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[00:00:28] Welcome everybody. I can see that the people are joining our webinar. Give a few minutes for people to join. People are still joining. Welcome, people. Uh. Welcome, everybody. We will make a start in one minute. Welcome to the people that are joining this webinar. I can still see the numbers are increasing. Great to have you here. Okay. We will start. Hello. Good morning, good afternoon, good evening. My name is Richard Leger, the executive director for the World Federation of Occupational Therapists. And it's my pleasure to welcome you to this webinar, which is one of a series of clinical webinars aimed at introducing rehabilitation professionals to the critical role of early rehabilitation following earthquakes. These webinars are a collaborative effort between international professional associations and our counterparts in Myanmar, in support of those affected by the recent earthquake. Over the next few days, you'll have the opportunity to participate in different clinical webinars covering fractures, spinal cord injuries, traumatic brain injury, and An amputation following an earthquake. They will be recorded and will be made available for those who are unable to join us today. Today's webinar will be focusing on peripheral nerve injury and provide important insights into safe, early rehabilitation techniques and management. There will be an opportunity to ask questions. Please use the chat function or Q&A function in the webinar.

[00:03:22] If we don't have time to respond to them all, we can provide a summary of the questions and answers and we'll upload those along with the video. Um, when when the webinar is complete. If you'd like to be contacted in the future with updates about these webinars, could you please leave your name and email address in the chat so we can contact you? We know that early rehabilitation is a critical component of disaster response. It allows us to intervene at the right time, supporting people to optimise their functional recovery and more. Most importantly, reduce the risk of long term disability. We initiate rehabilitation during the year when when we initiate rehabilitation during the acute phase of care. We help prevent complications such as contractures, deconditioning and pressure injuries, issues that can significantly delay recovery and impact quality of life. Rehabilitation also plays a vital role in maintaining the continuity of care. It provides the gap between the acute medical management and the longer term reintegration into the community, helping individuals return to their lives as safely and as independently as possible. But it's not just about physical outcomes. Early rehabilitation

addresses the psychological and cognitive impacts of trauma as well. Supporting people at a time when they're most vulnerable. By embedding rehabilitation into our emergency response frameworks, we strengthen our healthcare systems.

[00:04:59] We create a more comprehensive, multidisciplinary, multidisciplinary approach that not only responds to immediate needs, but also lays the groundwork for long term recovery and resilience. It's now my pleasure to introduce Debbie Grey. Debbie is a senior occupational therapist originally from South Africa, where she completed her education and began her clinical career. After several years of practice there, she relocated to the United Kingdom and has spent over 20 years working in National Health Service hospitals, specialising in trauma and orthopaedics, with a particular focus on hand therapy. Debbie has contributed to international emergency responses through short term deployments, including to Gaza in 2015 and Nepal following the earthquake that same year. For two and a half years, she has been based in Ukraine. Her work has included on the job training with rehabilitation teams across the country, focusing on trauma related injuries. And she's currently where she's currently working in a burns unit, supporting staff and training local rehabilitation staff. Her experience covers a diverse clinical and humanitarian settings, and she brings a valuable role to the perspective to the role of early rehabilitation and disaster response. I will hand over to Debbie and thank her in advance for her presentation. Thank you, Debbie, and thank you to everybody again for joining today.

[00:06:32] Thank you Richard. Um, hello everyone, and thank you so much for giving up your precious time, um, to take part in the in the webinar this evening. I'm going to share my screen now and let's just make sure everyone can see. That will work. All right. Can everyone see that then? Yeah. Okay. Um, so I'm going to go ahead and, um, as we you know, we're talking about peripheral nerve injuries. And I hope this overview will give you, um, more confidence to look out for, for potential injuries to perform those, um, when you, when you're seeing patients with sometimes very, very complex, uh, trauma, trauma injuries often, um, with peripheral nerves, they are often the ones to be missed, especially in the early management of patients following the acute injury. So we'll I'll introduce the topic and, um, look at peripheral nerve injuries in the context of an earthquake and how to, how to identify a peripheral nerve injury. Looking at how we adapt our clinical practice and manage them, and treating them in looking and identifying common complications associated with peripheral nerve injuries. How we

can try and prevent or manage these complications, as well as how to develop a basic treatment plan for peripheral nerve injuries. Oh my screen's not. There we go so quickly going over anatomy now don't worry too much if you can't remember everything. This is why we have Google. We can Google everything. We can use our phones or computers to, um, help us to, to remember things, refresh our memories, but with with the nerve anatomy.

