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Spinal Immobilization

Panelists: Darryl Conway, MA, LAT, ATC; Ellen K. Payne, PhD, LAT, ATC, CSCS, EMT; Edward Strapp, FP-C, NRP, LAT, ATC

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Moderator: James R. Scifers, DScPT, PT, SCS, LAT, ATC

Spinal immobilization is one of the most common pre-hospital procedures performed in the athletic setting following trauma. Variations in practices for spinal immobilization have resulted in recommendations to standardize practice across interdisciplinary care teams. As a result, position statements have been developed advocating the use of a long spine board (LSB) as the primary spinal immobilization device. However, recent advances in technology and the evidence related to the use of the LSB have advocated for clinicians to select from a wider array of choices when considering spinal immobilization. This clinical roundtable investigates these alternatives to the LSB when completing spinal immobilization in the sports medicine setting.

Scifers: What options are available to athletic trainers as alternatives to the LSB? Is there a difference in these options for use in spinal immobilization versus just lifting and moving a patient?

Conway: The CombiCarrier II (Hartwell Medical; Carlsbad, CA), scoop stretcher, vacuum mattress (Hartwell Medical), vacuum pad (Hartwell Medical), and Kendrick

Extrication Device (KED) (Ferno; Wilmington, OH) are all alternatives to the LSB that I have familiarity with. Many of these options are similar to the LSB in concept and function, but offer various advantages and disadvantages that must be considered. All are effective for both spinal immobilization and lifting and moving patients.

The CombiCarrier II and scoop stretcher are similar, although there are moderate differences in their design. Both can function as devices to lift and move patients and offer the convenience of separating from under the patient if they are to be removed. The CombiCarrier II is a hybrid between an LSB and scoop stretcher that can function as either depending on need.

The vacuum mattress is used in lieu of an LSB and functions similarly to it except that it allows the rescuer to fill void spaces more easily and is reported to be more comfortable for the patient. The vacuum pad is frequently used in combination with the LSB, CombiCarrier II, and/or patient stretcher to fill void spaces, create molds around the head in lieu of external head immobilizers, and decrease pressure on bony promi-

nences. Finally, the KED is a semi-rigid device that is approximately half the size of a traditional LSB and secures the head, neck, and torso in an anatomically neutral position. All of the devices mentioned can be used for spinal immobilization and/or for lifting and moving patients.

Payne: I appreciate the multifunctionality of the CombiCarrier II over the scoop stretcher. This device can be used for lifting and moving patients who may not require full immobilization (eg, hip injuries) and for full spinal immobilization of the patient just like an LSB. The scoop stretcher is used mostly for lifting and moving a patient, such as getting a patient out of tight spot and transferring him or her to the ambulance stretcher, vacuum mattress, or LSB. These devices are not designed for full spinal immobilization.

Athletic trainers will find the vacuum mattress easy to use in the field and more comfortable for the patient. The KED and short board are used for extrication and spinal immobilization of patients in a seated position, prior to transferring them to an LSB or the ambulance stretcher. They are used less in emergency medical services (EMS) as we change our thought process on spinal immobilization criteria and the best way to extricate a patient.

Strapp: In my experience, the three most common spinal immobilization options are the LSB, the CombiCarrier II (or scoop stretcher), and the vacuum mattress. The newer concept of spinal motion restriction

involves transporting a patient without gross movement and then allowing him or her to rest comfortably without immobilization. This spinal motion restriction approach has changed how we have handled spinal immobilization, and these new options have each become approved for full spinal immobilization through research. Additionally, these options allow a provider to focus on limiting movement during immobilization while providing increased patient comfort during transport.

In terms of the use of each of these devices in the field, the CombiCarrier II is frequently used as a simple transport/transfer device that does not require full spinal immobilization or in cases where you are simply lifting or carrying a patient for a short distance before placing him or her on a stretcher, but the newer devices are approved for full spinal immobilization. The vacuum mattress is more challenging to position under a patient and has limited uses as a transport device. Due to the lack of rigidity of the vacuum mattress, if not fully deployed, it will cause undue hip flexion and be a challenge without having numerous rescuers carrying the device.

Scifers: How do these options align with the current evidence?

Conway: Most alternative options to the LSB produce favorable results when comparing stability, comfort, tissue pressure, and motion. The scoop stretcher has been found to cause decreased motion compared to the LSB and is comparable to or better than manual techniques for spinal immobilization. As stated earlier, the vacuum mattress is reported to be more comfortable for the patient during periods of prolonged immobilization due to lower pressures exerted on bony prominences. The vacuum mattress has also been found to provide greater or equal

stability to the LSB when compared in multiple planes. Finally, the LSB was found to be easier and faster for the clinician to use, and provided a decrease in spinal movement when compared to the vacuum mattress.

