
A CLINICAL TOOLKIT FOR:
WHEELCHAIR SKILLS
TRAINING AND
PROMOTING
ACCESSIBILITY IN
SCHOOL-BASED
PHYSICAL THERAPY




*A comprehensive guide for
students and clinicians.*



PURPOSE OF THIS GUIDE

This toolkit was created by Caroline Lynott, a 3rd year DPT student at The University North Carolina at Chapel Hill as part of her Capstone project.


The purpose of this guide is to provide a compilation of resources for working with manual wheelchair users in the school-environment, spanning from equipment delivery to functional skill training. It is generally intended for use **for and with** children who will be *independent mobilizers* with specific indications including (but not limited to) children diagnosed with:

- ★ Spina Bifida
 - ★ Cerebral Palsy
 - ★ Spinal cord injury
 - ★ Muscular Dystrophy
 - ★ Spinal Muscular Atrophy
 - ★ Multiple Limb Deficiency
 - ★ Juvenile Rheumatoid Arthritis
- 



GUIDE OBJECTIVES

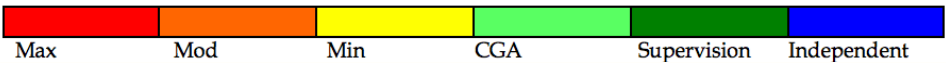
This guide provides the user with the ability to:

- ★ Successfully evaluate equipment at delivery.
 - ★ Appropriately select specific skills to teach the student.
 - ★ Write functional goals.
 - ★ Incorporate functional outcome measures into treatment.
 - ★ Promote self-determination by engaging the student in the management of his or her equipment.
- 



TIPS FOR USE

- ★ Prioritize your interventions. Skills listed in the guide may not be appropriate for all students.
- ★ Use dry-erase marker to document in real-time.



- ★ Record the student's assistance level on this sliding scale for each skill to have for easy documentation.
- ★ Share the guide with your students, have them participate in the process to improve motivation and self-determination.



Look out for this blue box for helpful hints and tips along the way!



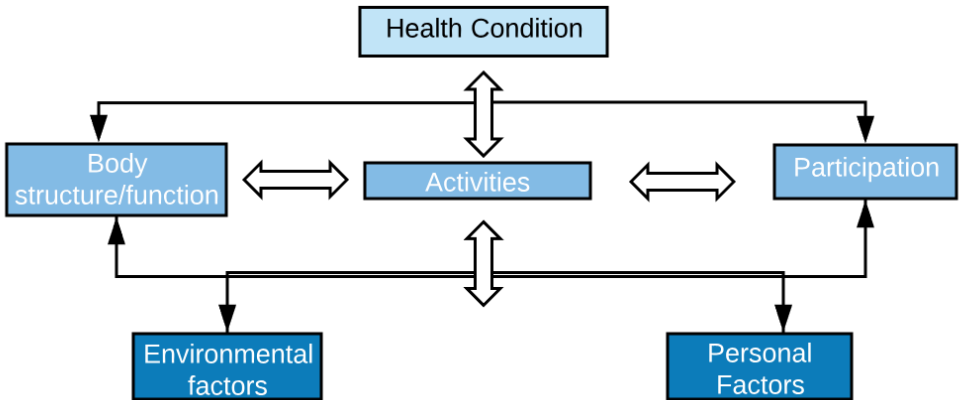


TABLE OF CONTENTS

- 5 ICF MODEL APPLICATIONS
- 6 EQUIPMENT DELIVERY CHECKLIST
- 9 TEACHER INTERVIEW
- 11 STUDENT INTERVIEW
- 13 WHEELCHAIR SKILLS CHECKLIST & GOAL WRITING
- 35 FUNCTIONAL OUTCOME MEASURES



ICF MODEL APPLICATIONS



Body structure/function

- ◆ ROM
- ◆ Endurance
- ◆ Strength
- ◆ Vision
- ◆ Cognition

Participation

- ◆ Classroom learning
- ◆ Lunchtime
- ◆ Recreation
- ◆ Transitions between classes

Personal Factors

- ◆ Age
- ◆ Motivation
- ◆ Hobbies & Goals

Activity

- ◆ Seatbelt
- ◆ Brakes
- ◆ Propulsion
- ◆ Turning
- ◆ Transfers


Environmental factors

- ◆ Classroom layout
- ◆ School accessibility
- ◆ Outdoor areas



It is important for the physical therapist to consider all elements of the ICF model when creating a plan of care and selecting equipment. This will ensure the intervention is appropriate for the student's specific need and mobility goals.

EQUIPMENT DELIVERY CHECKLIST

 Depending on your student's age and readiness, you can have them assist in completing this checklist to promote independence with their new equipment.

1. Does the equipment appear to match the order in:


- Size
- Color
- Style
- Attachments

2. How is the fit? Adapted from: Axelson, 2013

- Seat Width (+2" from greater trochanter)
- Seat Height (+2" for footrests)
- Seat Depth (-2" from popliteal fold)
- Back Height (-2" from inferior scapular angle) *May differ depending on the level of truncal support needed.
- Armrest Height (5-7" from chair seat)

3. Is there room for growth?

- Seat Depth
- Back Height
- Leg Hanger

 Pediatric wheelchairs need to have the means to accommodate for the child's growth. Seat depth growth occurs within the frame and seat height growth occurs within the canes.