[00:08:34] Basically you've got your your your your neurone, you've got your axon which sends the, the signals and you've got your dendrites, which are the receptors to receive those messages. So your, your basic nerve and with your axons sending those messages and the axon. You can see on this on the screen that's surrounded by your myelin. Sheath there. And the myelin sheath is that fatty tissue layer that helps to conduct the signal around the myelin sheath. You have got some um it's encased the whole axon is encased in connective tissue. And that's your endoneurium. Um, and then these, these, these axons, each flaxen axon, they're grouped into bundles and these are called fascicles. Now, around these, these bundles, these fascicles, you'll get another tissue, a layer of connective tissue. Um, and that will be your, um, your, your Perry, your fabric, your perineurium. Um, and then so you've got these, um, bundles of, of axons and then around the encased with a whole lot of fascicles. You've got your epineurium. Okay, so your big is your big nerve. So, you know, you've got different types of nerves. It could be that it's simple sensory nerve. Um, and they are then transmitting messages from your from your receive the endings where the nerves are, wherever that is for tactile touch. And then it's sending messages back to the CNS central nervous system. Um, and then the central from in terms of the motor nerves, you'll be sending the messages from the central nervous system.

[00:10:23] And those messages are transmitted via the motor nerves to your motor end plate or your muscles. But you can also get mixed nerves. So you get a mix of the sensory and and motor nerves together, as well as the peripheral nerves. In essence, you know, that's beyond the central nervous system. If the peripheral nerves are what, um, they link the, um, is the body and from the central nervous system. We're looking at causes of peripheral nerve injuries. You'll get your open injuries or open lesions. And they could be tidy, which is for example thinking of injury could be a blade a knife a piece of broken glass. And then you get what I'm seeing a lot of now in Ukraine, a lot of untidy, um, open injuries. So you've got your blast, your blast wounds from bullets,

shrapnel, severe burns and your open fractures. And no doubt you've also been seeing some of them with your patients. Your side. Now, unfortunately, um, your closed injuries as well. You can get by compression, which also hinder the, uh, the blood flow to the area. So again, it could be course could be a compartment syndrome. And so attract limb and foreign body or a bone also compress the the peripheral nerve injury or sustain posture. Maybe the lying a certain position and the nerve was was compressed while something was um trapping the limb, as we said, and causing pressure to that part for a sustained period.

[00:12:10] Another way is also traction ischaemia. So it's a it's a forceful pull on, on on the nerve. So that could be due to fracture dislocation on a patient that's seen before as well. Um, in the pole was a, was a young girl who was pulled from the rubble and building a collapsed. And it caused a lot of traction strain on her brachial plexus on her arm. So in terms of, um, just an overview of the signs and symptoms for peripheral nerve injury, Acutely when you're looking at the sensory nerves that would be could be affected. And those types of symptoms you might find are that if a patient's complaining of a burning sensation or shooting or shooting pains or symptoms or a tingling sensation, and when I'm talking about this, I'm talking about both arm or leg. And then if there's a if the motor nerve is being affected, symptoms would be a loss of power. Um, muscles not working, um, as it normally would, perhaps not working and then associated loss of function because of that. Also, you might have abnormal signals being sent if the, if the nerve is being disrupted in any way. And so they might complain of feeling of, of electricity as you're looking at um, if it's been become a more chronic or post-acute injury. Type of injury. Then there might be, because of the, um, disruption or effect to the sensory nerves or somatosensory system.

[00:13:56] Um, they might experience or you might observe, you'll get altered skin colour changes because of the, um, abnormalities to to to blood flow. Um, and and sweating changes. It could be that the increased sweating or decreased sweating. So if the muscles haven't been working, um, been uh well, well then you might see signs of muscle wasting. Um, and also patients in compensating with their movement patterns because of the muscle weakness, and also perhaps also because they cannot feel, um, as well, especially in terms of dexterity. So when we look at, a classification of nerve injuries. I'm sure you've all heard of maybe a neurapraxia, but, um, there's one classification system and we're talking about it, and it breaks down into three levels.

