Use of Gait Speed in the Acute Rehab Setting

Objectives
1. Apply the walking speed literature to patients typically seen in the acute rehab setting (stroke, amputation, debility, multi-trauma, TBI).
2. Be able to establish functional goals based on the patient’s walking speed.
3. Educate the patient and their support system to the relevance of walking speed to morbidity and functional outcomes.

Walking speed – Introduction
- Walking speed – used to predict outcomes as early as 1980.
- Length of stay
- Discharge disposition
- Mortality of older adults
- Early cognitive impairment
- Hospitalization
- Falls
- Normal data has been established for comfortable and fast walking speed.
- Strong validity and reliability.

Measuring Walking speed (WS)
- Marked off pathway between 5 and 10 meters.
- Include an acceleration and deceleration phase.
- Self-selected tests: 2.5 meters.
- Maximal tests: 3 to 3.25 meters.
- Clear instructions that include real-life examples or demonstration especially for maximal walking speed tests.
- “When I say go, walk at your normal comfortable walking speed until I say stop.”
- “When I say go, walk as fast as possible and safely, but without running.”

- Example: Walk as fast as you can safely like you are trying to reach a bus that is about to pull out.
- Assessing both self-selected or comfortable WS and maximal WS provides a clearer picture of the patient.
- Timing begins when the person crosses the 2.5 meter (end of acceleration) mark and ends when the patient’s foot crosses the end of the timed designated distance.
- Patient may use an assistive device.
- Physical assistance is allowed for balance but not to advance a person’s limb. Therapist should be behind the patient to not influence the patients walking speed.
- 2 trials for best reliability.

Video
- Normative Data Healthy Adults

<table>
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<th>FWS (m/s)</th>
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<td>M/F</td>
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Walking Speed CDOA
- Minimal Detectable Change (MDC95) (Goldberg & Schepens, 2011)
- Average 60+ 0.14 m/sec
- CWS 0.6 – 1.0 m/s 0.11 (33% AD use)
- CWS > 1.0 m/s 0.14 (13% AD use)

Predictive Values
- Fall risk and need for intervention
- Morbidity – Red/yellow/green flags to predict future health and function
- Mortality
- Frailty – walking speeds less than 0.7 m/s (Lee et al., 2018; Fried et al., 2001)

Walking Speed in Clinical Practice
- Screen for mobility problems
- Document baseline level of function
- Educate patients and caregivers to the significance of their walking speed
- Determine goals for the physical therapy intervention to improve patient outcomes
- Measure outcomes to see if the intervention made a clinically significant difference

CASE STUDY: L Subdural hematoma
- Demographics:
  - 86 yo female
  - HTN, HL, CAD, AFib, Heart failure, COPD, OSA, ESRD on HD, RA, Gout, peripheral neuropathy
- On Eval CWS – 0.27 m/s with rollator
- On discharge CWS – 0.5 m/s with rollator
- Discharge Disposition
- Clinical goals:
  - Walking Speed: Patients s/p Acute Stroke

Predictability of discharge to rehab (Salbach et al., 2001)
- Less than 0.3 m/sec 0.95%
- Greater than 0.6 m/sec 0.22%

5 MWT at comfortable speed most responsive to change 1st 5 weeks after a stroke
- Ability to predict safe community ambulation 6 months post stroke
- CWS (>0.75 m/s) PASS (>30.5) and Age (<73.5), No CWS only PASS (>20.5) predictive (Aaslund et al., 2017)
- FWS > 0.42 m/s & FES < 57 < 3 months s/p stroke (Rosa et al., 2015)

MCID – 0.16 m/s (Tilson et al., 2010)

Functional Walking Categories (Perry et al., Stroke, 1995)
- Physiological 0.1m/s + 0.05
- Limited Household 0.23 m/s + 0.17
- Unlimited Household 0.27 m/s + 0.12
- Most limited community 0.40 m/s + 0.18
- Least limited community 0.58 m/s + 0.18
- Community 0.80 m/s + 0.18
Case Study: Left Cerebellar CVA

- 72 y/o female
- Blood pressure, renal disease, hyper-tension
- GCS 15/15 - 30
- Discharge: CWS - 80%
- Discharge: Observation - 0
- Clinical goals

Walking Speed: Patients S/P Chronic Stroke

- Trended CWS - 0.55 m/s
- Discharge CWS - 0.82 m/s
- Discharge disposition -?

Clinical goals

Walking Speed: Patients S/P Chronic Stroke

- Trended CWS - 0.55 m/s
- Discharge CWS - 0.82 m/s
- Discharge disposition -?

Clinical goals

Case Study: Hip Fracture with ORIF

- 82 y/o F
- Hx of falls, MVR (5 years ago), B Cataract surgery (4 years ago), HTN
- On eval CWS - 0.2 m/s
- On discharge - 0.32 m/s
- Discharge disposition -?

Clinical goals

Walking Speed: Patients S/P Hip Fracture

- Trended CWS - 0.20 m/s
- Discharge CWS - 0.32 m/s
- Discharge disposition -?

Clinical goals

Case Study: T12 – L1 compression fracture

- 52 yo male
- S/P fall off a ladder
- On eval CWS - 0.78 m/s, FWS - 0.96 m/s with TLSO and RW
- On discharge CWS - 1.13 m/s, FWS - 1.39 m/s with TLSO
- Discharge disposition -?

Clinical goals

Case Study: Patients with Parkinson’s disease S/P back surgery

- 68 y/o M with H & Y Stage 3
- Lumbar posterior fusion S/P spinal stenosis L2 to L5
- HTN, history of 3 falls past 2 years
- Eval CWS - 0.6 m/s
- Discharge CWS - 0.8 m/s
- Discharge disposition -?

