

## EXPERT INTERVIEW


### PARTICIPANTS:

**William Marras, PhD, CPE**

*Honda Chair Professor, Department of Integrated Systems Engineering and Director, Spine Research Institute  
Ohio State University*

**Heather M. Monaghan, MHSc, RN**

*Editor-in-Chief, American Journal of Safe Patient Handling & Movement*



**WILLIAM MARRAS, PH.D., CPE** holds the Honda Chair in the Department of Integrated Systems Engineering at the Ohio State University. He serves as the director of the Biodynamics Laboratory, Spine Research Institute, the Center for Occupational Health in Automobile Manufacturing and is Executive Director for the Institute for Ergonomics. Dr. Marras also holds joint academic appointments in the Department of Orthopaedic Surgery, the Department of Neurosurgery, and the Department of Physical Medicine & Rehabilitation. His research is centered on understanding multidimensional causal pathways for spine disorders through quantitative epidemiologic evaluations, laboratory biomechanics studies, personalized mathematical modeling, and clinical studies of the lumbar and cervical spine. His findings have been published in over 200 peer-reviewed journal articles and numerous books and book chapters including a recent book entitled “The Working Back: A Systems View.” He holds Fellow status in six professional societies including the American Society for the Advancement of Science (AAAS) and has been widely recognized for his contributions through numerous national and international awards including two Volvo Awards for Low Back Pain Research and an honorary Sc.D. degree. Professor Marras has been active in the National Research Council (NRC) having served on over a dozen boards and committees and has served two times as Chair of the Board on Human Systems Integration for multiple terms. He has also served as Editor-in-Chief of *Human Factors* and is currently Deputy Editor of *Spine*. In 2009 he was elected to the National Academy of Engineering (the National Academies). Recently he recorded a TEDx talk entitled “Back Pain and your Brain.”

**Heather Monaghan (HM):** Can you share with our readers something about your background and how you arrived in your current job with Ohio State University?

**William Marras (WM):** I was a basketball player in college and one of the few basketball players who majored in engineering. Consequently, it got me wondering how injuries occur, and it got me interested in applying my engineering education towards analyzing musculoskeletal injuries, which basketball players suffer quite a bit. So that is what really started it. I began taking some classes in that area and found out I really enjoyed it. As they say, the rest is history.

**HM:** Why engineering?

**WM:** My father was an engineer, and when I was a kid, I really liked to take stuff apart. Sometimes I actually put things back together, but most of the time, I just took things apart. I guess engineers have a sense of mechanical ability, and that is where my interest lay. I like to build things, make things, and analyze things.

**HM:** You’ve lived in Ohio for many years. What is it about Ohio that has kept you at this university?

**WM:** To do what I do, I really need access to a lot of resources, such as people who deal with medicine, animals (veterinary school), other engineers who can supplement what I do, and I need to talk to people who are into psychology. Ohio State University is one of the few universities in the country where all of that is on one campus. It is

one of the largest universities in the world, and the college of medicine and the college of veterinary medicine are each 5 minute walks for me, so it makes collaboration much easier, and we’ve got a supporting structure around us with the university structure. If you do good work, they reward you. It makes it very difficult to leave.

**HM:** What do you feel is the most significant piece of research you have completed and why?

**WM:** It is probably not a particular paper as much as a track. There’s probably more than one answer to that because I’ve been here a long time. What we brought to the table is being able to understand the role of motion and dynamics and what happens to the spine of the person, so that’s probably the first breakthrough. We’ve been able to build personal-

ized models of humans that can be used to understand how people respond to things such as patient handling, cognitive problems, personality, psychosocial pressures, or whatever.

HM: I noticed you also have several patents for the equipment that you measure the movements by.

WM: Correct.

HM: How did you become involved in safe patient handling?

