Sliding off a wheelchair seat: still a problem to address

Élise Jobin
Occupational therapist
May 2012
Overview

- Introduction: definition, cause and consequences of sliding
- Problem solving, how to intervene:
  - Modification of the WC itself
    - Measurement
    - Accessories and components
    - Cushion
    - Bealt
  - Modification of the way the client performs some ADL’s
INTRODUCTION: DEFINITION, CAUSES AND CONSEQUENCES OF SLIDING
Definition

- To slide or to glide: continuous motion voluntary or not on a surface: the two surfaces remain in contact
- Sliding or gliding: the action to slide or the motion of a downward load
- Slippery: introduces the notion of danger
Causes

- Physical
  - Kyphosis
  - Decreased muscle tone of the trunk
  - Diminished seating tolerance
Causes

- Physical
  - Hyper-extension of the trunk
  - Lack of coordination
  - Contractures or muscle retraction of lower extremity joints: hip, knee or ankle
  - Pain or discomfort
  - Lower extremity propulsion
Causes

- Cognitive
  - Self-stimulation (rocking movement)
  - Behavioral problem
  - Wandering
Causes

- Environmental
  - The wheelchair:
    - Measurement
    - Components
    - Accessories
  - Furniture’s layout
  - Disposition of the objects the person wants access to
Causes

- Environmental
  - Environmental stimuli
  - Floor covering
  - Distances to propel
  - Shoes
  - Clothes
Causes

- Environmental
  - Transfer equipment and methods
  - Possibility for the client to go back to bed when needed
  - Care organisation:
    - Many layers of material between the client and the seat such as: lift sling, several pads
Consequences
Consequences

- Inappropriate position to perform tasks and ADL
- Discomfort and/or pain
- Risk of pressure sores
- Decreased autonomy in propulsion
- Accidents & incidents
Consequences

And nonetheless, of course this remains an eternal problem that we always have to assess over and over and it is

TIME CONSUMING

So what can we do???
STEP 1: LET’S START WITH BASIC STUFF THAT CAN SAVE US SOME TIME
Step 1

- Initial verification:
  - Am I with both the correct client and the correct WC, serial #?
  - What condition is the WC in? A breakage can cause sliding. If yes, can it be repaired?
  - Are the WC and its components used for the correct purpose?
    - footrest on, seatbelt attached...
  - Positioning device and especially cushion in place?
    - The right cushion
    - Cushion up side down?
    - 2-3 cushions one over the other…
Step 1

- 3 cushions…
STEP 2: LET’S HAVE A LOOK AT THE WC, IT’S COMPONENTS AND THE ACCESSORIES AS CAUSES OF SLIDING
Step 2

- Are the WC and its dimensions appropriate for the client?
  - Width of the WC
    - Weight loss
    - Weight gain
  - Depth of the WC
    - Too deep
    - Foot propulsion
Seat too deep
Foot propulsion

- We can see on this picture that the motion of the leg under the seat is restricted because of the seat depth.
Solution

- **Seat Width**
  - Anthropometric width + 1”/ 2”

- **Seat Depth**
  - Anthropometric measurement of thigh – 1”/ 2”
  - maybe more...
  - Propels with legs: 2” less; ↑ space for calf movement
  - Usually propels with arms: 1” less
  - Cushion with negative bevel
Cushion with negative bevel
Solution for seat depth

- Surely not ideal...
- Add cushion over the backrest to reduce depth
- Prefab backrest can sometimes be fixed with spacer in front of the back cane instead of behind
- Cut the seat in front but be careful the footrests remain at the same place...
Add cushion over the backrest
Spacer between backrest and back cane
Seat cut
Seat-to-floor height

- Review of measurement taking
  - Support height (what we want as a result) = cushion thickness + W/C height
    - 18” leg length and feet that touches the floor = 2.5” cushion compress + 15.5” w/c height
  - Too high
    - Foot propulsion
    - To seat at the back of the WC
Height too high... Sliding
Height too high... Sliding

- Just after transfer
- After 5 minutes of foot propulsion
Solution

- Easier to solve...
- Height of the WC can be adjusted:
  - Hemi-height chair
  - Position of the wheel on the axle-plate or the front caster fork
  - Size of the wheels
  - Drop seat
  - Reduce the thickness of the cushion
    - Hemi cushion
Hemi height chair
Standard height chair
Wheel position
Drop seat
Ideal position
Foot support