Clinical Goals
Walking speed: Patients with Parkinson's disease

- CWT and FWT are valid measurements to assess differences in walking speed across disease progression.
- Positively related to 6MWT, mini-BEST, & ABC
- MDC shows changes in stages of PD
- UPDRS 0.02 m/s, 0.06 m/s, 0.09 m/s (small, medium, large change respectfully)
- S&E 0.13 m/s
- H&R 0.18 m/s (Combs et al. Gait & Posture. 2014;39:784-788)

People with amputations – 6 levels

- Level 0: Does not have the ability or potential to ambulate or transfer safely with or without assistance and a prosthesis does not enhance their quality of life or mobility.
- Level 1: Has the ability or potential to use a prosthesis for transfers or ambulation on level surfaces at fixed cadence. Typical of the limited and unlimited household ambulator.
- Level 2: Has the ability or potential for ambulation with the ability to traverse low level environmental barriers such as curbs, stairs or uneven surfaces. Typical of the limited community ambulator.
- Level 3: Has the ability or potential for ambulation with variable cadence. Typical of the community ambulator who has the ability to traverse most environmental barriers and may have vocational, therapeutic, or exercise activity that demands prosthetic utilization beyond simple locomotion.
- Level 4: Has the ability or potential for prosthetic ambulation that exceeds basic ambulation skills, exhibiting high impact, stress, or energy levels. Typical of the prosthetic demands of the child, active adult, or athlete.

Walking speed and strength in persons with amputations

Several authors have found a strong correlation between walking speed and hip strength in persons with an amputation (Crozara, Hubbard).

Corzara et al (2019) found (Crozara et al. Gait & Posture. 2019;70:383-388) hip extension power (amputated side) (67% of variance) and asymmetry of hip abduction power (15% of variance) as main predictors of CWS in people with lower limb amputations.

Walking Speed: Patients with Amputation

- Traditionally, use of walking speed/functional transfers potential
- Study: CWT: 0.17 m/s to 0.19 m/s without additional stability
- Feed forward function: Basis of equinus or flexor pattern
- CWS: 0.03 m/s to 0.05 m/s
- Fastest CWS associated with higher K-level, higher discharge FIM-Motor, younger age, M and BKA vs AKA (Batte H et al. Pros & Orth International 2019.43(2):196-203)
Walking Speed: Patients s/p Cardiac surgery

- Predictability
  - Walking speed post-operative can influence long-term outcomes
  - Determined that being a slow walker increases mortality

- Norms
  - CABG: 0.94 m/s
  - Isolated valve sx: 1.0 m/s
  - CABG & valve: 0.94 m/s

- MDC
  - CABG: 0.16 m/s

Walking Speed: Traumatic Brain Injury

- Predictability
  - 10MWT is a reliable measure of gait velocity with test repetition
  - Can be used to assess CWT and FWT

- Self-selected walking speeds higher than 1.0 m/s greatly increase the likelihood of running following brain injury.

- CWT have the highest ecological validity of the clinical gait tests

- MCID:
  - CMT: 0.15 m/sec
  - FMT: 0.25 m/sec

Case Study: S/P hip fracture with Dementia

- 85 y/o M Alzheimer Stage 3
- Fell at home 1 week ago, underwent ORIF, WBAT
- Admission CWS: 0.15 m/s
- Discharge CWS: 0.23 m/s
- Discharge disposition??

Walking Speed: Patients with Alzheimer’s/Dementia

- Predictability
  - Associated with potential to develop dementia
    - Hackett et al. JAGS. 2018;66:1670-1675

  - Associated with finding of mild cognitive impairment

- Gait speed affected by a person’s fear of falling especially under dual-task functional task

- Both CWS and FWS is associated with impaired cognitive function

- MDC
  - Alzheimer: 0.16 m/s
  - Dementia: 0.27 m/s

Walking speed and cognition

- Gait speed and TUG can be used to assess for Mild cognitive impairment (MCI) in older adults

- 47 CDOA (75 y/o)
- Executive function assessed via the Trail Making Test Part B
- Physical performance via TUG, FTSTS, and gait speed
- Gait speed related to performance of executive function
- Gait speed and grip strength associated with prediction of 10 year cognitive decline

Walking Speed: Tool for patient/family education

- Personal factors such as motivation to exercise, fatigue and anxiety are strongly correlated with activity levels in TBI patients after discharge from Inpatient Rehabilitation
- Walking speed can educate patients and families of their risk of negative outcomes
- Mortality
- Co morbidities
- Falls
- Risk rehospitalization
- Decrease in gait speed may be indicative of new health problems
- Slower walking speeds and a great decline in speed are at greater risk of developing dementia, despite cognitive changes
Patient family Education

- Patients and families need to understand that the speed at which people who are living “well” in the community typically walk.

Walking Speed: Tool for Case Management/Discharge Planning

- Knowledge of tool
- Decision making
- Working across the continuum of care from ED to outpatient, and pre-surgical evaluations
- Justification of services
- Communication with other healthcare provider and third party payers

Goal setting

- Case studies, what goal would you set for each of these patients?
- Based on the MDC and initial walking speeds, what clinical goal would you write for each of the patients presented in the case studies today.

Future Research

- Effect of different environments on walking speed
- Use of walking speed to predict vulnerable patients prior to surgical or medical treatments
- Use/knowledge of walking speed by case managers and admission nurses

Conclusion

- Walking speed can be performed in any clinical area where you have a straight 5 to 10 meter pathway.
- Walking speed is a functionally valid outcome tool with strong psychometric properties.
- Walking speed should be communicated and explained to all members of the patient’s care team.
- Slow walking speed can be an indicator of high probability of functional and cognitive decline over 5-10 years.