WM: Through Tom Waters and Barbara Silverstein. My first exposure was in Copenhagen. I was at a conference where Barbara Silverstein was, and she was with SHARP in Washington. They were thinking of having legislation in place that would cause all patients to be lifted with two caregivers instead of one. We were talking about that, and she didn't have the evidence to justify it, so she asked me if I would be willing to do a study in that area that looks at the spine when lifting with one caregiver versus two caregivers. We did that and found that it was dangerous no matter how you did it. Subsequently, that caused her to go away from the idea of mandating two caregivers to more of a zero-lift policy in the state. Shortly after that, Tom Waters asked me to come and talk at the patient handling conference in Florida.

HM: You have been quoted, along with Dr. Tom Waters, as being instrumental in determining there is no safe way to manually lift a patient. Unfortunately, there are many facilities that are not using equipment. How do you think we can influence facilities into taking heed of what you are saying?

WM: I think you need a spectrum of things to really make that happen. It's a systems problem. There is a long history of caregivers not using patient handling equipment, so that is against you. There are environments where it's really not available, and there's a culture of do anything you can to help the patient without regard to yourself. I think what you need is to change the environment. You need to have equipment in place. You need to educate the caregiver, and part of that education is helping them understand how their spine breaks down and the fact that you're not going to heal from serious spine problems; it does permanent damage. If they understand that what they do today may influence what happens to their spine 2 years from now, that would give them a reason to use patient handling equipment. It's proper education, availability of equipment, correct design of equipment so it is easy to use, and just create an environment that makes it easy and safe for the person to do it correctly.

HM: You have done a lot of work on taking the concept of safe patient handling from just the lifting to reducing push/pull

forces. What piece of research do you think people should read in order to summarize the case for equipment other than lifts?

WM: They should read my book. It is called *The Working Back*.<sup>1</sup> It is fairly comprehensive about all the different pieces of the puzzles. It deals with more than patient handling; it deals with anything you do with your back in a work environment.

HM: Over the last couple of years, we have seen many of the movers and shakers in the safe patient handling industry retire, including, of course, Dr. Audrey Nelson from the Veterans Health Administration, Dr. Tom Waters from the National Institute of Occupational Safety and Health, Barbara Silverstein, although she is still involved with SHARP, and the loss of William Charney, who was a great advocate of lift teams, as we know. You have worked with all of these individuals. What do you think is the legacy they have left to the safe patient handling industry?

WM: They are the ones who raised the awareness and let people know that there's a real problem here. I think we really need people to step in and pick up where they left off because this was a collection of people who were extremely passionate about this area. Like any movement, you need a backbone behind it that's going to push it forward. These people are the backbone. I just hope it doesn't die without them around, because I think their vision, insight, and sense of what is right and wrong is what brought this to the forefront of everybody's attention, and we need to keep pushing in that direction so it gets out into common practice in the field and the industry.

HM: It's just having those drivers for the industry to keep it going that is concerning.

WM: Yes, there are also those on the funding side, people like Michael Hodgson, who is also out of it now. He is the one that enabled a lot of the work that was done by this group.

HM: Over the last few years, we have seen nearly all of the equipment manufacturers reduce the size of the wheels on their portable lifts to enable them to go under beds and gurneys. How do you think we can reverse this trend? Because, obviously, small wheels increase risk.

WM: I think that is a huge mistake on their part. The studies we have done show wheel size does make a difference, especially small wheels on carpet. I think a lot of that has been driven by the use of this equipment in nursing homes and places. They want it to look like your home, but there is a cost of having it fit under the gurneys and under the furni-

ture. I think we need to raise awareness to turn this around. We've known for decades that big wheels are better, and it's shocking that people design equipment like this right now. All we can do is show them the alarm and point to the literature that recognizes the problematic issues of this and hope people will listen. Typically when you see things at these conferences and point out the problems, there are people listening; so if we make a big deal about it at the conferences and then people go to the exhibit area and ask these penetrating questions, hopefully that will affect some change.

**HM:** I always remember one of the last things that Dr. Audrey Nelson asked the vendors before she retired was for them to make motorized mobile lifts. I guess she was almost looking to counteract this issue of the small wheels.