4. How well is the child positioned?

- Pelvic Alignment Spinal Alignment

- 90 degree position of: Elbows Hips
 Knees Ankles

- Maintains proper position at: 5 minutes
 1-2 hours
 End of day

5. Are all attachments present?

- Footrest type Handrims
 Armrest type Brake handle
 Back support Seat-belt
 Seat cushion Other supportive straps



Often times attachments can be left out from the order at delivery, refer to the LMN prior to delivery to recall what attachments were ordered. (See next page to document)

6. Are all parts functioning?

- Brakes Breakdown & Folding
 Anti-tip Growth Mechanism
 Wheels & Casters

7. Has the student/ caregiver been trained on positioning, equipment use and maintenance?

- Yes No

Delivery Notes:

Often times attachments can be left out from the order at delivery, refer to the LVM prior to delivery to recall what attachments were ordered. (See below)

Documentation of training/orientation:

PRIORITIZING PT INTERVENTION



Get to know your student's daily routine and activities to get a sense of how to approach skill training at school. One way to do this is to conduct a brief interview with his/her teacher and your student.



Sample *Teacher Interview* Questions

1. What are the student's strengths at school?
2. What are typical tasks or activities that the student participates in while in the classroom?
3. Which bathroom does the student typically use?
4. What areas of the school are frequent for the student to visit throughout the day?
5. How does the student get to/from school?
6. Where is recess typically held?
7. Does the student eat lunch in the classroom or the cafeteria?
8. Have you seen him/her struggle throughout the day with any particular task?
9. Is the student self-directed and motivated to make choices?
10. How is his/her safety awareness?

Teacher interview notes:

PRIORITIZING PT INTERVENTION



Sample *Student* Interview Questions

1. What are your goals with your (new) equipment? Are there specific skills you would like to learn or master?
2. What areas of the school do you go to on a typical day?
3. Is there anywhere you cannot go at school, home or other places?
4. Do you have any hobbies/ interests/ favorite school subjects?
5. Do you find that you have to ask for help for certain tasks? At specific times during the school day, at home or other places you go?
6. Do you have any trouble with tasks at home or other places you go?
7. Do you get to/from school by car or bus? Do you have a strategy for managing your wheelchair during travel?

Student interview notes:



WHEELCHAIR SKILLS CHECKLIST & GOAL WRITING

This section is intended to be a step-wise depiction of mobility skills within the school environment spanning from basic to advanced. It is a personal collection of skills driven by brevity and functionality for easy clinical use and adaptation. (Skills marked with a ♦ have been adapted from Axelson, 2003.)



For beginners in the **cognitive stage of learning**, it is ideal to work on skills in *minimally distracting environments*. As the student demonstrates competency, you can pose additional challenge with peers present. See next page for a brief review.

STAGES OF MOTOR LEARNING

Adapted from: Schmitz, 2007

Stage 1: Cognitive *"What do I do?"*

Feedback: After every trial, slowly begin to fade.

Practice: Blocked with adequate rest, provide manual assistance as needed.

Environment: Minimize distraction and stressors.

Stage 2: Associated *"How do I do it?"*

Feedback: Faded; Knowledge of Performance, facilitate self-evaluation.

Practice: Serial practice of related skills.

Environment: Introduce change/unpredictability.

Stage 3: Autonomous *"How do I succeed?"*

Feedback: Occasional, only if errors occur.

Practice: Massed practice, stress consistency of performance.

Environment: Variable, promote applicability of success in various settings.



Consider these challenges to optimize cognitive processing:

1. Spend one day per month **without** giving any verbal cues (use gestural prompting or auditory stimuli instead)
2. Ask the student how he/she could improve before providing feedback

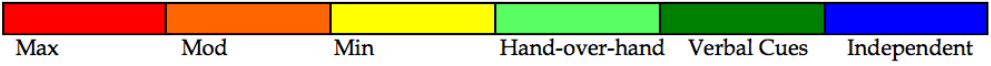


STEP 1: SAFETY



The student demonstrates safe use of:

✓ Handrims:



✓ Brakes:



✓ Seat Belt:



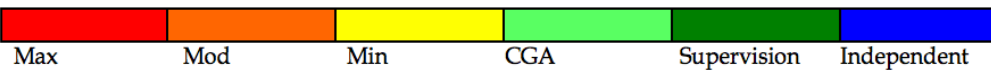
✓ Foot Straps:



✓ Armrest Removal and Reattachment:



✓ Body and Spatial Awareness:



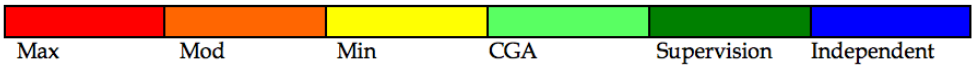
Safety Training Notes:

STEP 2: CLASSROOM NAVIGATION

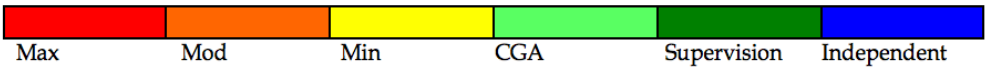
✓ Maneuvers to/from entrance and desk:



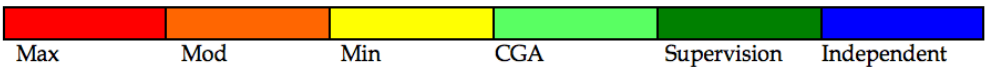
✓ Takes off coat/jacket/backpack and stores (in cubby, locker etc.):



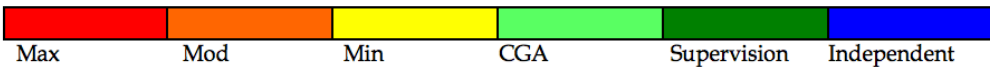
✓ Maneuvers through crowded desks and tables (narrow spaces):



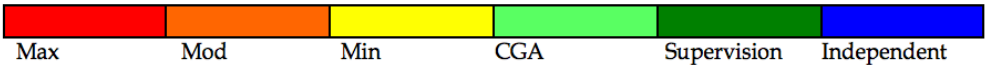
✓ Reaches for items on book shelf:



✓ Carries items to desk:

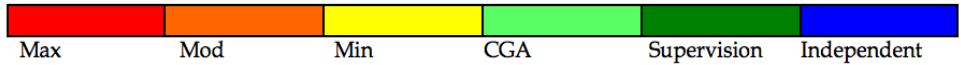


✓ Washes hands:

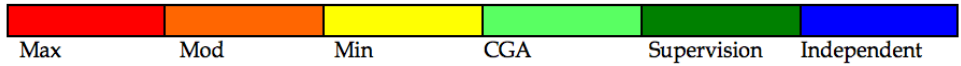


STEP 3: TRANSFERS

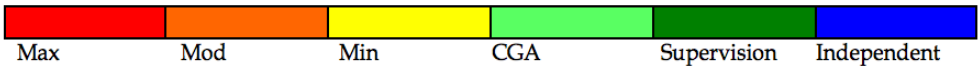
✓ Transfers to/from classroom chair:



✓ Transfers to/from floor:




✓ Transfers to/from toilet:



It may also prove helpful to document and record the time it takes to complete the transfer. This will help you to track the student's progress and efficiency over time.

Transfer notes:

STEP 4: HALLWAY NAVIGATION

 Utilize open hallway space to focus on efficiency, speed, endurance and safety of propulsion. It may also be helpful to map out/practice routes for safe exiting of the school during a "mock" fire drill.

In **empty hallways**, the student demonstrates:

 Forward propulsion with 11:00-2:00 pattern (see page 36): 



 Backward propulsion with 2:00-11:00 pattern: 



 Turns to the Left and Right:




 360 degree turns



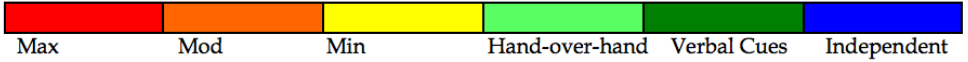
 Efficient Speed



 To test for speed efficiency, ask the classroom teacher if you can bring a buddy to walk alongside your student.

In line with peers, the student demonstrates:

✓ 11:00-2:00 propulsion pattern: ◆



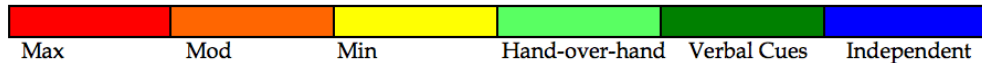
✓ Maintaining place in line and efficient speed:



✓ Coming to a quick stop: ◆

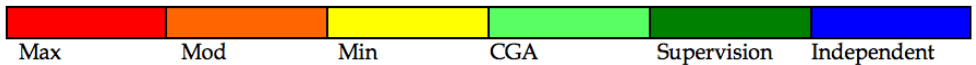


✓ Safety and body awareness:

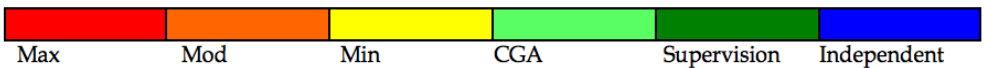


In crowded hallways, the student demonstrates:

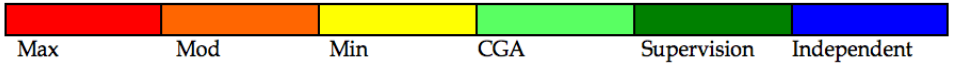
✓ 11:00-2:00 propulsion pattern: ◆



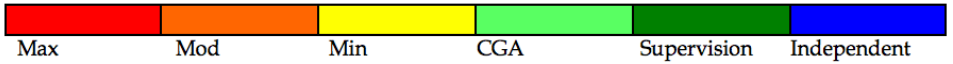
✓ Safety and body awareness:




✓ Efficient Speed:



✓ Safe exit during fire drill:



 When working on efficient speed, it can be helpful to time peers and your student walking/propelling along equal distances. Calculate each speed and use the data to compare speeds as a function of a percentage.

