

Clinical Indications for Dynamic Wheelchair Seating: Muscle Tone

Where force occurs

What happens if this force is not addressed?

Dynamic solutions

Expected outcomes

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**SEATING
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WE MAKE **WHEELCHAIRS** BETTER

Where: Hips / Knees / Ankles

What happens if this force is not addressed?

- 1) Extensor tone will continue against unyielding surfaces
- 2) Breakage can occur at:
 - a. Footrest hangers and footplates
 - b. Back canes
 - c. Seat frame
 - d. Seating system mounting hardware
 - e. Head support mounting hardware
- 3) Breakage can occur while in transport, placing the client at risk of injury
- 4) Injury can occur:
 - a. Client may be injured from violent physical contact with the mobility base and the seating system.
 - b. Client may be injured from contact with sharp broken objects after or during the breakage.
- 5) Loss of posture can occur:
 - a. Client may move out of a beneficial position, resulting in poor alignment, poor pressure distribution, and decreased function.
 - b. Poor alignment may specifically reduce trunk and head alignment and control.
- 6) Pain or discomfort can occur:
 - a. Client may experience discomfort / pain due to the excessive forces exerted against the wheelchair components as a result of high muscle tone. This can create discomfort / pain at the point of contact as well as throughout the joints as the force “has nowhere to go” and is not diffused. Pain or discomfort can decrease sitting tolerance.
- 7) Shear forces can occur:

- a. Force and movement against the seating surfaces can create shear which, in turn, increases risk of skin and tissue injury.
- 8) Excessive energy expenditure can occur as the client continues to extend against unyielding surfaces. This can increase caloric output, body temperature, sweating, and fatigue.
- 9) Decrease in function can occur as a client generally is not able to use the body functionally while in a pattern of extension.
- 10) Client agitation can occur as a result of these issues.

What dynamic components may be used to prevent the above issues?

- 1) Dynamic Backrest hardware
- 2) Dynamic Legrest hardware
- 3) Dynamic Head support hardware
- 4) Dynamic secondary support components (i.e. shoulder straps)

Expected outcomes.

- 1) When Extension forces occur, the dynamic component will move, force will be diffused, and the energy built up in the dynamic component will return the client to their starting position without loss of postural alignment.
- 2) Due to force diffusion:
 - a) Extreme extension patterns should decrease in frequency and intensity
 - b) Reduced equipment breakage
 - c) Reduced client injury
 - d) Reduced loss of posture
 - e) Improved head posture and, as a result, improved swallow, breathing, and visual field
 - f) Increased Sitting tolerance / comfort
 - g) Reduced shear forces
 - h) Reduced energy expenditure
 - i) Increased function, including access to assistive technology

- j) Reduced agitation
- 3) Due to movement:
 - a) Increased active range of motion
 - b) Increased sensory input

Where: Torso (Spinal Extension, similar characteristics as Hip Extension)

What happens if this force is not addressed?

- 1) Extensor tone will continue against unyielding surfaces
- 2) Breakage can occur at:
 - a. Footrest hangers and footplates
 - b. Back canes
 - c. Seat frame
 - d. Seating system mounting hardware
 - e. Head support mounting hardware
- 3) Breakage can occur while in transport, placing the client at risk of injury
- 4) Injury can occur:
 - a. Client may be injured from violent physical contact with the mobility base and the seating system.
 - b. Client may be injured from contact with sharp broken objects after or during the breakage.
- 5) Loss of posture can occur:
 - a. Client may move out of a beneficial position, resulting in poor alignment, poor pressure distribution, and decreased function
 - b. Poor alignment may specifically reduce trunk and head alignment and control
- 6) Pain or discomfort can occur:
 - a. Client may experience discomfort/ pain due to the excessive forces exerted against the wheelchair components as a result of high muscle tone. This can create discomfort / pain at the point of contact as well as throughout the joints as the force “has nowhere to go” and is not diffused. Pain or discomfort can decrease sitting tolerance.
- 7) Shear forces can occur:

- a. Force and movement against the seating surfaces can create shear which, in turn, increases risk of skin and tissue injury.
- 8) Excessive energy expenditure can occur as the client continues to extend against unyielding surfaces. This can increase caloric output, body temperature, sweating, and fatigue.
- 9) Decrease in function can occur as a client generally is not able to use the body functionally while in a pattern of extension.
- 10) Client agitation can occur as a result of these issues.

