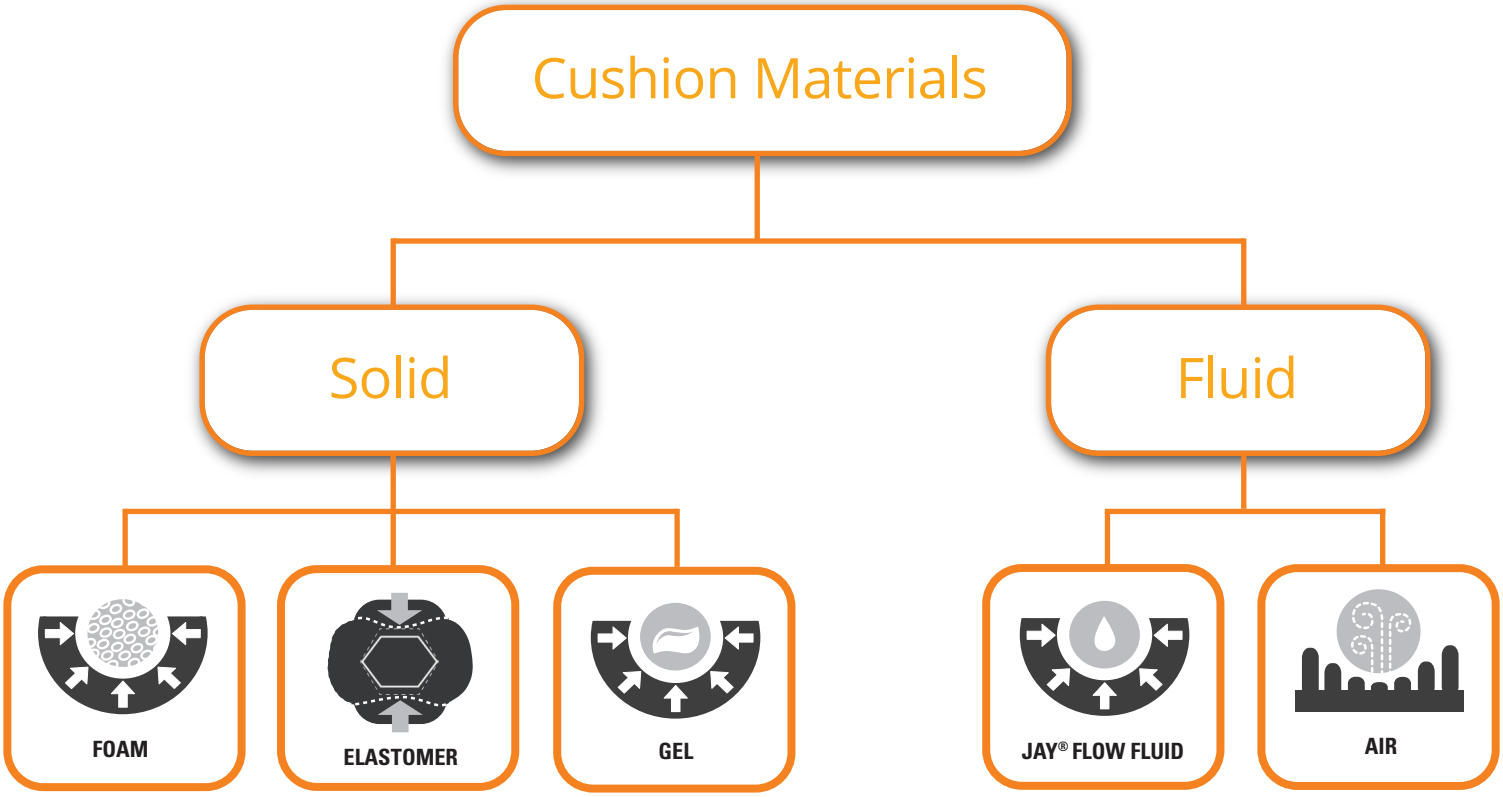
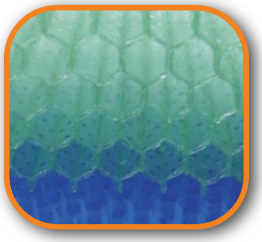
# Material Selection in Cushions

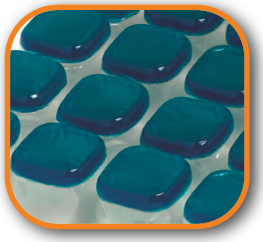
Although cushions may look similar in design on the outside, the materials used on the inside can have a significant impact on their performance. Understanding how materials perform will improve the clinician's ability to select a cushion based on their client's goals. This reference table describes material, their benefits and the clinical considerations when selecting the most appropriate wheelchair cushion.




