

Limited Evidence Suggests That Gel Cushions Are More Effective Than Foam Cushions For Providing Pressure Relief

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CLINICAL SCENARIO: You are going to perform a home visit with Anne, a frail 85 year old woman who has Dementia and is in the later stages of the illness. The referral states that her wheelchair is in need of repair and she needs a new cushion. Upon arrival, the home care worker informs you that Anne spends over four hours per day in her tilt wheelchair. When you mention the importance of shifting Anne's weight so that she does not develop pressure sores, the home care worker gives you a puzzled look and then says that she shifts Anne's weight often. However, you are not convinced. You feel that Anne must have a cushion that gives her optimal pressure relief since she is in the chair for many hours per day and her weight may not be shifted as often as it should be. Anne is presently sitting on a foam cushion. You remember learning in OT school that a gel cushion is better than foam for pressure relief. You wonder if there is evidence to support the prescription of a gel cushion for Anne.

<p>CLINICAL QUESTION: In a population of individuals who use wheelchairs daily and are at risk for pressure sores, are gel-filled cushions more effective than foam cushions for providing pressure relief?</p>
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<p>SUMMARY of Search, 'Best' Evidence' appraised, and Key Findings:</p>
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<p>Health databases searched: CINAHL, Medline, Embase, InfoRetriever, National Rehab InfoCentre. Evidence-based databases searched: OT seeker, Pedro, and Cochrane Database of Systematic Reviews</p>

<p>Various Subject Headings and MeSH terms were used for the following words: wheelchair, pressure sore, pressure relief, and cushion.</p>
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<p>The best evidence found was a study by Conine et al (1994) which used a randomized controlled trial (RCT) for the study design. Two case studies were also found.</p>
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<p>The RCT by Conine et al (1994) and the case study by Goossens et al (1993) suggested that gel cushions are more effective than foam cushions for providing pressure relief. A case study by Shechtman et al (2001), however, suggested that foam cushions may provide better pressure relief than gel cushions for heavy individuals.</p>
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<p>CLINICAL BOTTOM LINE: There does not seem to be enough evidence to support or reject the use of a gel cushion over a foam cushion in order to provide Anne with better pressure relief. However, since the RCT suggested that gel cushions are better pressure relievers than foam, and the design has a low likelihood that the results are due to chance, I would trust its results. In addition, the population involved in the RCT were similar to Anne as they were 60 years of age or older and sat in a wheelchair for a minimum of four hours/day. Therefore, I would prescribe a gel cushion for Anne.</p>

Limitation of this CAT: This CAT has only been prepared by a single reviewer and has not been externally peer-reviewed.

SEARCH STRATEGY:

Databases and sites searched	Search Terms	Limits used
CINAHL	Subject Heading: Pressure Ulcer/, Pillows and Cushions/, wheelchairs/ or wheelchair fitting/ or wheelchairs, powered/ or wheelchairs, ultralight/	None
Medline	MeSH: Decubitus Ulcer/, Wheelchairs/, cushion\$.mp.	None
Embase	Subject Headings: Decubitus/ wheelchair/ seat/ cushion\$.mp.	None
OT Seeker	Pressure relief, pressure sore, cushion	None
InfoRetriever	Decubitus ulcer, cushion	None
National Rehab InfoCenter (NARIC)	Pressure sore, cushion	None
Cochrane Database of Systematic Reviews	Search terms: cushion\$.mp pressure\$.mp	None

Please Note: For each database, the Subject Headings or MeSH terms for pressure sore/pressure ulcer, cushion, and wheelchair were all combined.

INCLUSION and EXCLUSION CRITERIA

- Inclusion: Pressure sores as a result of wheelchair seating surfaces; persons who use wheelchairs throughout most of the day; articles evaluating gel and foam cushions
- Exclusion: Pressure sores as a result of mattress or bed surfaces; articles not available at the Queen's University library

RESULTS OF SEARCH: Based on levels of evidence by the Steering Committee on Clinical Practice Guidelines for the Care and Treatment of Breast Cancer. Canadian Medical Association Journal 1998;158(3): S2. (retrieved April 2005, from <http://www.cma.ca/cgi/data/158/3/DC1/1>)

Table 1: Summary of Study Designs of Articles retrieved

Level of Evidence	Study Design/ Methodology of Articles Retrieved	Number Located	Reference
III	Cohort study with randomization of participants	1	Conine et al (1994)
	Case Study	2	Goossens et al (1993); Shechtman et al (2001)

BEST EVIDENCE

Reasons for selecting these papers as the 'best' evidence were:

- One study was a high quality randomized, uncontrolled cohort study. The other two articles were also related to the clinical question but provided evidence with less direct application

SUMMARY OF BEST EVIDENCE

Table 2: Description and appraisal of clinical trial by Conine et al (1994)

