Evidence appendix

FICTIONAL EXAMPLE. These invented records were processed through the Raven Nexus draft engine. No real veteran, clinician, or medical opinion is represented. Do not submit this example as evidence.

This is an unreviewed working draft, not medical evidence. The clinician must independently review the records and literature, reach their own conclusion, and author or adopt any final opinion.

Records

R-A: Service clinic note, dated 2012-04-18, page 1
Exact selected excerpt: “Service clinic assessment: lumbar strain after lifting an equipment case during duty. Local tenderness documented; no leg symptoms reported. A temporary lifting restriction was issued.”

R-B: Separation history, dated 2014-07-09, page 2
Exact selected excerpt: “The patient reports intermittent back discomfort with heavy lifting. The examination documents normal strength and gait; no imaging was obtained at this visit.”

R-C: Urgent care note, dated 2019-02-12, page 3
Exact selected excerpt: “The patient reports new back pain after moving furniture at home. The patient describes earlier intermittent discomfort but no treatment records for the intervening period were supplied.”

R-D: Current spine assessment, dated 2025-11-06, page 4
Exact selected excerpt: “Assessment: lumbar degenerative disc disease, with activity-related low back pain. Imaging describes lower lumbar disc degeneration. The note does not state when degeneration began or attribute it to a particular injury.”

Separately attributed history

Veteran-reported symptoms: Back discomfort with prolonged standing and lifting.

Veteran-reported contrary or complicating facts: An intervening furniture-moving injury is documented. No continuous treatment history is supplied.

Research analysis and source context

L-A: Sebastian Skals, Rúni Bláfoss, Mark de Zee, Lars Louis Andersen, Michael Skipper Andersen. Effects of load mass and position on the dynamic loading of the knees, shoulders and lumbar spine during lifting: a musculoskeletal modelling approach. Applied ergonomics. 2021. PMID 34126573. DOI 10.1016/j.apergo.2021.103491. https://pubmed.ncbi.nlm.nih.gov/34126573/

Research candidate, not proof of an individual medical connection. Applicability requires independent clinician review.

Verified: 2026-09-07T03:06:14.391Z

No study-specific analysis passed the current checks. Do not treat this citation alone as a medical rationale.

Source scope: abstract only, not full-paper review. Publication types: Journal Article.

Exact primary-source abstract follows. Any quantities below are quoted from the source, not generated or estimated by AI. Read results with the methods and source sample-size context; if the source omits a denominator, it is not supplied here.

Abstract
Musculoskeletal models may enhance our understanding of the dynamic loading of the joints during manual material handling. This study used state-of-the-art musculoskeletal models to determine the effects of load mass, asymmetry angle, horizontal location and deposit height on the dynamic loading of the knees, shoulders and lumbar spine during lifting. Recommended weight limits and lifting indices were also calculated using the NIOSH lifting equation. Based on 1832 lifts from 22 subjects, we found that load mass had the most substantial effect on L5-S1 compression. Increments in asymmetry led to large increases in mediolateral shear, while load mass and asymmetry had significant effects on anteroposterior shear. Increased deposit height led to higher shoulder forces, while the horizontal location mostly affected the forces in the knees and shoulders. These results generally support the findings of previous research, but notable differences in the trends and magnitudes of the estimated forces were observed.

L-B: K Luoma, H Riihimäki, R Raininko, R Luukkonen, A Lamminen, E Viikari-Juntura. Lumbar disc degeneration in relation to occupation. Scandinavian journal of work, environment & health. 1998. PMID 9869307. DOI 10.5271/sjweh.356. https://pubmed.ncbi.nlm.nih.gov/9869307/

Research candidate, not proof of an individual medical connection. Applicability requires independent clinician review.

Verified: 2026-09-07T03:06:14.391Z

No study-specific analysis passed the current checks. Do not treat this citation alone as a medical rationale.

Source scope: abstract only, not full-paper review. Publication types: Comparative Study; Journal Article; Research Support, Non-U.S. Gov't.

Exact primary-source abstract follows. Any quantities below are quoted from the source, not generated or estimated by AI. Read results with the methods and source sample-size context; if the source omits a denominator, it is not supplied here.

OBJECTIVES
The aim was to study risk factors of lumbar disc degeneration demonstrable with magnetic resonance imaging (MRI) with special emphasis on occupational load and back accidents.

METHODS
The subjects in this cross-sectional study were 53 machine drivers, 51 construction carpenters, and 60 municipal office workers aged 40-45 years. Data on possible risk factors were available from current structured questionnaires and for 4 and 7 years in retrospect. The prevalence of lumbar disc degeneration L2/L3-L5/S1 was determined with MRI.

RESULTS
An increased risk was found for posterior disc bulges among the carpenters and for anterior disc bulges among the machine drivers, but decreased signal intensity was not related to occupation. Car driving was also associated with anterior disc bulges. All signs of disc degeneration were related to a history of back accidents. Disc degeneration was not related to body height, overweight, smoking, or the frequency of physical exercise.

CONCLUSIONS
Occupational load affects the risk of disc degeneration of the lumbar spine. Accidental back injuries and motor vehicle driving are associated with an increased risk of disc degeneration. Anterior and posterior disc bulges seem to be related to different types of physical loads.

L-C: S M McGill. The biomechanics of low back injury: implications on current practice in industry and the clinic. Journal of biomechanics. 1997. PMID 9109558. DOI 10.1016/s0021-9290(96)00172-8. https://pubmed.ncbi.nlm.nih.gov/9109558/

Research candidate, not proof of an individual medical connection. Applicability requires independent clinician review.

Verified: 2026-09-07T03:06:14.391Z

No study-specific analysis passed the current checks. Do not treat this citation alone as a medical rationale.

Source scope: abstract only, not full-paper review. Publication types: Lecture; Research Support, Non-U.S. Gov't; Review.

Exact primary-source abstract follows. Any quantities below are quoted from the source, not generated or estimated by AI. Read results with the methods and source sample-size context; if the source omits a denominator, it is not supplied here.

Abstract
The purpose of this paper is to introduce some concepts of low back injury for use towards developing better injury risk reduction strategies and advancing rehabilitation of the injured spine. Selected issues in low back injury are briefly reviewed and discussed, specifically, the types of tissue loads that cause low back injury, methods to investigate tissue loading, and issues which are important considerations when formulating injury avoidance strategies such as spine posture, and prolonged loading of tissues over time. Finally, some thoughts on current practice are expressed to stimulate discussion on directions for injury reduction efforts in the future, particularly, the way in which injuries are reported, the use of simple indices of risk such as load magnitude, assessment of the injury and development of injury avoidance strategies. This paper was written for a general biomechanics audience and not specifically for those who are spine specialists.

Board passages used in the examiner-response section

No Board passages are included.

Provider guidance (descriptive, not medical reasoning)

Board figures (Claim Raven's reading of Board decisions, 2021 to 2026): the Board granted 24.2% of 32460 decided service connection rulings on Lumbar Spine claimed as directly related to service. Of every Lumbar Spine ruling it granted or denied with a private medical opinion in the record, it granted 76.9% (6699 rulings). These figures do not identify who should sign and do not predict an outcome. The clinician must independently confirm that the medical question is within their scope and practice.