Hallway training notes:

Student: _____ ft/s m/s (circle)

Peer: _____ ft/s m/s (circle)

% = (Student speed / peer speed) x 100%

% = _____

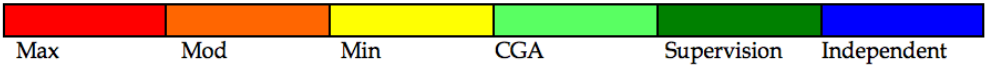
STEP 5: OTHER SCHOOL AREAS



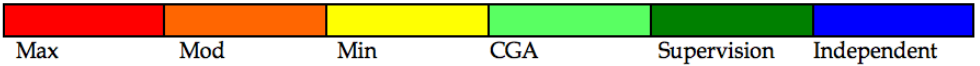
Choosing to train mobility skills in other school areas will depend the student's daily routine, functional goals and things noted in the teacher interview.

CAFETERIA

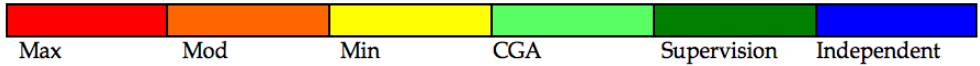
✓ Navigates between lunch tables:



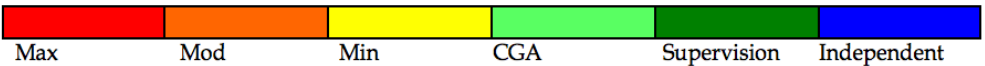
✓ Transfers to/from lunch table seat:



✓ Navigates through lunch line:



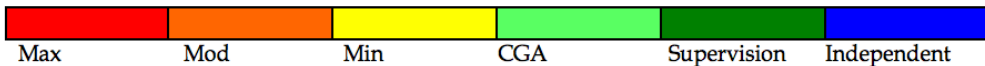
✓ Carries empty tray to table:



✓ Carries tray with lunch items to table:



✓ Clears and disposes of lunch table items:



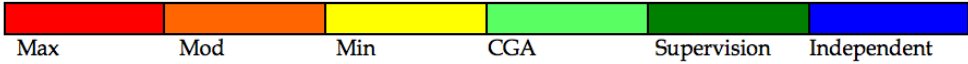
OUTDOOR AREAS

Focus on: Elevation changes, ramps and hills

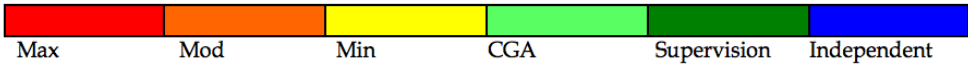
The student negotiates:



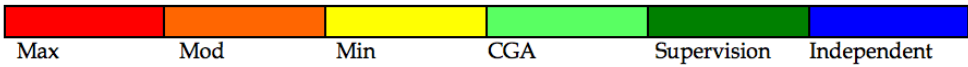
From drop-off location to classroom:



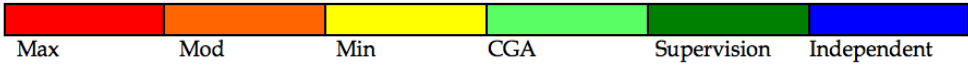
From pavement to sidewalk via curb cut:



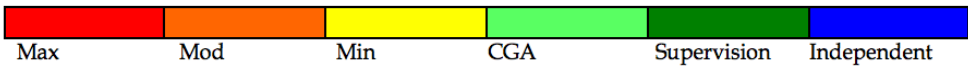
Up ramp (specify incline %):



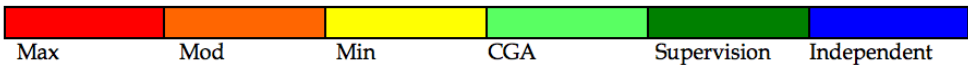
Down ramp (specify incline %):



Uphill (specify location):



Downhill (specify location):



GUARDING ON INCLINES

Uphill: posterior to the student.

Downhill: anterior to the student.

Outdoor Area Training Notes:

Environmental modification(s):

Incline %:

Hill Training Location:



PLAYGROUND

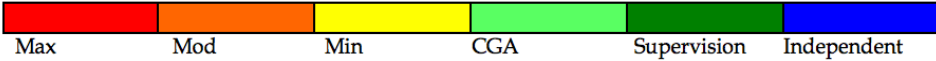
Focus on: Rough Terrain



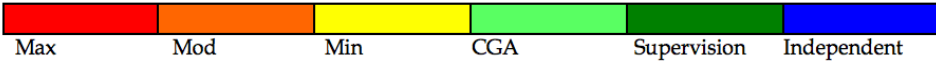
The student negotiates:



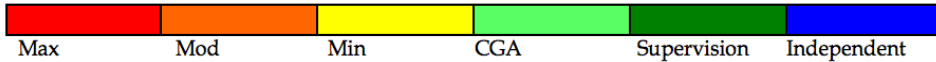
To/from classroom to playground:



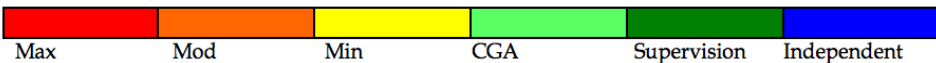
Through grass:



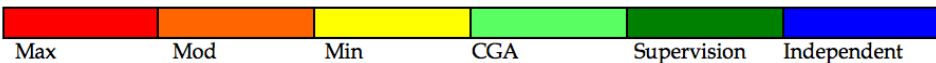
Through wood chips/ mulch:



Up playground ramp:



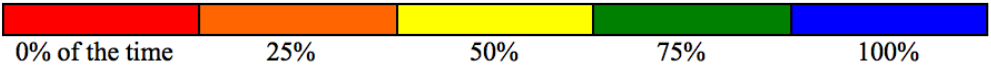
Down playground ramp:



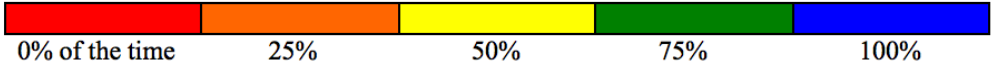
Try to use this time on the playground to also assess accessibility and options for play for the student. See next page to document.

The student engages in:

✓ Play with peers on ground surfaces:



✓ Play with peers on low play equipment:



Playground Training Notes:

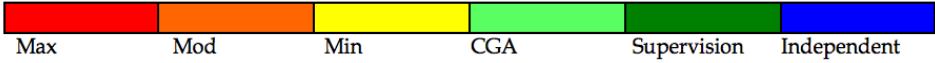
Accessibility and Play Opportunities:



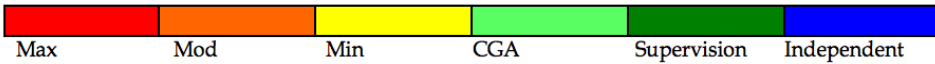
SCHOOL BUS



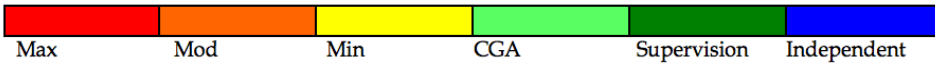
Negotiates onto platform lift:



Navigates narrow bus aisle:



Transfers to/from bus seat:



This is a good opportunity to ensure the bus driver and monitors are oriented to helping the student on/off the bus and managing tie downs. Document any training on the next page.



You may be able to contact the bus company to have an empty bus available at school during off hours for initial practice.

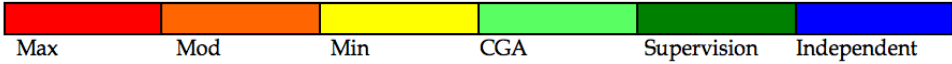
School Bus Training Notes:

Bus Driver/ Monitor Training:

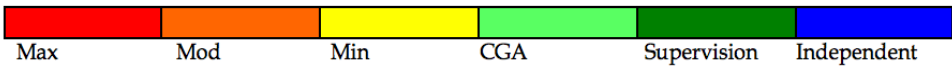
DOORS AND ELEVATORS



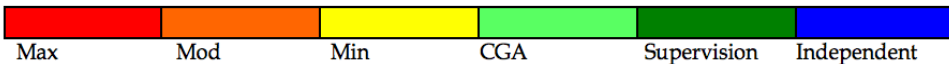
Opens automatic doors:



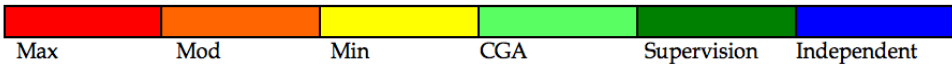
Opens low-resistance doors (push to open):



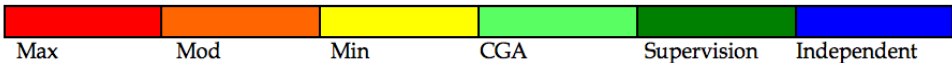
Closes low-resistance doors (push to close):



Opens low-resistance doors (pull to open):

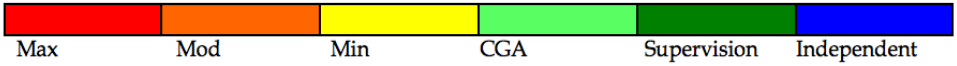


Opens low-resistance doors (pull to close):

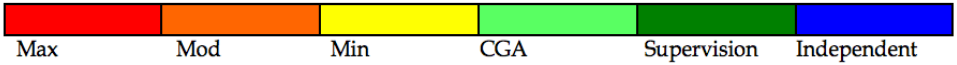


Be sure to document the location of the door and the door type as pushing a door open/closed is generally easier than pulling a door open/closed.

