Washington State Department of Labor & Industries

Exoskeleton Advisory Committee
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Process for Considering and Deploying Industrial Exoskeletons for Return to Work

Submitted by Matt Marino on behalf of the Exoskeleton Advisory Committee*

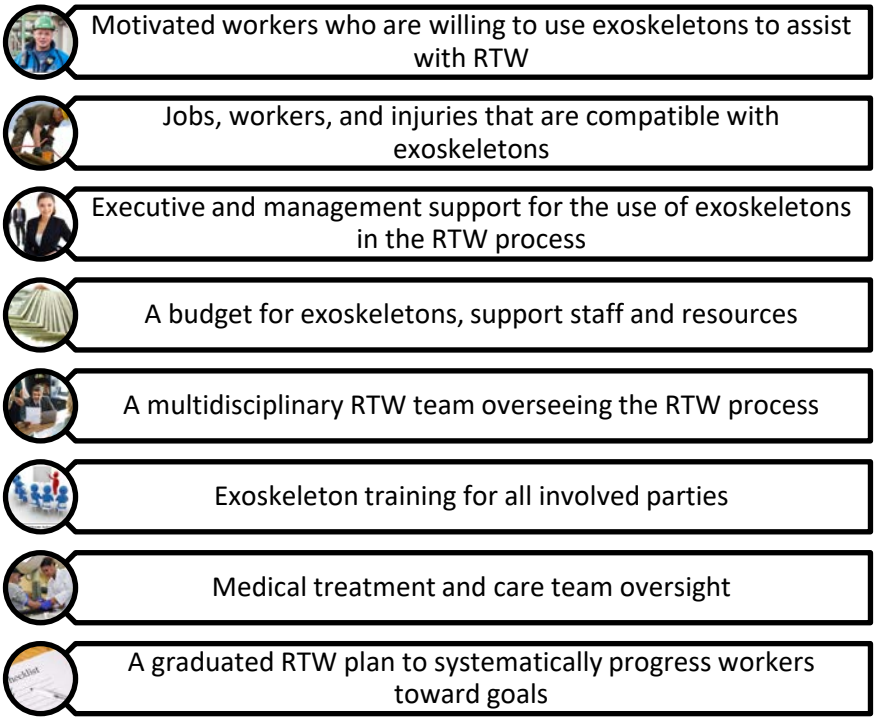
There is currently no existing evidence to support the use of occupational exoskeletons specifically for Return to Work (RTW). There is limited evidence to support the use of occupational exoskeletons for injury prevention. However, a growing body of research has found associations between certain occupational exoskeletons and reductions in strain and fatigue for certain tasks as well as improvements in productivity and work quality. Reductions in strain and fatigue can reduce the risk for injury. There is also evidence of undesirable tradeoffs associated with the use of certain exoskeletons for certain tasks. Due to small samples sizes and non-standardized methods used in the research that do not carry over well to actual workplace environments, the best conclusion we can currently draw from the research evidence is that the outcomes of using exoskeletons in the workplace for RTW purposes are unpredictable at this time. Caution should be taken with exoskeletons until there is sufficient evidence to support them for specific applications such as RTW, and at this time careful professional management of the following process is recommended. This document is intended to serve as an example of a potential process that can be used when an occupational exoskeleton is indicated for appropriate workers seeking to RTW.

Criteria to consider:

