Can paramedics use ergonomic work strategies to avoid injuries?

by Carrie Taylor

For the first half of my career as an ergonomist, I would cringe when organizations asked me to come in and "teach people how to lift safely". I wanted to shout, "Ergonomics means fitting work to people, not fitting people to work!" I felt sure that it offended employees, to suggest that an ergonomist should tell everyone to bend their knees while lifting heavy, awkward loads, and injuries would be avoided.

I've grown. I still believe that the best strategy for avoiding strain/sprain injuries is to design the hazards out of the job – provide equipment that eliminates or eases hazardous work. This is obviously true for paramedicine – powered stretchers and other mechanical assists continue to drive strain/sprain injury prevention[1]. But I now understand that, with experience, workers do develop techniques that really ought to be shared with new workers[2, 3]. And these techniques are rarely as simple as "bend your knees" or "keep your wrist straight."

One of our ergonomists started to facilitate hands-on industrial ergo training for workers, and was delighted by the response of participants who "discovered" how much more strength they had in the forward direction than in the sideways direction. This ergonomist also had a particular interest in paramedicine, so we set out to find some work that he could be truly passionate about. We started by interviewing the safety professionals at eight Ontario paramedics services. The interviewees provided anecdotal evidence of a shortage of hazard-specific training for this group, and affirmed that paramedics were insulted by the basic lifting training that was being provided. Techniques for lifting a box do not translate into strategies for extricating a patient from between a toilet and a sink.

York Region was interested in participating in this project, so we asked to spend a half-day with a group of [3-4] medics, learning about and documenting their challenges, and the strategies that they had developed to overcome them. We did this work on a volunteer basis, speculating that we would eventually create something we could market. We had followed this "ergo work strategy" approach with outdoor workers, and with utility service reps, so we felt confident that we could use it with this group. We anticipated difficulties with identifying feasible strategies, because paramedics are highly skilled workers who perform a wide variety of physically demanding lifts in awkward positions, with limited control of the circumstances [4,5].

Ergo work strategy development

The response at the pilot site was excellent. Although we had asked for time with 3-4 experienced medics, the service assembled about 8, including some trainers, some near retirement, some who were on modified work, and an assistant chief. Focusing only on stair chairs and transfers, we filled three whiteboards with potential ergonomic work strategies. We were overwhelmed by the enthusiasm – even the skeptics in the group agreed that these strategies needed to be more effectively communicated to new workers. After a couple of hours of really productive brainstorming, we followed the medics into the field to gather information that would allow us to compare the "common practice" with the corresponding "ergonomic work strategy". We photographed both methods, measured hand locations (height, forward reach relative to the feet, and lateral hand positions), grip type, weights and push/pull forces. We measured forces using a calibrated force gauge, obtaining 3-5 readings for each task. To complete a strain/sprain injury risk assessment, we would have gathered data with a variety of patients, various types of equipment, and in multiple settings. However, our goal for this project was to obtain sufficient evidence to be able to compare the "common" and "ergo" work strategies. For example, we wanted to know how a slider sheet compared with a cotton sheet, when moving a patient from stretcher to bed. This required only two sets of measurements.

As ergonomists, we were well equipped to compare methods, biomechanically. We used biomechanical modelling software to estimate the demands on the body for each technique, comparing the common and ergo strategies [6,7]. The models predicted that some of the "common practice" tasks were so

demanding that a 25th percentile worker (on the small side) would not be capable of performing the tasks, even once. All of the ergo work strategies that the paramedics identified offered a biomechanical advantage. We were able to create one-page posters to quantitatively show how the two methods compare, and to provide instructions for how and when to use the ergonomic strategies.

Coaching plans

We didn't stop at "ergo work strategies" – it's not enough to "post" a strategy and hope everyone can follow it. We wanted to ensure that the strategies could be taught to all workers, using practical, hands-on training.

Fortunately, our team had recently participated in instructional design training, so we put our own new skills into practice. For each strategy, we created a coaching plan, so a facilitator can:

- introduce the strategy
- demonstrate it
- get participants to try both the common and ergo strategy and quantitatively compare them.

We also created debriefing questions (and answers) to ensure that participants clearly connected the activity in the training with the task in the field. We limited the modules to 5-10 minutes in length, so they can be tucked into short gatherings. We may later string some of them together to create longer sessions, to take advantage of annual meetings when we can gather more people together for longer.

Training delivery

We've put a lot of thought into this, and so far, we don't think so. Many of the strategies involve positioning the body or using simple tools to reduce how much muscle effort is required. In our practical training, we use bathroom scales to allow participants to measure their pushing, pulling, lifting, and gripping efforts, often working in pairs. (Force gauges could be used, of course, but bathroom scales are much less expensive and provide a reasonably accurate way to quantify an effort in a training environment.) Sometimes we have participants simulate a task by applying a specific amount of force to the scale, and then provide an effort rating.

For example, when teaching paramedics how much a slide sheet can reduce pulling effort, we position partners facing each other, with the scale between them. Each partner hooks their hands around the scale and pulls until the dial reads 34 lbs, which corresponds to the 150 N effort that we measured while pulling a patient con a cotton sheet. Participants then provide an effort rating on a 5-point scale. To simulate the ergo work strategy of using a slider sheet, participants repeat the activity, pulling with only 22 lbs of effort (100 N), and provide another 5-point effort rating. The facilitator reports the average scores, and guides a discussion about how effective the strategy was, where it applies, and what barriers paramedics may encounter when trying to implement it.

We can imagine a future where virtual reality or gaming systems advance to include a "force" component – a paramedic could apply force to a board or plate and the program would provide feedback about the direction or amount of effort applied. Some researchers are experimenting with the use of the WII Balance board for similar purposes [8]. This technology would allow us to convert our materials into training that could be delivered virtually. For now, the interaction between participants and the use of force-measuring equipment are integral to the training's success.

Does this training actually work to improve paramedics' work practices?

Lots of people facilitate ergonomics training, but whether it works has been the focus of many research papers [9,10,11,12].

We've created a protocol for measuring success, and we've already conducted a pilot study in a long-term care environment, for care providers. We use surveys to measure baseline and follow up employee comfort, self-reported ability to identify the best way to perform a task, and self-rated productivity, work quality, and engagement. We also ask for simple 10-point usability ratings on our attendance sheets after each session.

The first training pilot study didn't run according to our plan, but we did see an increase in participants' self-reported ability to identify the best way to perform a task, and improved comfort scores for almost all body parts. (We received only 13 matched sets of surveys; results trended in the right direction but were not statistically significant.) If you're interested in becoming a pilot site for our paramedics training, please reach out to us. We'll certainly be sharing our success after we run a few more pilots.

About the Author

For almost 30 years, Carrie Taylor has been the Principal Ergonomist for Taylor'd Ergonomics Incorporated, a consulting and training company in Ontario, Canada. (www.TaylordErgo.com) She holds an undergraduate Bachelor of Science in Human Kinetics, and a Master of Science degree, and is a Certified Professional Ergonomist in Canada and the USA. She can be reached at Carrie@TaylordErgo.com.

Her colleague, Callum Murphy also holds an undergraduate degree in Kinesiology and Associate Ergonomist certification in Canada. He is passionate about ergonomics and paramedicine, and looks forward to further work in this area.

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