There is another one and that's Sunderland and Sunderland. If you look up that classification system, uh, it breaks up axonotmesis the second level into into more detail. So with a neurapraxia, um, often from a compression compressive sort of injury from compression and the nerve is usually intact but unable to signal. So axons intact but unable to signal might be some damage to the myelin on the area. Um and they usually recover anticipate it could be some days, but my patients will be 3 to 4 months, um, for them to regain recovery and a motor function associated with it. Then the next level of severity in terms of nerve injury is axonotmesis.

[00:15:42] So this is when the axon is damaged. So but the structure of the the nerve or the connective tissue around it is intact. So recovery will take several months. And smart patients have taken up to a year or more to fully recover. And also it depends on how high or the level of the nerve injury, whether it's say it's right up, um, proximal part of the arm or leg or worse, towards the distal part. Um, and recovery in these circumstances with excellent uses may not the patient may not achieve complete recovery. Um, and if they don't have any surgical intervention, um, and especially if the injury, as I said, is more proximal. And the thing here to take into account is the distal end plate muscles. And if that degenerates prior to the nerve regeneration. Then you're not going to have a functional outcome. Functional outcome. And then the last level is neurotmesis. So that's when the axon and connective tissue are completely damaged. And so it's a complete cut of the nerve. And. The the nerve might try to regenerate. But surgery is normally uh, always uh needed for any kind of, uh, good outcome for. The nerve properties. So if we look at a nerve, they do not tolerate stretch. Well, they don't like being stretched. So, um, they don't lengthen the same way that a muscle can and, um, might lengthen up to 6% to stretch it, but then they will recoil, um, and so beyond 10%, it usually results in damage to the nerve.

[00:17:36] And so just bear this in mind as well. If a patient has been fortunate enough to have a surgery early for surgical repair to the nerve, then it's just thinking about the very early stages of, of acute rehab and, and thinking about the fact that we shouldn't be stretching that either, while it's an initial phase of healing. So in terms of, um, when we look at Axonotmesis or neurotmesis, uh, what happens with the damage that's, uh, being sustained to the nerve, and the nerve is it goes under, uh, undergoes a process called wallerian degeneration, where the distal part of the axon distal to the level of the injury was that degenerates. And so in it leaves a hollow tube. Now you want you want

a hollow tube. It doesn't always happen that way. Because we'll talk about complications to what stops the nerve from regenerating and or hinders it. But, um, you want this hollow tube for for for for a nerve to, to grow because it'll go from the proximal part towards the distal end. So if the patient needs surgery, uh, this might not be picked up, um, early on. And also, that's why I'm highlighting this. This topic is important, I believe, because often peripheral nerve injuries are missed. So often in the case of a disaster, like an earthquake, when a patient, they've got so many complex injuries, got fractures, open wounds, um, then often the nerve has not been repaired.

[00:19:20] Um, straight away. Um, but if they've been fortunate enough to have the nerve repeatedly. That's that's great. Um, and then it might be a delayed repair. So that might be a possibility of being detected. But then if we think about and I'll talk about it in the next few slides, if it's been, uh, down the line and there's no chance for a primary or secondary nerve repair, um, we might be looking at, um, tenant grafting. Um, if they might later on, then if there's if no function, if there's no chance of the nerve repairing, um, then they might have to look at tendon transfers. Um, and then a functional fusion to the joints. And often what we need, we can be a role as critical in terms of also trying to prevent contractures. Um, and because sometimes these patients will need a contractual lease if, if they're contracted because of, of lack of movement, for example, um, and uh, and so they'll need that anyway if they're going to be looking at, at any nerve repair because you'll need them moving for those restaurants, obviously. Um, so again, with the primary nerve repair, it's a stitching the two ends together. So you've got to have good length for the nerve, because we know that the nerve does not like to be stretched. And that's why it's so important and critical that you try and do in the first few days after injury, but otherwise the grafting.

[00:20:51] Often the patients have seen a lot of patients here where they'll use the graft from the serial nerve, because that's the sensory nerve, and that's one that I can't say it's not important, but where it's located, it's not as important in terms of was under the foot. And there'll be a problem for feeling. Yeah. Having sensation. So um, under the foot. But for the back of the lower leg there, that's a, um it's okay. So they often graft the serial nerve and they can take a large enough piece then to plug in where that nerve is defect. So in terms of outcomes of surgery, it's it's not always a guarantee that the nerve is going to recover after surgery. Um, and also depends on the context. It depends on the surgical capabilities. It depends on the premorbid, um, status of the

patient as well. Um, it depends on the aftercare and the follow up as well. And again, person smokes, for example. Um, the positive indicators as we know if they're young. Um, if it's an early repair. Um, if it's a single function nerve. So if it's, for example, either a sensory nerve or, or a motor nerve, but it's more complicated if it was a mixed nerve have been repaired. And again, if it's, uh, the location of the repair was more distal, say at the wrist level or lower leg level. Um, versus if it was higher up because we know that nerve has to then travel a long way with its healing recovery regenerates, um, uh, in the process of healing.