*Foam*



*Elastomer*

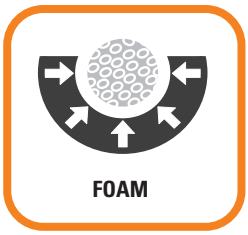
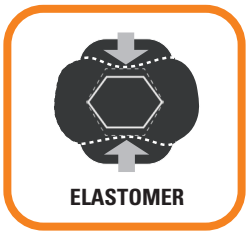


*Gel*

*JAY Flow Fluid*

*Air*

# Material Selection in Cushions (Continued)

| MATERIAL | Description | Clinical Benefits | Additional Considerations |
|---|---|---|---|
|  | **Foam** is a material which is formed by trapping pockets of gas. It can be a variety of densities, firmnesses and weights. Based on the uniformity of the cells, they will be more or less rigid.<br><br>Closed cell foam has a uniform cell structure which creates rigidity.<br><br>Open cell foam is softer due to a less uniform cell structure.<br><br>The weight of a foam is dependent upon mass, not upon firmness or densitiy. Therefore rigid foam may also be lightweight, whereas softer foam may be heavier.<br><br>Memory foam (viscoelastic) has increased viscosity and density which allows it to return slowly to its shape after compression. | Inexpensive and lightweight<br><br>Low maintenance<br><br>Absorbs impact loads well<br><br>Firm foam can provide a level base of support<br><br>Soft foam can be used for comfort<br><br>Viscoelastic memory foam has vibration dampening properties<br><br>Various densities can be combined for pressure relief, moving load from high risk bony prominences to lower risk areas | Compresses over time<br><br>Difficult to clean and absorbs moisture<br><br>May create tension on the tissue depending on the softness of the foam<br><br>May create shear forces on the tissue depending on the foam design<br><br>May retain heat in hot climates and get harder in cold climate<br><br>Memory foam may hold more heat than standard foam and it becomes more compressed over time, with less return<br><br>May increase pressure on bony prominences over time |
|  | **Elastomer** is a man-made polymer with varying degrees of viscoelasticity.<br><br>In wheelchair cushions, an elastomer is often a matrix-like polymer structure.<br><br>Immersion is dependent upon the softness of the elastomer. It has a greater durability than foam over time. | Easy to clean<br><br>Allows some compression<br><br>Immersion is dependent upon the rigidity of the elastomer<br><br>Can be lightweight depending on design, e.g. honeycomb structure<br><br>Design may allow airflow which may improve microclimate<br><br>Has shear reduction qualities due to higher viscoelasticity properties | Limited displacement<br><br>Less immersive than lower density foam or fluids<br><br>More difficult to customize in the field in response to specific postural needs |
|  | **Gel** is a solid jelly-like material that can have properties ranging from soft and weak to hard and tough.<br><br>Although it is mostly liquid, it behaves like a solid. Therefore, it has some viscosity, but does not allow for complete immersion.<br><br>Gel maintains its shape even when opened or cut. | Some movement and viscosity<br><br>Often easy to cut, modify and put in small places<br><br>Can offer good friction/shear control<br><br>Easy to clean | Heavy<br><br>Temperature sensitive<br><br>Holds heat but can feel cold to the touch initially<br><br>Limited displacement, less immersion than liquid, air, or most foams used in cushions |

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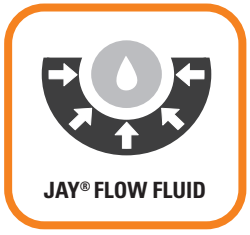
|  | **JAY Flow Fluid** is a non-Newtonian fluid. A non-Newtonian fluid remains in a semi-solid or highly viscous state.<br><br>In a non-Newtonian fluid, viscosity changes when under force to either more liquid or more solid.<br><br>Although a non-Newtonian fluid can take a shape without a container, it will flow with pressure. Therefore, it needs to be contained when used in a cushion. | Good pressure distribution<br><br>Conforms to the body<br><br>Weighs less than gel<br><br>Moves with the body<br><br>Can help control shear<br><br>Does not respond to load with counterforce of foam, thereby extremely good for pressure care<br><br>Provides good immersion while creating a large area of surface contact to distribute | Heavier than foam or air<br><br>Needs some maintenance<br><br>May require redistribution following use due to migration with pressure |
|  | **Air** is a Newtonian fluid. A Newtonian fluid maintains its viscosity independent of stress. A Newtonian fluid only changes its viscosity in response to temperature.<br><br>If you provide a Newtonian fluid with stress, it will remain the same thickness (viscosity), but if you heat it up or cool it down it can become more liquid or more solid.<br><br>Newtonian fluid, such as air or water, cannot maintain a shape without a container. However, if the container is opened, it will spill and be released, thereby negating it's efficacy. | Lightweight<br><br>Moves with the body<br><br>Easy to clean<br><br>Pressure distribution<br><br>Can be used as entire cushion or within a foam base for stability<br><br>Provides good immersion while creating a large area of surface contact to distribute | Reduced stability, particularly in an air-only cushion<br><br>Risk of puncture<br><br>Frequent maintenance to ensure proper inflation<br><br>Sensitive to pressure changes, such as during air travel |

## References


1. Polyurethane Foam Association. (1991, rev 2016). Flexible polyurethane foam: A primer. In Touch, 1(1), 1–7. Retrieved from: https://www.pfa.org/wp-content/uploads/2019/02/IntouchV1.1a.pdf

2. Sherman, S. (2011, November). Skin Protection and Cushion Materials. Retrieved from: http://www.sunrisemedical.ca/dealer-clinician-tools/education-in-motion/clinical-corner/november-2011/skin-protection-and-cushion-materials

3. Watanabe, L. (2017, September). Immersion, envelopment and off-loading. Mobility Management. Retrieved from: https://mobilitymgmt.com/Articles/2017/09/01/Seating-Strategies.aspx