**WM:** Part of that was driven by one of the studies we did looking at pushing and pulling. Pushing and pulling with a lot of these lifts is fine as long as you are going straight, but what we found was once you are making a turn, especially if you are making a sharp turn into a bathroom, that's where the problems occur on the spine of the caregivers. One of our recommendations was to let the caregiver guide the lift but make it self-propelled, like a lawn mower, power steering for the system. As soon as we said that in one of the conferences, within a year people were actually doing that. But we have to keep them (manufacturers) aware of the important things that need to be changed each year and maybe reiterate those that aren't changing fast enough.

**HM:** How have you seen the equipment for patient lifting and handling change since you first became involved in the industry?

**WM:** I have been shocked they (vendors) have been as responsive as they are. There are a lot of good manufacturers out there, and they are listening. The problem is there is not a whole lot of funding to do a lot of research in this area. Most of our studies have been funded by small groups. Barbara Silverstein's group SHARP funded our first one, and everything else we've done on our own with nickels and dimes from here and there because we thought it needed to be done. I don't see a lot of funding out there to promote objective research in this area. A lot of that funding comes from individual manufacturers who have their own interests in mind, and I don't see them funding universities to do this kind of work so they can get the unbiased answers they need to design this equipment objectively.

**HM:** Ironically, they would probably sell more equipment if they did have that objective evidence.

**WM:** Correct, because it would be on display for everybody

to see. It would be in the journals, and they would be able to say, look, we comply with this or that. I think we need to figure out how to get funding funneled into this area because there is a lot more to be done and it's still a huge problem.

**HM:** Where do you think we could get the funding from for the research?

**WM:** There is less and less funding coming from the federal government these days with all the political problems out there. NIOSH's budget is miniscule for external research, and unfortunately, I think it is going to have to come from the private sector. I would like to see some type of consortium of manufacturers where each contributes to some type of fund for research to come up with the answers that are needed. I know there have been a couple of associations put together, but I don't see anything happening in terms of funding research, at least not at the levels that are needed to get the right answers, and in the meantime, people continue to get hurt.

**HM:** Coming back to your home state of Ohio, the state was one of the early adopters of safe patient handling legislation. Do you think it has been effective?

**WM:** I still see a lot of problems. If you take a look at our bureau of workers' compensation, they give money out for interventions, and by far the top area that is contributed to is for patient handling interventions. There is a need, and it shows that interventions that are applied properly actually work. It is hard to tell if this is a function of awareness or the legislation or whatever. All I know is there is a huge need and back problems in our state are a huge problem, and unfortunately our system is set up where we pay people on the back end after they get hurt as opposed to putting the money up for prevention. It's like that across the United States, not just Ohio.

**HM:** As a consultant, I find that what happens is that I tell them most hospitals can afford to put in a program if they start looking at where their pockets of money are. They work in silos, however, so they say they cannot afford one. But if you look at the loss of a nurse and the cost to retraining one, that's like an instant \$60,000 sitting in HR.

**WM:** Yes, if they would just do a return on investment, but I agree, everything is funded in silos.

**HM:** What do you think we can do to drive the push for federal legislation? At the moment, there does not seem to be a lot happening.

**WM:** I don't know that you can do anything. I think there's

not a whole lot of awareness with the general public about how big of a problem this is. There was a study published last month in the *Annals of the Rheumatic Diseases*<sup>2</sup> that showed that back problems are the number one disability worldwide—not just the US. This is all over the globe. Yet, people don't understand that it's related to what people do. They just think, I'm destined to have back pain or I'm going to get it no matter what. That's not necessarily true. Sure, genetics is one part of it, but it's complex and there are many factors. A big part of it is what you are required to do every day, and lifting patients that weigh 400, 500, or 600 pounds can be a major contributor. That's very clear. I think what we can do is to raise awareness with the government. We could try to get the people who are responsible for legislation and get them to understand what an important and real problem this is. Maybe educate them on the evidence that is out there, and there is a lot of evidence. Show them examples of people's lives that have been changed when they get back injuries due to patient handling and how it completely ruins their lives and their careers. Show them that things can be done to help. I think there is plenty of evidence there. I don't think most of these congressmen are ill willed; they just haven't seen the evidence yet. Everyone is always skeptical until you can show them personally how it affects things. The bottom line for a lot of these legislators is how is it going to save me money? I don't think we have done a great job of showing that.