<p><i>Purpose of the Study</i></p> <p>Though not explicitly stated, one would assume that the purpose was to investigate if there are any differences between foam and gel cushions in the incidence, location, severity, or healing duration of pressure ulcers (PU) in elderly patients over a three-month period.</p> <p><i>Sample</i></p> <p>141 elderly patients (> 60 years) from an extended care hospital who sit in wheelchairs daily for a minimum of 4 consecutive hours</p> <p><i>Intervention Investigated</i></p> <p>Participants were randomly assigned to either foam or Jay cushions in groups of 40 (73 and 68 patients, respectively). Patients were evaluated weekly by the nurse and research assistant for any signs of pressure sores. At the end of three months, a statistician analysed the data.</p> <p><i>Outcome Measures</i></p> <p>Eston Smith Scale–classification system for skin lesions</p> <p><i>Results</i></p> <p>47 out of 141 patients developed PU. 68 PU developed in bony areas. 42 PU developed in 30/73 patients in the foam group, and 26 PU developed in 17/68 patients in the gel group. The difference in the proportion of patients in each group with the incidence of PU was statistically significant ($p=0.04$).</p> <p><i>Authors' Conclusions</i></p> <p>Jay cushions may significantly reduce the incidence of PU's over bony prominences in the buttocks area of at risk elderly patients</p>
<p>Critical Appraisal:</p> <p>Validity</p> <p>A modified sequential clinical trial design was used. There was a large sample, however, there was no sample size calculation reported to ensure there was an adequate sample size. Sample bias may exist as participants were selected from the same hospital, therefore, it may be difficult to generalize results to other populations. Dropouts were reported and significantly more participants dropped out of the Jay group than the foam group due to discomfort ($p = 0.05$). However, there is no report regarding when the participants dropped out, information which could inform one about the tolerance level for sitting on a cushion. The OT, RN, and seating specialist were blinded to each other's data. The research assistant and RN examined patients blindly, however, there is no report about the procedures for blinding. Unless the cushions were changed prior to assessing the participants, the professionals may have been able see the cushions which may have affected the results. The outcome measure has high inter-tester reliability (Kappa at 0.94), however, there is no mention of the validity of this tool.</p> <p>Importance of Results</p> <p>Although the article stated that there were no significant differences between Jay and foam cushion groups with regards to several variables including hours in bed and weight, there is no supporting data. Randomly assigning patients to groups increases the chance that the groups were equal initially and that the results are not due to chance. Results were reported with statistical significance values at $p \leq 0.05$. It may have been beneficial to have included the number of hours per day patients were travelling in the wheelchair as well as how often individuals shifted their weight, as this information may effect whether individuals develop PU or not.</p> <p>Implications for Practice/ Applicability</p> <p>The results apply to the patient population in the clinical question. The results provide evidence for the use of a gel cushion rather than foam for providing Anne with pressure relief.</p>

SUMMARY OF BEST EVIDENCE

Table 3: Description and appraisal of case study by Goossens et al (1993)

Purpose of the Study

Though not explicitly stated, one would assume that the purpose was to determine the risk of pressure sores during wheelchair driving, when using a Jay Active cushion or a foam cushion.

Sample

9 male spinal cord injured persons, average age of 24.8 years

Intervention Investigated

6 participants sat on foam cushions, 3 sat on Jay cushions. Each participant completed 6 different driving conditions for 3 minutes per condition. Conditions were ones participants met during everyday life and included linoleum, pavement, a low slope, a curb of 5 cm height, a high slope, and a coconut mat. Measurements of pressure under the buttocks were taken for each individual during each condition.

Outcome Measures

Pressure recording system – pressure sensor cells were attached to pressure sensors which were connected to a recording system (RAMCORDER 1) The sensor mat was positioned under the left and right buttock of the wheelchair user.

Results

The results showed a highly significant difference between pressure acting on the foam and Jay cushions, with the lowest pressure acting on the Jay ($p < 0.001$). Using the ratio of pressure - time measured below a threshold pressure of 100 mmHg to pressure-time measured above the threshold (Bar, 1988), it was determined that the foam cushion produced a severe tissue response in all cases, whereas in most cases, the Jay cushion produced a mild response.

Author's Conclusions

Foam cushions produce severe tissue responses while Jay cushions usually produce mild ones.

Critical Appraisal:

Validity

Though not stated in the article, the design used appears to be a case study. The study had a very small sample consisting of only 9 males. The authors did not state how they arrived at the sample size. There is no description about how participants were recruited. The fact that only males participated may make it difficult to generalize results to females. There is no report about how it was decided which participants would sit on Jay cushions versus foam. There is no mention of the reliability or validity of the outcome measure. The rationale for the calculations performed for the results regarding tissue responses was not described in detail. However, the writers do provide a reference for such calculations. The procedures were well described in general, although there is no description regarding why participants remained in each condition for only 3 minutes while pressure measurements were taken. The reader is left wondering whether that was enough time to obtain accurate pressure measurements.