- The weight of the leg has to be supported, either with the foot on the floor or the foot plate
- Upper extremity propeller -→ footrests on if not -→ sliding until the floor can be the stopper
Lower extremity support

- Inappropriate foot plate support
Foot support

- Lower extremity propeller -» footrests off - if footrests on, knees in flexion -» sliding because of discomfort
Footrest and drop seat

- Possible solution: elevating and compensatory footrest
Elevating foot rest
Seat-to-back angle too closed

- A «one size fits all» WC - this is usually 90°
Seat-to-back angle too closed

- Kyphosis or hip contractures – posterior tilt
- Same problem if the angle is too closed (too straight)
Seat-to-back angle too open

- If the angle is too open (like with a reclinable backrest) there will be no support for the back-» slouch position and sliding
- With a person in this position, when the reclinable backrest will be straightened -» sliding position
Seat to back angle too open
Adjustment of the seat-to-back angle

- The impact on the depth of the chair
  - If the modification is between 85° and 100°, the depth remains the same;
  - For 95° and more, if we open up 10°, the depth of the seat will be increased by 1 inch;
  - Within the same range, if we open up 15°, the depth of the seat will be increased by 2 inches;
The impact on the depth of the chair

The angle is opened from 100° to 110°

= 

Increase of depth of the surface of seat of 1 inch
Solution

- Knowing that there will be an impact is very important
  - It will prevent changing many components that are possibly adequate
- From the beginning, choose WC with adjustable seat-to-back angle
Solution

- If the seat to back angle is not adjustable, the cane can be bent (beware it can also break…)
- Some prefab backrest have the option of angle adjustments
- For the seat depth solution, we discussed possible solutions for this problem previously
Fixed front-to-back tilt

- The difference between the height of the WC at the front and at the back
  - The front is higher than the back... Sliding
  - Same height at the front and at the back... If there are no tonus issues and pelvic and trunk are stable, it could be adequate. But otherwise...
  - Front higher than back... It increases stability by using gravity to maintain a stable seating position
Fixed front-to-back tilt

- Conservative measurement = 1 inch
- When sliding we can go up to $2\frac{1}{2}$ inches
- Beware of the combination with contoured cushion that already has a difference between front & back thickness
Fixed front to back tilt

- Why not?
  - Severe difficulty with transfers. Especially for community dwellers that lives alone and has to be independent in transfers
  - Seat-to-floor height very low for little old lady’s that foot propel... Simply impossible
  - Weak clients that need to maintain trunk mobility and for whom fixed tilt will be enough to immobilize them too much
  - Be aware of the effect on proximity of table and surfaces for activity or ADL and on visual contact
Fixed front-to-back tilt
2 inches
Solution

- From the beginning
  - Try to have a range of adjustment by the back wheel + and – 1 inch.
  - At the front there will be an adjustment of at least an inch. If possible choose a fork longer. If necessary, only the front wheel can be changed.

- If the maximum has been done with the wheel, add a drop seat.

- Sometimes a contoured cushion can be a part of the solution.
Footrest

- This is the component that will support the feet. It includes the footrest, the foot plate, and sometimes the heel support and the calf support.

- It has to take into consideration:
  - The length of the leg
  - The seat-to-floor height - for clearance
  - The type of shoes
  - Contractures at the knee, ankles
Different footrests

90°  70°  60°
**footrest**

- **Knee flexion contracture**
  - Shortened Hamstrings
  - The problem: calves are in contact with the seat and cushion and it is not comfortable, the client is pushing himself forward to reduce this pressure... Sliding

- **The Solution**
  - 90° footrest or contracture foot plate
  - Seat depth much shorter: cut it and if impossible bring the backrest forward or thicker to reduce the seat depth. Keep at least 1 inch clearance with the calf
  - Negative bevel at the front of the cushion
Contracture footplate and Negative bevel of the cushion
Example
Basics