[00:22:31] So the reason why I've said that is because nerve regeneration takes a long time. The rate of 0.5 to two millimetres today, I think two millimetres is a bit optimistic to be honest. And especially if we're looking at the context that we are, we are talking about. Um, and so again going from proximal to distal. So if we have a high arm, if it's a very proximal, um, injury, uh, then if you think about that, that half a millimetre per day, it's going to take a long, long time. And the motor end plates need to be re innervated within 18 months of injury, sometimes sooner uh, to achieve motor recovery. And um, the maximum recovery from the injury can take up to to uh 24 months. Two years. So I mentioned tendon transfers and tendon transfer is really when I'm seeing a lot here where the nerve. They've tried a delayed repair or tried a nerve graft and it hasn't been successful. But months and months and months and months apart, if not a couple patients, it's been a couple of years. And so for some of these patients, it's functionally, um, pretty pretty devastating. They've lost a lot of function, especially if you think about, say, radial nerve injury. Um, but if the patient gets the right specialist, right surgeon and surgical team, then the options might be options for tendon transfers available.

[00:24:15] Uh, so this is taking there are lots of criteria as to as to choice of muscle and uh, um, whatever tools and the procedures that they they will, they will, they will do and but for example your for a patient who's lost wrist extension they can use a pronator teres. And if and reroute it to to the extensor carpi radialis and or for for the foot. Now I'm no expert so but you could use the posterior because that if it's rerouted can act as a dorsi flexor flexor with the peroneal nerve damage. But often it depends what setting you're in. And if this if you've got the local surgical capabilities and you really have to have good rehab as well afterwards for this. And so complications and as with a lot of your trauma injuries and you'll see it the same with the bigger, um, mixed picture of the polytrauma. Um, so you're going to have that neuropathic pain Time, and that would be

included. And that could be caused by your neuroma. Um, you've got the hypersensitivity, um, injury to, um, due to the loss of sensation. So this is also why I'm highlighting peripheral nerve injuries, because if you don't have the good sensation, um, to your foot, to your hand, where it might be, um, patients need to be educated for the safeguards, um, because they cannot feel that they have that protective, um, sensory feedback and complications due to oedema as well.

[00:26:02] And also with what we want to also prevent, we can manage oedema and we want to prevent the contractures due to loss of movement. So patient moving and then that position of deformity prolonged um then unnecessary contractures can develop. And then also from wound healing and infection. And also if you get more scar tissue from delayed wound healing and from infection that can also have a very detrimental also to the to the healing recovery of that nerve. Just think about that nerve trying to make its way through. Um, along along the path. And then you've got a further obstruction or something like scar tissue as well. Um, and ultimately, it's your loss of function for these patients. Um, so as I've mentioned, your nerve injuries, like they are common in earthquakes and often missed. Um, so, uh, and as we know, it can result in significant, uh, disability. Um, and I think, I think really take home to all of you is you might not be sure, you might see a patient and that there's a lot going on and there's a lot you're trying to decide to prioritise. But I think if in the back of your mind you've got a few things. When we talk about the signs and symptoms of nerve injuries and give you more confidence to maybe highlight it. You might not. Nothing you can do, um, in that moment if it's not going to. We don't know if it's going to heal or not or regenerate, but there's a lot you can do in that moment to, to to educate the patient and give them basic, um, treatment plan to help to, to, to to manage the pain or to desensitise or to um, uh, um and prevent contractures with, with, with range of movements and look at functional options as well for them and also not to be scared to mention it to the the medical team to signpost.