Importance of Results

Statistical significance was reported for the results. Although not stated in the article, it is evident from the table that 6 individuals used foam cushions while only 3 people used Jay cushions. Although no power calculation was provided, results based on data from 3 people is likely insufficient to be representative of a larger population.

Implications for Practice/ Applicability

The information is particularly useful because the conditions chosen represent surfaces that wheelchair users meet in everyday life. However, participants had a mean age of 25 years and all had spinal cord injuries, therefore, the results may not be able to be generalized to the patient in the clinical question.

SUMMARY OF BEST EVIDENCE

Table 4: Description and appraisal of case study by Shechtman et al (2001)

<p><i>Purpose of the Study</i> To determine if there are differences in pressure relieving abilities of 6 wheelchair cushions: Flexseat (foam), Jay 2 (gel), Pindot Personal Seat (custom contoured foam), ROHO High, ROHO Low, and Stimulite, and if differences exist, are these related to body mass.</p> <p><i>Sample</i> 40 adult wheelchair users who were patients at a rehabilitation hospital</p> <p><i>Intervention Investigated</i> Participants were divided into two groups based on body mass index. Each participant sat on a cushion for 5 minutes after which pressure was recorded. This procedure was repeated until all cushions were tested for each participant. The order of cushions tested was randomized.</p> <p><i>Outcome Measures</i> X-Sensor Pressure Mapping System</p> <p><i>Results</i> Two ranges of pressure were analysed: 66-100mmHg (high pressure) which is a range potentially dangerous to tissue health, and 100+mmHg (highest pressure) which indicates a critical level of pressure. In the average BMI group at the highest pressure range, the ROHO high and low cushion had significantly lower pressure than the Pindot cushion ($p < 0.05$). There were no significant pressure differences between the cushions in the high pressure range for the average BMI group.</p> <p><i>Author's Conclusions</i> ROHO High and Low cushions were better pressure relievers than Flexseat and Jay 2. Please note that there were no comments made specifically comparing the gel and foam cushions for the average BMI group.</p>
<p>Critical Appraisal</p> <p>Validity It is difficult to feel confident that results are valid because of biases inherent in the lack of randomization and lack of comparison data. Sample bias may be present due to the fact that participants were selected from the same hospital, making it difficult to generalize the results. There was no sample size calculation reported to ensure that there was an adequate power. There may have been intervention bias due to the fact that pressure measurements were taken after a short time interval (5 minutes), which may not be enough time to get accurate results. Only one test wheelchair was used which may not have been customized to the needs of the participants. All participants were blinded to the cushion being tested because all cushions had the same cover. It is not stated if the outcome measure has been tested for reliability or validity. The outcome measure only tested cumulative pressure, there is no information regarding pressure around bony prominences.</p> <p>Importance of Results Results were all reported in terms of statistical significance. Since there was no randomization of participants and no control group, it is difficult to feel confident that the results are not due to chance.</p> <p>Implications for Practice/ Applicability Although some of the participants in the average BMI group are probably similar in weight to the patient population in the clinical question, the results cannot be applied to the patient population because there are no comparisons between the foam and gel cushions for pressure relieving abilities.</p>

REFERENCES

Articles critically appraised:

- Conine, T.A., Hershler, C., Daechsel, D., Peel, C., & Pearson, A. (1994). Pressure ulcer prophylaxis in elderly patients using polyurethane foam or Jay wheelchair cushions. *International Journal of Rehabilitation Research*, 17: 123-137.
- Goossens, R.H., Groenland, W.I., & Snijder, C.J. (1993). Assessment of decubitus risk in a test circuit using different wheelchair cushions. *Journal of Rehabilitation Sciences*, 6: 8-12.
- Shechtman, O., Hanson, C.S., Garrett, D., & Dunn, P. (2001). Comparing wheelchair cushions for effectiveness of pressure relief: A pilot study. *Occupational Therapy Journal of Research*, 21: 29-48.

Related articles not individually appraised:

- Kernozek, T.W. and Lewin, J.W. (1998). Dynamic seating interface pressures during wheelchair locomotion: influence of cushion type. *Occupational Therapy Journal of Research*, 18(4): 182-192.
- Clinical trial that evaluated air, gel, and foam while the focus was on articles evaluating only gel and foam
- Yuen, H.K. and Garrett, D. (2001). Comparison of three wheelchair cushions for effectiveness of pressure relief. *AJOT*, 55: 470-475 .
- The article was not available at the Queen's Library. The article evaluated three cushion types but the abstract did not clearly describe the study design.