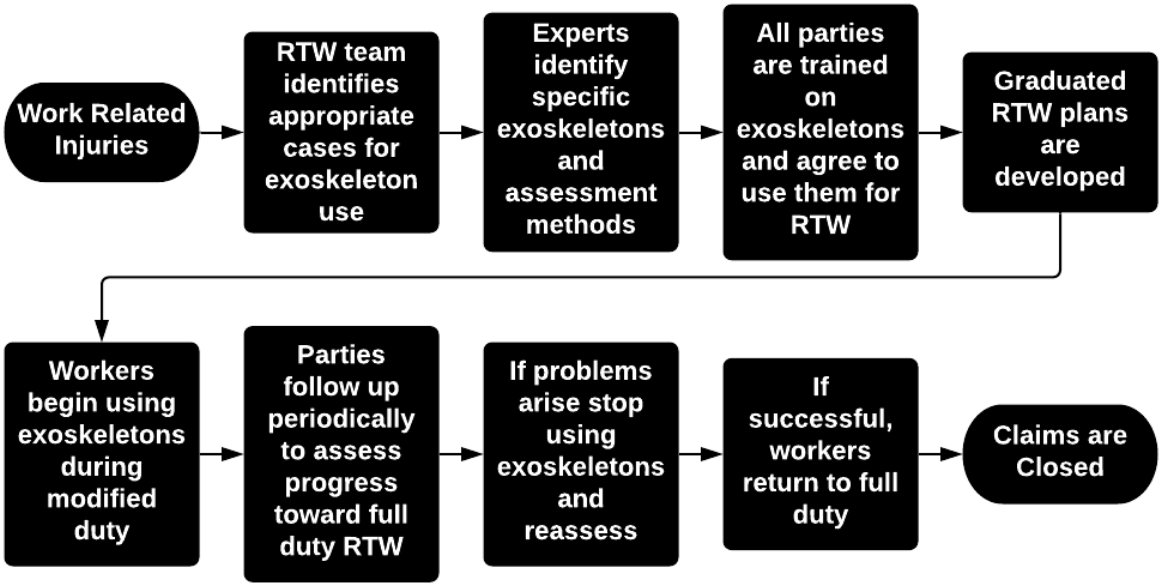
- A worker is motivated to return to work following an injury.
- It is possible to identify an exoskeleton that can support the worker, and that is compatible with the job to which the employee is seeking to return.
- The injury, or the area of dysfunction that contributed to the injury, is located in an area of the body that can be augmented, supported, assisted, off-loaded or otherwise benefited by the exoskeleton being considered.
- The worker is interested in and willing to wear an exoskeleton.
- There is executive and/or upper level management level support for the use of exoskeletons in the RTW process.

- There is a budget for purchasing and overseeing the use of the exoskeleton.
- There is a multidisciplinary RTW team including but not limited to physicians, rehabilitation professionals, claims adjusters, case managers, operations managers, human resource managers, workers compensation managers, ergonomics professionals, and exoskeleton experts involved in the case who have been educated on the use of exoskeletons and who support their use in the RTW process.
- There is a plan for training the involved parties including the worker, his or her manager, and RTW team on the safe and proper use of the exoskeleton, expectations for RTW, and any considerations that apply as a result of the exoskeleton's use, such as but not limited to tapering (increasing and/or decreasing use) the exoskeleton (tapering is optional and may depend on the client, user and/or claim).
- The physician involved provides medical clearance for the worker to use the exoskeleton, determines eligibility and appropriate restrictions with and without the use of the exoskeleton, provides treatment, and tracks patient progress toward goals.
- The rehabilitation professionals involved are aware of the worker using the exoskeleton, provide treatment, and track patient progress toward goals.
- The ergonomics professional performs an ergonomic assessment of the worker's job, determines there are no other ways to reduce or eliminate the risk of injury (see NIOSH's Hierarchy of Controls), and confirms that the worker performs a job that is appropriate for the use of an exoskeleton. For example, the worker performs overhead work that can be supported by a shoulder-assist exoskeleton, or a bending and lifting job that can be supported by a back-assist exoskeleton.
- The occupational exoskeleton expert confirms that the worker performs a job that is appropriate for the use of an exoskeleton, oversees exoskeleton training, and manages the use and care of the exoskeleton.
- There is a graduated RTW plan for progressing the worker from modified/transitional duty to full duty.

Criteria Summary



Exoskeletons for RTW Process Summary



Process Outline:

Note: It is very important to follow all of the process steps. Omitting a step could result in a poor outcome.

1. A worker has injured an area of the body that can be augmented, supported, assisted, off-loaded or otherwise benefited by an exoskeleton, and is seeking to RTW to the same job, and/or a transitional duty job with continued exposure to potential risk factors that can be safely reduced by an exoskeleton.

2. A multidisciplinary RTW team involved in overseeing injury claims and the RTW process are familiar with and have received training on occupational exoskeletons, their intended uses, their potential benefits, and their potential pitfalls.

3. The involved parties identify a potential claim, case, and/or client for potential use of an exoskeleton device to assist with RTW.

4. The involved parties meet to discuss and agree on the appropriateness of using an exoskeleton to support RTW for a specific worker, injury, healing status, and job. The injured worker may also be invited to attend this meeting.