[00:28:02] It might not be peripheral injury but rather say something than not. So the reason why I put these pictures up here, um, these are cases as well as it might. The patient might not have sustained the peripheral nerve injury from the actual trauma event, um, earthquake. It might be due to to to other to other things. And I, I see a lot of this with external fixators. It's no one. No doctor has tried to cause a peripheral nerve injury or you know it with such an influx of patients. And sometimes it is, um, limb it's life

saving limb salvaging procedures that happen right in the beginning. And so, um, I've had patients where I've picked up signs of, of, of, of peripheral nerve injury. And then I've said, oh, can we look at the x ray? You might not have access to x ray. Um, hopefully, hopefully you do. But but maybe just signpost the medical team. Um, and if you're not confident to look at x ray, that's okay too.

[00:29:04] But just think about this. Hopefully this highlights that you can think about other other causes of, of this um, signs and symptoms of the peripheral nerve injuries. So in these ones you can see like the one with um uh, second from the right at the top, and external fixator was was nicely rubbing on the ulnar nerve too long, and then the doctor just unscrewed it a bit and pull it out a bit. And then think of the lower leg. You think about foot drop. It's it's common with them. Your peroneal nerve on the well just by the the fibula area. Often there's a screw around that area and that can cause problems. So just think about those things. Um, and then with your your humeral fractures I often see with radio associated radio palsy or brachial plexus. From further topic there's been a traction pull. Um, yeah. And a lot of oedema with it. So I'm not going to go too much in depth about complex regional pain syndrome. I just want you to be aware it's it's a really complicated condition. Um, but it's hard to treat. Um, but it is a rare condition. And and what it is, is marked by chronic pain and neuroinflammation and anaemia. Um, and there's two types but it can be chronic and and progressive. The the big the big factor with this um is that it's distributed disproportionate. The pain that it causes is or the patient experiences is disproportionate to the injury.

[00:30:48] So a lot of the symptoms that we look at or just the pain symptoms that are often caused by something else. And I don't want you to, um, just to, uh, sort of deflect from, from, from other causes that might be willing to rule out anything else that it could be, whether it's compartment syndrome, whether it's infection, for example, or whether it's, um, yeah, they've got something and trapped inside or causing, causing, uh, causing the pain. But I. I would say that. So when you ruled out all, all the, all the other, um, potential causes, this is where our type, type two is in the presence of a major nerve damage. They might develop this. So the key symptoms are severe, disproportionate pain. Um, allodynia, which is normally pain, uh, from, from simply from a non-painful stimulus. Even just a little little light touch could be experienced as extreme pain for the, for this person, um, abnormal stiffness and swelling. And also again, the changes in the sweating, the blood flow, the autonomic dysfunction

sometimes altered temperature regulation. So with these patients, you don't just leave them to be and think, oh, they don't want to be touched and too much pain. No. These patients are very different. You, um, you want to, together with a whole multidisciplinary team. Because they'll need to be managed by the whole team, including with medications, and is encouraging the movement in a graded way.

[00:32:25] Handling and getting them to to use the that affected lung. Nodding. Nodding. Not allowing. Deceased. And so again on the ideal scenario, if we're looking at the gathering information that we need from the patient, we can if we've got access to notes or we find out before we even this patient look at the nature of energy associated injuries, if any surgery has been, um, carried out, if they pass medical history. Um, the the medical. Uh, yeah. Um, medicines that might be taking. Um, and then as well patient with with when you're with the patient really get to understand the pain levels. Um, can their dominance if it's, if it's affected what what dominant hand. What the dominant hand is. Um, again, what we usually do, we find out their roles and, and, um, look at their and assess their sensation. So if you just look and we can learn a lot by looking, looking at the posturing of the of the hands now I'm sorry, I am going to go on more about hands and legs, but it would be this is the same, um, same concept here. And so looking at the posturing, looking at wounds where the wounds are, um, in infections where the scars are. So this if it's subacute, where the scars are and the skin texture about when you're talking about if it's sweating too much or really dry skin compared to the area around looking at any swelling, um, any muscle.

[00:34:02] But this would be down around the muscle wasting, wasting and the deformities. So signs of nerve injury. Um, so again use Google. But what about remembering everything for you? If you can't use Google, um, but you know, we're from I'm not talking about high up the brachial plexus. You know that peripheral nerves initially that complex, um, pattern of complex, um, network of nerves higher up around the shoulder area that your brachial plexus, and then you've got, um, the nerves coming off and from the top, um, the top. But, um, we're going to go, um, talk about the median and radial nerve, but you have got the other peripheral nerves, um, that feeds the muscles higher up in the arm. Um, but the classic, uh, patterning there with your median nerve, um, is your is your, um, that that a a thumb, um, positioning where and or the hand of um, benediction as well. And then you've got the, the ulnar nerve where you've got your claw fingers on the other side. Now, depending on how high the ulnar nerve

injury is, if it's a lower, um, it's at a lower level. You get more of a claw then higher up. Um, I think just because sake of time, I'm not going to go into too much detail now. But this is all things you can read up more about. Um, and then the radial nerve palsy, your classic sign is your wrist drop because your extensors are affected.