- Choosing a seatbelt includes: the type of belt, the length of it, the buckle, the protectors and the installation measurement.
- Keep in mind the purpose of the seatbelt (restraint vs positioning). Sometimes, even when the seatbelt has been chosen to prevent sliding, added on the WC, this becomes a restraint.
Pelvic seatbelt

- 2 inserts: 45° straps? 60° from the anterior superior iliac crest
  - 45°, is not always easy to measure. This is often more like an abdominal belt
  - Better to be more forward than backward
  - 60°, is more effective to prevent rotation of the pelvis and still allow movement at the trunk
Pelvic seatbelt

- 4 inserts: The second strap perpendicular from the anterior superior iliac crest to the seat
  - Adequately maintain pelvic stability & reduce effect of posterior tilt on sliding forward
Pelvic 4 point seatbelt
Pelvic 4 point seatbelt
Adjustments of the seatbelt

- Most be tight enough so that only one hand can pass between the belt and the pelvis
- If there is more space, there will be sliding and it will only give a false impression of safety
- A lot of teaching needs to be done with caregivers
Cushion

- First check if the cushion is not too worn
- Contoured
  - Better weight distribution
  - Crural bevel stabilizes the inferior iliac crest
  - But...
- Gel
  - Very efficient in reducing shearing
Contoured cushion with gel pad
Prefab contoured cushion
STEP 3: IF IT’S NOT THE WC, LET’S HAVE A LOOK AT HOW THE CLIENT DOES ADL’S
Problem solving

- Much more difficult to change the way the client uses the WC during the ADL’s...
  - Seating in the WC:
    - When and how does the client transfer? In the morning but also at any moment during the day eg: bathroom
    - If necessary, with the help of who? Teaching?
    - For how long? One or many periods?
    - Does the client have a rest during the day?
Problem solving

- When the client is sitting in the WC, what does he do? ADL’s, IADL’s, socialization, recreation activities
- Can one or many tasks cause sliding? A very important thing to check is propulsion
- Can the client place himself and replace himself far enough back in the WC on his own? Is the required help available when needed?
- Can the environment where the client does his ADL’s have an effect on sliding?
Problem solving

- Many little things to consider
  - Type of clothes worn
  - Type of shoes or changes of shoes
  - Many layers of material between the cushion and the client’s buttocks: Pads, sheet, towel, lift sling...

- Agitated behavior, if so,
  - Why?
  - When?
  - With who?
  - Restraint?
SOME MORE IDEAS ???
Dynamic positioning

Why?

- Prevent sliding when it is caused by the effect of inadequate tonus (spasticity, rigidity)
- Shock absorption when caused by uncoordinated movement or agitation
- Provide the opportunity to be supported & mobile at the same time
- Can reduce pain, discomfort
- Can have an effect on blood circulation and wound healing
Dynamic positioning

- Dynamic backrest
Dynamic positioning

- Dynamic pelvic support
Dynamic positioning

- Dynamic footrest
Dynamic positioning

- Dynamic head rest
Dynamic positioning

- Flexible anterior trunk support
When sliding is an important issue, why would we be in such a dilemma?

- When sliding has an important effect on sitting tolerance or the tolerance of others to keep the client sitting...
- When the self-propulsion is minimal or is not goal oriented
- When an important fixed tilt is required to maintain an appropriate sitting position and reduce sliding AND the client has to eat in the WC...
- When the client is agitated in a way that he requires stabilization with a heavy device
Solution

- Tilt-in-space with 20° tilt
Solution

Pivot Point

Forward pivot point provides 20° of tilt with no knee rise.

Forward pivot point ensures easy tilt operation and a smaller overall footprint for the wheelchair.

Wheelchairs for function and independence
Solution

- tilt-in-space with the forward pivot point
Conclusion

- Always identify the cause before starting to problem solve
- Make sure you follow step 1 before anything... If not, this can certainly be time consuming
- Education of caregivers and other professionals is required
- Their is not a real recipe but a great combination of appropriate measurements (especially depth and seat-to-floor height), fixed tilt, well adjusted seatbelt, contoured cushion with gel can be the solution in many circumstances.
Thanks to Elisabeth Cole for the pictures from her presentation: *Avoiding Old School Methodologies and Misuse and Overuse of Seating and Mobility Products*, CSMC, 2010.

Questions?

Thanks!