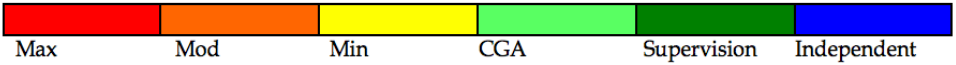
✓ Opens high-resistance doors (ie. doors with a crash bar):



✓ Negotiates through high-resistance door:



✓ Calls, operates and negotiates into/out of elevator:



Door training Notes:

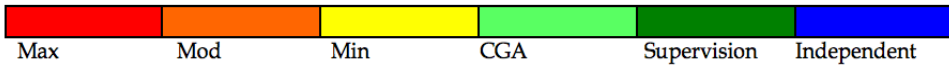
Door type and location:

STEP 6: ADDITIONAL CONSIDERATIONS

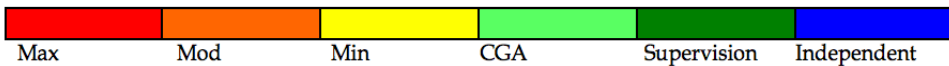
1. Pressure Relief



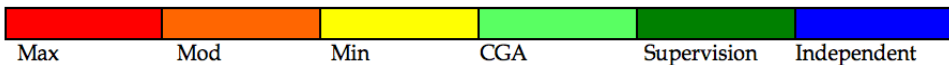
Performs anterior-lean method:



Performs lateral-lean method:



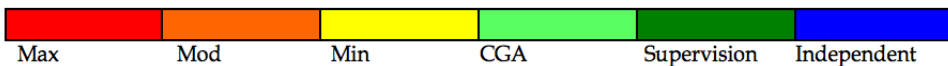
Performs push-up method:



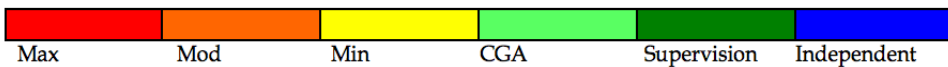
2. Wheelies (older students)



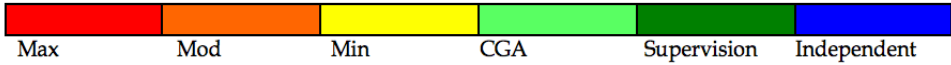
Pops partial wheelie:



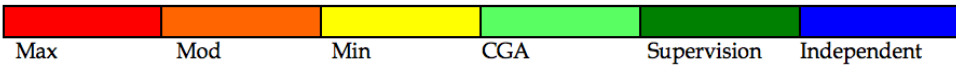
Finds balance point:



✓ Performs wheelie up/down shallow curb (4-6"):

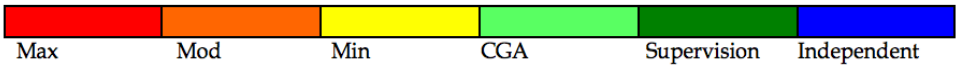


✓ Performs wheel up/down standard curb (8"):

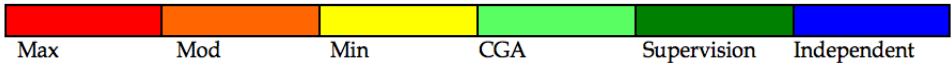


3. Driving to/from school

✓ Negotiates into/out of car:

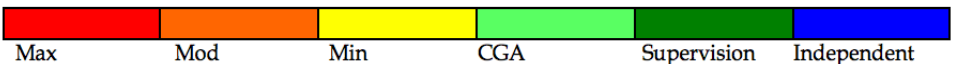


✓ Has strategy for getting equipment into/out of car:

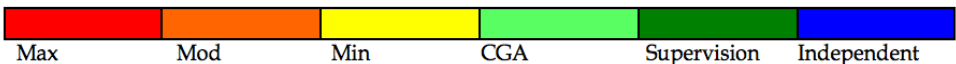


4. Graduation

✓ Negotiates onto stage:



✓ Negotiates off of stage:



FUNCTIONAL GOAL

WRITING TIPS

Adapted from: Randall et al (2000) & Bovend'Eerd et al (2009)

S.

Goals are **specific** to the particular skill(s) you are training or outcome measure used.

M.

Goals are **measurable** through distance, time and/or level of assistance provided.

A.

Goals are **achievable** through prioritizing intervention and plan of care.

R.

Goals are **realistic** through expectation of variability in practice. Written in terms of trials; i.e success on 4/5 trials.

T.

Goals are **timely**, based on school-directed intervals such as quarters or marking periods.



Check out the next page which has color matched sample goals based on the skills incorporated in this guide!

STEP 1: SAFETY

Goal: By the end of the quarter, following a transfer, with one verbal cue the student will manage brakes, adjust and buckle seatbelt and foot-straps on 2 consecutive days of the week.

STEP 2: CLASSROOM NAVIGATION

Goal: By 10/31/2020, the student will navigate safely throughout his classroom including around desks, obstacles and peers with supervision only on 4/5 days of the school week.

STEP 3: TRANSFERS

Goal: By the end of the school year, the student will transfer to/from his classroom chair in less than 30 seconds with verbal and manual cues on 4/5 trials.

