he had managed well at this within the hospital
- Over reliance on written instructions. Not able to commit things to memory
- Was not able to use the google map on his phone when he missed the bus stop and got off course

Participation possibilities: Safe on his own out there? Not just yet!

Current Research related to Knowledge Translation / Sharing of the CMA-2

- To **develop** and **pilot test** a **Certification Training program** for PTs and OTs to support CMA-2 transfer to clinical care and research
  1. Design a **Simulation Based** training program – in situ training (OT and PT participants go on the street in a CMA-2 outing with a simulated patient)
  2. Build **training materials** to be housed in a **cloud based educational platform**
- In 2019, we will be looking for PTs and OT to do our online training and evaluate the CMA-2 materials
Acknowledgements

• Funding for the reliability study was provided by the ABI Centre for leadership, Holland Bloorview Kids Rehabilitation Hospital

• We thank the youth and the PTs and OTs who took part in the CMA-2 assessments!

Questions

Contact me at: vwright@hollandbloorview.ca