[00:35:35] Okay. But with median nerve, it's mostly your flexors. And, you know, within sensation it's to the, um, radial half the volar underneath the area of your, of your hand. Ulnar side sensory impairment would be to the ulnar side, um, of the um volar aspect of palm aspect of, of the hand. And then your, um, radio would be um, your extensors are affect extensor muscles. Um, and, and then, uh, just, just behind, um, the thumb, index finger and your sensory loss or impairment. Okay, if we've got time, I'll come back to this. And then you'll. Sorry. Just to go back so often with the radial nerve. If you've got complex, uh, humeral fractures as well, that can be, um, affected with the radial nerve. Um, your for your lower limb. Just looking at the common injuries, um, is most often would be your peroneal tibial sciatic nerve. And these are important in the control of the ankle foot position which we need for mobility. So the perineal nerve injury you would see signs of foot drop. Um, maybe you've got a weakness in it. Um, and these commonly associated with your fibular fractures at the knee. And again, as I've mentioned before, the pin site. So, um, a patient I had there, um, he was, he had foot drop there and very, very hyper sensitive, uh, foot. And he had a pin site right by the by the, um, by the factory. Uh. And then with the sciatic nerve, you'd get the knee flexion and weakness and knee flexion.

[00:37:25] Maybe a crush injury or, um, you've got, uh, pelvic or femoral fractures, um, from sustained traction type sciatic nerve entrapment. So in terms of assessing, uh, motor function, we're going to look at, uh, what you do all the time. I think, you know, as, as therapists, um, we'll observe it's good to know your anatomy because although I haven't had time now to go into detail with each of the, the, the peripheral nerve functions and what muscles they feed if it's a motor nerve, obviously, I'm not talking about sensory the motor nerves then, um, some of the mixed then, um, we need to look at and knowing your anatomy, then you can differentiate, and sometimes you'll get a mixed pattern because it's more than one nerve. Peripheral nerve that's been affected. So it might be be quite confusing initially. And look first at your active movement, because if it's been a delay in seeing the patient, then maybe they've started developing some soft tissue tightness, some contractures. So make sure that they've got good

passive range before you look. Um, so look at look at um look at active. But then also just check the passive if you to make sure that that's not because of contractures that they can't move. Um, again intrinsic muscles in the hand. And if you're looking at at at testing them to see it, they're not that powerful. So if it feels that we could probably pick another hand to check, check.

[00:38:52] It's the same. Um, and if you can try and feel the muscle bellies when you are, you are testing to see if you're going to flick or feel some kind of, um, contraction. And then generally use the the Oxford scale for manual muscle testing. Them and sensory your first your your the most basic. Their would be your for protective sensation as your hot and cold or your sharp and blunt sensation for the patient to discriminate. That and the ten tests. It's just a moving light touch and you are comparing to both sides. And it's literally you can you can read up more about that, but it's just, um, getting the patient to rate nought out of ten as to what it feels like when you, um, brushing your fingers along the same area on your contralateral side to, to the side that you're testing, and then they can, um, score that and then you get the two point discrimination. Um, I'm not going to talk about, um, monofilaments now because I don't think that that's, um, appropriate for the context, but something, um, down the line. But if you have access to them that can be used. So, um, again, if we're looking at, um, testing checks that the patients use in terms of, um, uh, for sensation. One thing that people can do if it's difficult to maybe, um, uh, be able to assess the patient, um, or if it's a little kid that cooperative, then the wrinkle test is something where you can read up about as well.