STEP 4: HALLWAYS

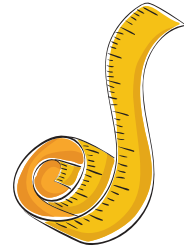
Goal: By the end of the marking period, the student will propel her wheelchair in the hallways while keeping up with peers and demonstrating safety awareness with supervision only, on 3/5 days of the school week.

STEP 5: OTHER SCHOOL AREAS

Goal: By 5/1/2020, the student will negotiate up and down a ramp of 5% or greater with contact guard assist and manual cues 50% of the time on 4/5 trials.


STEP 6: ADDITIONAL CONSIDERATIONS

Goal: By the end of the quarter, with one verbal cue per day, the student will perform independent pressure relief on 5/5 days of the school week.



WHEELCHAIR-SPECIFIC FUNCTIONAL OUTCOME MEASURES

All measures adapted from SeekFreaks post except page 39 (see individual references at the back of the guide).

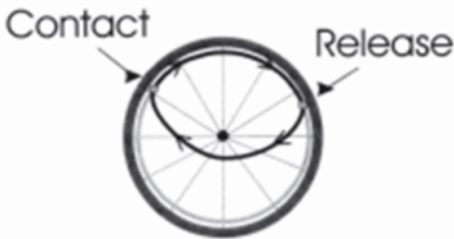
 Track progress on functional outcomes using the recording charts. Include the previous scores to show students their progress on subsequent trials.

1-STROKE PUSH TEST

Instructions: On a flat surface, have your student maximally propel with one forceful push stroke.

Record: Measure the distance travelled between start and end points at posterior wheel.

Proper propulsion technique:



Contact the wheel at the 11 o'clock position, propel and release at the 2 o'clock position.

| 1-stroke push test | Test 1 | Test 2 | Test 3 |
|--------------------|--------|--------|--------|
| Distance | | | |
| Date | | | |

Normative Data (Range)

1.8 m
minumim

7.2 m
maximum

Adapted from: Verschuren et al, 2012

WHEELCHAIR PROPULSION TEST (WPT)

Instructions: Have your student propel at a self-directed pace on a pre-determined 10-m course.

Record: Measure the time it takes to complete and number of propulsion cycles. Also record qualitative observation of propulsion mechanics.

| WPT | Test 1 | Test 2 | Test 3 |
|-------------|--------|--------|--------|
| Time | | | |
| # of cycles | | | |
| Date | | | |

Normative Data (Range)

Time

6 sec.
minimum

38 sec.
maximum

Median: 15 seconds

Cycles

2
minimum

41
maximum

Median: 13.5 cycles

Adapted from: Askari et al. 2013

6-MINUTE PUSH TEST

Instructions: On a flat 10-m course, have your student propel at a self-directed pace for 6 minutes, allow for rest breaks as needed, but do not stop time.

Record: Measure the distance travelled by counting the student's laps around the course. Use a measuring wheel to tabulate intermediate distance at the test's conclusion.



If able, you can also measure and record the student's pre- and post-test heart rate for quantification of endurance.

| 6-minute push test | Test 1 | Test 2 | Test 3 |
|--------------------|--------|--------|--------|
| Distance | | | |
| Date | | | |

Normative Data (Range)

145.9 m
minimum

387.1 m
maximum

Mean: 266.5 m

Adapted from: Verschuren et al, 2012

FORWARD REACH TEST (FRT)

Instructions: Have the student position themselves adjacent to a wall, and instruct them to reach as far forward as they can with their shoulders flexed to 90 degrees.

Record: Measure the distance along the wall from the start point to the end point via the translation of the middle digit. Qualitatively record any compensatory strategies used.

| FRT | Test 1 | Test 2 | Test 3 |
|----------|--------|--------|--------|
| Distance | | | |
| Date | | | |

Normative Data (Range)

22.7 cm
minimum

37 cm
maximum

Full page adapted from: Deshmukh et al, 2011

Outcome Measure Notes:

1-Stroke Push Test:

WPT:

6-minute Push Test:

FRT:

References

As they appear in the guide

Schmitz, Thomas J., and Susan B. OSullivan. *Physical Rehabilitation Assessment and Treatment*. [Print] F.A. Davis Company, 2007 pp 368.

Axelson P, Minkel J, Perr A. *The Manual Wheelchair Training Guide*. 2nd ed. [Print] Minden, NV: Pax Press; 2013.

Randall KE, McEwen IR. Writing patient-centered functional goals. *Phys Ther*. 2000;80(12):1197-1203. Available at: <https://academic.oup.com/ptj/article/80/12/1197/2842443>.

Bovend'Eerd T J H, Botell RE, Wade DT. Writing SMART rehabilitation goals and achieving goal attainment scaling: a practical guide. *Clinical Rehabilitation*. 2009;23:352-361. DOI: 10.1177/02692155081901741. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/19237435>.