What dynamic components may be used to prevent the above?

1. Dynamic Backrest hardware
2. Dynamic Legrest hardware
3. Dynamic Head support hardware
4. Dynamic secondary support components (i.e. shoulder straps)

Expected outcome.

- 1) When Extension forces occur, the dynamic component will move, force will be diffused, and the energy built up in the dynamic component will return the client to their starting position without loss of postural alignment.
- 2) Due to force diffusion:
 - a) Extreme extension patterns should decrease in frequency and intensity
 - b) Reduced equipment breakage
 - c) Reduced client injury
 - d) Reduced loss of posture
 - e) Improved head posture and, as a result, improved swallow, breathing, and visual field
 - f) Increased Sitting tolerance / comfort
 - g) Reduced shear forces
 - h) Reduced energy expenditure
 - i) Increased function, including access to assistive technology
 - j) Reduced agitation
- 3) Due to movement:

- a) Increased active range of motion
- b) Increased sensory input

Where: Cervical

What happens if this force is not addressed?

- 1) Extensor tone will continue against unyielding head support surfaces
- 2) Breakage can occur at Head support mounting hardware. Even if breakage does not occur, excessive forces can move the head support out of alignment.
- 3) Breakage can occur while in transport, placing the client at risk of injury
- 4) Injury can occur:
 - a) Client may be injured from violent physical contact with the head pads.
 - b) Client may be injured from contact with exposed hardware if head pad and/or mount break.
- 5) Loss of posture can occur:
 - a) Poor alignment may specifically reduce head alignment and control
 - b) If the head moves into hyperextension as the result of undiffused tone or of the head support moving out of position, extensor tone may increase, reflexive responses may be elicited, and postural insecurity, startle, and anxiety may increase.
- 6) Pain or discomfort can occur:
 - a) Client may experience discomfort/ pain due to the excessive forces exerted against the Head Support as a result of high muscle tone. This can create discomfort / pain at the point of contact as well as throughout the cervical joints as the force “has nowhere to go” and is not diffused. Pain or discomfort can decrease sitting tolerance.
- 7) Shear forces can occur:
 - a) Force and movement against the seating surfaces can create shear which, in turn, can result in loss of hair on the occiput.
- 8) Excessive energy expenditure can occur as the client continues to extend against unyielding surfaces. This can increase caloric output, body temperature, sweating, and fatigue.
- 9) Decrease in function can occur as a client generally is not able to use the body functionally while in a pattern of extension. If the head is out of alignment, the client may specifically experience impaired breathing, swallowing (increasing risk of choking and aspiration), and visual field.
- 10) Client agitation can occur as a result of these issues.

What dynamic components may be used to prevent the above?

- 1) Dynamic back hardware
- 2) Dynamic head support hardware

Expected outcome.

- 1) When Extension forces occur, the dynamic component will move, force will be diffused, and the energy built up in the dynamic component will return the client to their starting position without loss of postural alignment.
- 2) Due to force diffusion:
 - a) Extreme extension patterns should decrease in frequency and intensity
 - b) Reduced equipment breakage
 - c) Reduced client injury
 - d) Reduced loss of posture
 - e) Improved head posture and, as a result, improved swallow, breathing, and visual field
 - f) Increased sitting tolerance / comfort
 - g) Reduced shear forces
 - h) Reduced energy expenditure
 - i) Increased function, including access to assistive technology
 - j) Reduced agitation
- 3) Due to movement:
- 4) a. Increased active range of motion
- 5) b. Increased sensory input

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