Payne: The National Athletic Trainers' Association (NATA) Position Statement briefly discusses the use of these alternatives to the LSB, but these devices don't seem to get much traction in this publication. More recently, a Joint Position Statement from the American College of Surgeons Committee on Trauma (ACS-COT), American College of Emergency Physicians (ACEP), and the National Association of EMS Physicians (NAEMSP) mentions the use of alternatives to the LSB. Although there is some evidence available supporting the use of the vacuum mattress, at this time there appears to be limited evidence available on the use of the CombiCarrier II in the pre-hospital setting. There is some concern about its use during a computed tomography scan. Given the limited research available on the subject, additional studies are clearly needed.

Strapp: Using the CombiCarrier II or vacuum mattress has become more popular due to the current evidence against full spinal immobilization on all trauma patients. There has been a recent shift to selective spinal immobilization following a focused spinal assessment using the Nexus criteria. With this recent shift in views, EMS personnel and athletic trainers should be focused on selective spinal immobilization while paying attention to patient comfort. It is well known that selecting appropriate padding, which minimizes movement due to discomfort of the rigid traditional LSB, is extremely beneficial to the well-being of the patient. The options of having devices such as a spinal immobilizer (with a cervi-

cal collar) and a soft padded stretcher placed at a 30- to 45-degree angle makes the use of a transfer device (from the position found onto the stretcher) a much better option and a great case for the CombiCarrier II. Additionally, the vacuum mattress allows for a much more comfortable position with adequate padding of the voids and a more molded position around the patient. This is particularly beneficial in anatomical deformities or non-traditional in-line supine position patients.

Scifers: How are you using these options in your practice? How are EMS personnel currently incorporating these options into their policies?

Conway: At the University of Michigan, we use the CombiCarrier II for our spinal immobilization on the field/ice in conjunction with our EMS. We own multiple devices that are available at the specific venues and are given to EMS when they arrive for standby coverage and/or are in place by the patient during emergency situations. For other sports that are less equipment intensive, we have not yet transitioned to the CombiCarrier II and use the standard LSB that EMS carries. We collaborate with EMS for training sessions throughout the year with each device. We also have a vacuum pad device and a vacuum mattress, but primarily use those devices for teaching purposes and have not fully integrated them into full-time clinical practice at this point.

Payne: As an educator, I make sure my athletic training students are aware of all of the alternatives available. They need to be knowledgeable and competent in using the LSB and the other devices (currently they learn the CombiCarrier II, scoop stretcher, and vacuum mattress) in a variety of scenarios. I am also working with other organiza-

tions to educate practicing athletic trainers about the available options and how to incorporate them into their emergency action plans.

I want to make sure athletic trainers are educated on the alternatives and familiar with each, especially when interacting with their local EMS and the equipment and methods that they may use for spinal immobilization. But that is a two-way street, and EMS personnel also need to be educated about the alternatives that athletic trainers may be using. For example, a lot of EMS personnel are not familiar with the vacuum mattress, mostly due to the cost. EMS policies and procedures for spinal immobilization can vary in each locality, so athletic trainers need to reach out and communicate with their local EMS so they can be on the same page when an emergency does occur. This is why it is important to include the local EMS when developing your emergency action plan.

Strapp: I am still seeing a large number of traditional spine boards in the normal EMS setting. However, we are seeing fewer patients with full spinal immobilization and more patients placed in spinal motion restriction. Wilderness and non-traditional environments are seeing a growing use of CombiCarriers and vacuum splints for a variety of situations. The use of CombiCarriers for pelvic and femur fractures is a great option because you do not need to log roll the patient before immobilization or transport. We are also seeing increasing trends with the CombiCarrier II being used as a transfer device to move a patient to a vacuum mattress or onto a stretcher. The vacuum mattress is ideal for prolonged extrications where it can be fitted to the contours of the patient well and is extremely beneficial in elderly patients who often have a kyphotic curve and forward head posture.

Scifers: Which of these alternatives do you find to be most useful? For what injuries and conditions?

Conway: Through my practice, I have found the CombiCarrier II most useful and have transitioned to that device for all equipment-intensive sports. This device provides us with the greatest amount of versatility and opportunity to manage most situations that present. We primarily use the CombiCarrier II for all extrication from the ground to the stretcher whenever spinal immobilization is indicated, but it is also useful for extrication for orthopedic issues.

Payne: Based on my current practice as an athletic trainer and an EMT, I'm most interested to see the continued use of the CombiCarrier II in practice. Its multifunctional design allows its use in a variety of scenarios, including spinal immobilization. As mentioned previously, it can be ideal for injuries such as hip injuries when "scooping" the patient is the preferred method for getting him or her on the board as opposed to the traditional log roll. The device can be used to easily transition a patient from the ground to the ambulance stretcher with minimal movement of the patient. The CombiCarrier II can also be used with athletes still wearing equipment.