[00:40:29] It's a submerging the affected area into, into sort of a bowl of warm water. Sometimes I say 20 to 30 minutes and actually then, um, the body, sympathetic system, the fingers, you know how you've been in the bath for so long, it wrinkles and actually find if there's been some sense sensory nerve impairment, then there might be an area that doesn't wrinkle. And then also check signs where the fragments. Whereas um, a patient that is then, um, they're um, um, it's, they're unable to get them to make an O. Um for, for um, to make sure that they're using the right master groups. And then instead of making a D where they're, they're compensating with another set of muscles when you're trying to differentiate between, say for example, um, median, uh, nerve injury or, and your ulnar nerve injury, you might be able to differentiate with that. So um, so when it comes to, to, to treating patients, um, I we're looking at, at just maybe the priorities and pain and sensation. You want to, um, target and manage that. You want

to, uh, prevent stiffness and contractures. And then we're looking at function, function, function. So looking at the when you're planning and prioritising what are your main objectives right there and then and looking up uh the down the line if you need to give patients some information if they're going to go off and you don't know, sure, if you're not going to follow up immediately or they're going to be referred to another place.

[00:42:09] What does the patient need to know? Um, then and there that would be helpful to guide them, um, before they're seen again and again. How often do you need to see this patient if you are able to have them return, depending on your current caseload? And when do you need to refer a patient to another service? And when do you discharge the patient? So um, with that we're going to encourage a lot of the the function. We look at a lot of the bilateral activities. Um, we will look at looking at patient independence and self-management of treatment techniques. That's really key I think, and patient independence and and daily functional activities, whether that's with some compensatory means or not. Um, and you'll create your problem lists and review. So treatment. I can't stress enough it's advice and education. I think the biggest thing for these patients to know that with a nerve injury. We might not know when we first see this patient. Um, if this and it depends on on the team around the medical team around if it's been a definitive. They know exactly, um, what the extent of the nerve damage and if perhaps we're anticipating, uh, recovery or not. Um, but what with what you do know, um, you need to advise and educate the patient.

[00:43:31] And so looking at appropriately geared exercises, sensory retraining and where and if needed, the splinting and casting. So and don't forget it's the basic techniques. Well if you've got a wound that's healed scar management thinking about that scarring can also impede that that that the nerve that can cause um, the nerve symptoms as well. Um, and um, but also it can help to, to free that area up your graded Decentralisation, your oedema management, your splinting and casting, and your basic your exercises, your functional retraining, home program and goal setting. So I'm speeding on because of time. Time. Um, but when you when you're teaching the patient. Because sometimes with with my patients, if I'm, I'm sending them off and they might only come back to me in six weeks time and I've given them a home program. Um, hopefully, you know, maybe you can see them regularly and sooner. But I have to explain to a patient why I've given them. So initially, they can't move. They they're battling to feel a certain area. And I've given them some passive exercises. And I've

been telling them to think about the movements. Imagine the movements. Use other hand to, to, to also um, uh, or like you imagine move and then to keep the ranges. But if they're not seeing a change, um, day after day, they have to understand why you came to. And we're going to tell them, obviously, because the nerve recovery takes a long time and they might need a splint to support the joints, maybe at rest, maybe for function.

[00:45:09] Um, and so also mentioning the risks that, uh, are associated with, with the peripheral nerve injuries. But if they can't feel. Um, again, I've mentioned about the realistic recovery time scale and also, uh, that smoking also delays recovery if they've had a surgery or not. We know that smoking um, uh, does does delay recovery. And so with these exercises as possible, if it's 4 to 6 times a day, maybe that's optimistic for the patients. But uh, it's a passive and active if able unless it's contraindicated. So if there's anything, if they've got a unstable fracture or, um, anything else that we need to bear in mind sometimes this might be we are adapting around. What else? What other injuries the patient is presenting with? Remember that we don't want to overstretch attraction effect of nerve. If they can encourage a weight bearing and using the effective limb and normal movement patterns as possible. Um, again, this whole idea of the cortical representation. Um, so we look at sensory re-education. So maintaining cortical representation, um, plays a vital role in helping individuals, uh, recover sensual motor functions after the trauma. Um, injury. So, so rehab techniques are aimed to stimulate the brain's ability to adapt and organise itself. So, um, and there's a word you might have heard of with the neuroplasticity there. So, um, in, in rehab, we, we help with our, with our techniques and exercises try to maintain cortical representation.