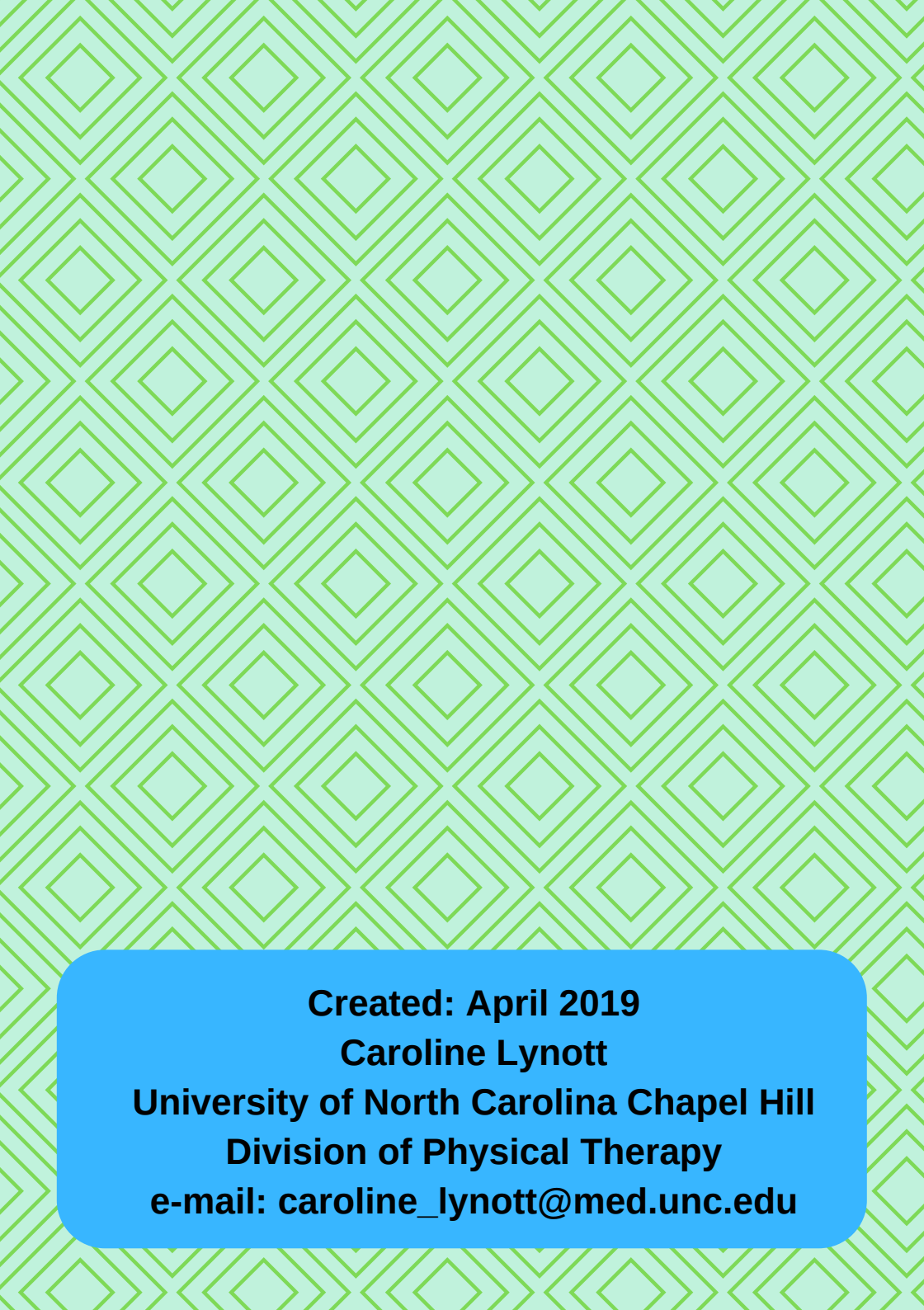
Vialu C. (2016). "Resource: 7 Promising Wheelchair Operation Tests for School-Based Therapists. SeekFreaks. [Blog Post]. Available at: <https://www.seekfreaks.com/index.php/2016/02/10/7-wheelchair-tests-school-based-therapist/>.

Versch O, Ketelaar M, Groot J, Nova FV, Takken T. Reproducibility of two functional field exercise tests for children with cerebral palsy who self-propel a manual wheelchair. *Dev Med & Child Neurol*. 2012;5(2):185-191. DOI: 10.1111/dmcn.12052. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/23253073>.

Askari S, Kirby RL, Parker K, Thompson K, O'Neill J. Wheelchair propulsion test: development and measurement properties of a new test for manual wheelchair users. *Arch Phys Med Rehabil*. 2013; 94:1690-8. DOI: 10.1016/j.apmr.2013.03.002. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/23499781>.

Deshmukh AA, Ganesan S, Shanker J. Normal values of functional and lateral reach tests in Indian School Children. *Pediatr Phys Ther*. 2011;23:23-30. DOI: 10.1097/PEP.0b013e3182099192. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/21304340>





Created: April 2019
Caroline Lynott
University of North Carolina Chapel Hill
Division of Physical Therapy
e-mail: caroline_lynott@med.unc.edu