Strapp: I think each piece of equipment has a place where it can be most useful. There is some overlap, but CombiCarriers are useful for pelvic and femur fractures because you don't need to log roll the patient before immobilization or transport. When used as a transfer device, the benefit of the CombiCarrier II to move a patient to a vacuum mattress or onto a stretcher before being removed and leaving the patient on this second device is critical. The vacuum mattress is useful in most cases of full spinal immobilization due to its

comfort but especially for prolonged extrications where it can be fitted to the contours of the patient well.

Scifers: Have you identified any concerns or limitations with the use of these options that you would want other clinicians to be aware of?

Conway: Clinicians must be aware that vacuum devices can be expensive and require substantial care and maintenance to avoid device failure. The devices may not be able to be used on all terrains, especially when working various extreme sports. The devices are large and can be bulky to pack and transport, and it can take longer to place the patient on the device compared to the LSB or other devices. Although there are many advantages to using vacuum devices, they require substantial training and coordination with all members of the interdisciplinary team, as well as daily inspection that can be more cumbersome compared to other devices.

Scoop stretchers also require a significant amount of training compared to the LSB. If using a traditional scoop stretcher, "pinch points" within the unit must be monitored during sizing and use, and additional attention must be paid to the locking mechanisms to make sure that they are secure. The KED has limitations with regard to the size of the individual and specific limitations as to when it is optimal to use. As with other devices, it requires substantial training to apply correctly.

Payne: Both the vacuum mattress and the CombiCarrier II are more expensive and the vacuum mattress requires a significantly greater storage area than the LSB. Each of these alternatives require additional training for the athletic training staff and other members of the sports medicine team who will be using them during an emergency.

Strapp: In addition to the cost and size of the vacuum mattress, there are some concerns with its use in cold environments. However, I have worked ski events (including with the National Ski Patrol) and have had no issues with using the vacuum mattress in cold and austere environments. The only real concern I have found with the CombiCarrier II is the latch/hinge, which occasionally becomes dirty or will not re-clip due to clothing or pinching the body. These issues can be easily corrected and do not really cause prolonged issues with patient care.

Scifers: There is a limited amount of peer-reviewed, clinical research regarding alternatives to the LSB. How would you like to see the spinal immobilization devices investigated in the future?

Conway: I believe that there is a great opportunity to complete quality clinical research related to alternatives to the LSB. I would like to see clinical research on the alternative devices specific to their use within various sports and conditions. Is there a difference in the use of each of the devices with equipment-laden and non-equipment-laden patients, on ice, in extreme environments, and/or with extreme/non-traditional sport situations? I would like to see clinical research regarding not just the application, comfort, and stability of the device, but also, as protocols evolve, related to removing the patient from the device, whether in the field or in a medical facility.

Payne: I believe there is an endless array of research opportunities with the CombiCarrier II. I would like to see research on all of these alternatives conducted outside of the laboratory setting on various surfaces, with various size athletes and equipment considerations.

Strapp: I think there needs to be further research on full spinal immo-

bilization compared to spinal motion restriction. Nevertheless, in terms of these devices, the research needs to continue to look at time and movement during the immobilization process. With the CombiCarrier II, I would like to see continued research on the amount of movement when used as a transfer device onto a vacuum mattress or only a stretcher for spinal motion restriction when full immobilization is not necessary.

Scifers: For a clinician who wants to begin using these alternatives to the LSB, what advice would you offer for incorporating them into the emergency action plan, policies and procedures, and protocols for working collaboratively with EMS?

Conway: I would advise clinicians to do their due diligence as an interdisciplinary team member and understand that when confronted with a situation in which spinal immobilization is indicated, there are options. Regardless of the situation and/or equipment to be used, relentless preparation and planning, consistent training, and an understanding of the benefits and drawbacks of each technique and device is imperative. Everyone must work as a team in deciding what devices are best, but also understand that there is no such thing as always and never! Every situation and every patient is different and individual circumstances must dictate appropriate actions.

Payne: Just like the LSB, the alternatives require substantial practice to become competent with the skills. If athletic trainers are planning to incorporate one of these into their sports medicine program, they should train pertinent stakeholders, including local EMS, on their use, including advantages and disadvantage. It is also important to

consider training EMS personnel on the proper removal of patients from these devices. Athletic trainers should also make sure their emergency action plan allows for options, because a singular option may not work in each emergency situation.

Strapp: Any time athletic trainers are looking to incorporate new emergency equipment or procedures into their program, I believe they should reach out to local EMS agencies to inquire about their comfort and performance level. If you can familiarize yourself with a procedure (or equipment) that someone is already using, it will help bridge any gaps that might be identified during a stressful event. Finally, and likely most important, make sure that these new devices are approved by your medical director, supervising physician, and employer before using them.

SUGGESTED READING

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