5. If an exoskeleton is determined to be appropriate, the exoskeleton expert involved identifies the specific exoskeleton/s, and reviews with the parties for approval. The parties must determine if the worker will be required to use the exoskeleton, or if it will be voluntary.

6. At this time data collection methods should be discussed, and the parties must determine if the worker will be required to participate in any data collection, or if this will be voluntary. As part of the medical care, Functional Outcome Measures should be used and tracked in all cases where an exoskeleton is used for RTW. A physician and/or therapist should identify Functional Outcome Measures for the specific injury. Functional Outcome Measures should be collected and interpreted by trained professionals only. Examples of Functional Outcome Measures include but are not limited to the Fear Avoidance Beliefs Questionnaire (FAB-Q), Oswestry Low Back Disability Questionnaire for low back injury, and the Disability of Arm, Shoulder and Hand Questionnaire (DASH) for shoulder or upper extremity injury. Functional Outcome Measure data collection should begin at the onset of treatment to establish the baseline, and continue throughout the duration of the claim until the worker returns to full duty and the claim is closed.

7. The worker is notified of the group's determinations and receives an introduction and training on the specific type of exoskeleton being recommended. If data collection beyond that which is typically collected by the involved parties is necessary, the worker should be educated on what data will be collected, how it will be collected, and why it will be collected. The worker must agree to use the exoskeleton and should review and sign an informed consent form for the data collection and use of the exoskeleton.

8. A graduated RTW plan should be developed and used to progress the worker from modified/transitional duty to full duty. This plan should be geared toward functional improvement and increased activity tolerance on a week by week basis and should be approved by all of the involved parties. The plan should include typical treatment for the injury in question,

the anticipated progression of the worker's restrictions toward full duty, and the use of the exoskeleton.

9. The exoskeleton is obtained from its producer. If any data collection equipment is needed, it should also be obtained from its producer.

10. Training with the worker, manager and/or other involved parties is scheduled and delivered. Training should include the use of the exoskeleton, the graduated RTW plan, any data collection, logistics and expectations.

11. The worker begins using the exoskeleton at work following training by a professional. This should be supervised by an exoskeleton expert, and the above parties. The amount of supervision may vary with worker, job, exoskeleton, healing status, work restrictions, and RTW goals. Any data collection must be performed by a professional.

12. If gradually increasing or decreasing use (tapering) of the exoskeleton is indicated and outlined in the graduated RTW plan, this must be managed by the involved parties and the worker should adjust exoskeleton use accordingly.

13. The worker should continue to follow up with his or her physician/s and therapist/s, and claim/case management meetings should be held at regular intervals for the involved parties to discuss progress toward RTW goals, and changes in work restrictions.

14. The worker continues to use the exoskeleton as described in the graduated RTW plan. If the worker is not making progress with the exoskeleton or the RTW plan, a follow up meeting is called to discuss and determine appropriate courses of action.

15. If the worker experiences any problems as a result of using the exoskeleton, use of the device should cease immediately, and a meeting held with the worker and the appropriate members of the team to take necessary actions.

16. Any data collection such as Functional Outcome Measures should be performed at regular intervals established and approved by the involved parties.

17. Any data collected should be reviewed by the involved parties at regular intervals to discuss and determine the effectiveness of the exoskeleton for the specific claim/case.

18. If all is going well with the graduated RTW plan, the worker should continue to use the exoskeleton until there is successful full duty RTW.

19. Depending on the RTW goals and decisions made by the involved parties, the worker may or may not continue using the exoskeleton following full duty RTW. If the worker is to continue using the exoskeleton after full duty RTW for injury prevention, this should be discussed with all involved parties, and any additional training provided. If gradually decreasing the use of the exoskeleton is indicated and outlined in the graduated RTW plan once the worker returns to full duty, the worker should adjust use accordingly, and return the exoskeleton at the completion of the tapering period.

20. Once the worker is able to RTW successfully and completes all necessary follow up visits with

physicians and rehabilitation professionals, the claim can be closed, and outcomes tracked accordingly.

21. A final summary (discharge) report for each claim/case including any data, Functional Outcome Measures, subjective feedback, and any other pertinent info should be attached to each patient's file, and outcomes tracked and analyzed to determine the effectiveness of exoskeletons for assisting workers with RTW.

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