**HM: We touched on some of the research gaps in safe patient handling. Outside of the equipment discussion we had, do you think there are any other priorities for research in this area?**

WM: Even the very basic things like what is the best way to put slings on people and what's the best way to reposition them, log roll them, and things like that. There have been very few really good quantitative studies done on even the basic techniques that are used out there. We have just done a few on lifting patients in or out of the bed and pushing and pulling, but there's a lot more to it in healthcare. How do you move people in the operating room from the gurney to the operating table? We could go on and on and on talking about these things. Pushing people in wheelchairs. There are so many answers we just don't have. Someone really needs to understand the research needs here and do a comprehensive study of this stuff.

**HM: You are a very prolific writer. What advice would you give to would be authors who read this journal?**

WM: You have to follow the scientific process/rules or else it won't get accepted. I also think you've got to write in a way that is understandable to people. Unfortunately, there are a lot of scientists and researchers out there whose goal

is to show how smart they are opposed to clearly explaining their scientific story. Share the story, explain the point. A lot of times you cannot find it in the complexity of the article. I tell my students this all the time—write down the message of your story. Make sure you have the science in there, but find a way to tell the story. That's all people are looking for. The second thing I have to say in regards to this is we've got to translate the science into the applications. I really see two worlds out there; you see the researchers who talk to the researchers and then you see the applied people who talk to the applied people, but I don't see a lot of researchers talking to applied people or vice versa. That's where the conversation has to be. People have to take the science and figure out how to craft it in such a way that they get some applicable solutions to the problem. That is what is missing a lot of the time.

**HM: You have achieved many things in your academic and research career, is there anything you want to achieve in the next 5 years?**

WM: There are lots of things that I would like to achieve, and what we are looking at these days is trying to apply a lot of these same techniques we've used to helping patients who already have these back problems. So far, my career is focused very much so on preventing these problems, but prevention is a hard sell. We are hoping to use these same techniques to help people, to try and figure out how to get them better in a scientific and logical way. In a nutshell, that's what we're working on these days.

**HM: Is there anything you would like to achieve specific in safe patient handling?**

WM: I listed a number of necessary studies that need to be done, and I'd like to figure out a way to do those. Our models are getting better and better, and our data collection techniques are getting better and better, but as they are getting better, the funding is getting less and less.

**HM: Was there anything else you wanted to add?**

WM: Back pain is a system. It's not just one thing—it's not just the weight of the patient that is the problem. It's the environment around the patient, the organizational environment, the physical environment, the patient's interaction with the caregiver, the way you think about your patients and your back. We have to approach this at a systems level, not just as another silo that looks only at the weight problem. It's more than just the weight issue.

**HM: Thank you very much for your time.**

## REFERENCES

1. Marras WS. *The Working Back: A System's View*. Hoboken, NJ: John Wiley & Sons; 2007.
2. Hoy D, March L, Brooks P, et al. The global burden of low back pain: estimates from the Global Burden of Disease 2010 study. *Ann Rheum Dis*. 2014;73(6):968-974.

### TO SUM IT UP:

1. Back pain is multidimensional and there are many factors that contribute to risk.
2. While patient lifting is certainly one of those risk factors, spine stress during patient lifting is also dictated by your relationship with your coworkers, your personality, your own body weight, and your general stress levels.
3. Patient lifting can certainly improve the situation. However, the availability of patient lifting devices must be supplemented with caregiver education and the properly designed lifting systems.
4. While we have made great strides in understanding the risk associated with patient lifting, more research is needed to fully understand this complex problem.