[00:47:00] And so with things like cancer education and nerve injuries. And the exercises are designed to, um, improve sensory feedback and re-establish the brain's connection to specific body parts. Now it depends on the severity of the sensory impairment. So we might have to peel it right back and look at even basics of like person like laterality. Um, but again, it's it's talking through with the patient, um, and giving them acute advice. Um, might be using the other hand for bilateral influence and then use of other senses. Um, you imagine the movements using your vision to help guide and prompt. We look about talk. I think you're all very familiar with texture retraining and the grading and that. Um, and dexterity and differentiation. And then there is if you want to look up mobile pickup tests. But because of time again I'm going

to erase some. But the mobile pickup test is a very simple test. If we're looking down the line, it's um, to help with, um, um, functional sensibility. So it's something that you can, you can adapt as well for, for what your assessment aims would be. But you're taking ten every day, some similar objects, um, maybe like a screw, a coin, a coin pen and paper clip and, and it's going to be similar, similar, um, temperature as well. But uh, the ones then you can then time a patient from picking up, putting them into a little box or container, and then you blindfold them and you do the repeat it.

[00:48:43] And then you could, might get them to pick it up and feel it and identify it as well. Um, and you can do the time retest as well. Oh, yeah. So in terms of, um, planting, that's a big topic in itself. My, um, I've spent a lot of patients with, uh, peripheral nerve injuries, but you got to think about, um, the aims and purpose behind it. So with any. Spencer, my big thing is the safeguards that go with it. If you're going to issue a stent, the patient really needs to understand why they've got it or how long they're supposed to, when and how long they're supposed to wear it for. Um, and any, uh, safeguards in terms of if the full pressure get advice and, um, any if there's any concerns, what it should look out for. And so and again this can be to Spence might help to prevent contractures, um, improve the range of movement if contractures are setting in. Zero stenting. Venting or enhance function for functional position. For example, with your median nerve injury, it could be a help to adapt the thumb a bit and you've got your ulnar for your ulnar nerve injury. You've got your your claw your and claw your blocking splint there. And radial nerve. It might be to to help to lift the wrist into more extension.

[00:50:13] And sometimes the fingers you can to and thumb and so but I think if you're going to be making just think about the, the the anatomical landmarks or the pressure points areas um infection control if it's possible. And also if a patient is began fluctuating swelling, you're going to be issuing a splint and then patient maybe increasing swelling increases or decreases or they've had some dressings on they come off. That splint shape is going to change. So is there a plan that you can check the splint. Um, if it's custom made. And for follow up there and the other have the monitoring. It might be that, um, there are other things that you can use to, uh, provide the same positional support for the patient. Doesn't have to be expensive thermoplastics. We might have access to custom made splints as well. So again, that's just going through, uh, for the patient, the safeguards actually educating them how and why time frames, strict pressure checks. Also please make sure that the patient or the caregiver knows how to

take the splint on and off. I actually get my patients to practice. Um, it sounds silly, but often a patient might get a little confused putting it back on again. And so often take pictures that you can, um, or photo of how it should, should be fitting, uh, in terms of where it should be fitting and the strapping as well. No tight strapping. Um, if a patient has got sensory issues, this could be it might be a contraindication.

[00:51:46] Maybe not if they've got good ability, um, to to do strict pressure checks and skin checks. Um, but a patient, um, hasn't got the cognitive ability to be able to identify problems then. And there's no carer to oversee the management. That might be a contraindication to to, uh, issuing a splint. Again, it shouldn't cause pain. Um, and just think about, uh, the skin condition as well. You don't want to compromise, um, your skin integrity. Um, and also with healing wounds. So just in summary, um, I'll, you know, the nightmare scenario with, with patients when you're presenting with who present with the peripheral nerve injuries. Um, for complex injuries, as as infection. Because that can just set everything back or exacerbate symptoms as a poor wound healing creates more scar tissue. Um, Where you've got a late identification of, uh, of the of the of the peripheral nerve injury. Um, which often has led to joint contractures. I see that a lot here. I see a lot of, um, some of the warm rooted coming back, and they've had a missed peripheral nerve injury. They've gone on because their wounds have healed, but they've come back with, with tight contractures, um, because they haven't had any, any education prior to that. Uh, it could be from, uh, secondary injuries. I think there are lots of different reasons you could get, um, from, from, from some of the, some of the procedures that have been carried out.

[00:53:30] It could be as well, if I think about, um, patients and sustaining, uh, injury because they can't feel, well, haven't got good sensation. Um, also, if they've had the surgery, we'll try to repair or if there's a lack of regeneration, they've got the hypersensitivity to deal with. They have now also maybe developed compensatory movement patterns as well. Um, and then you've got the complex regional pain syndrome. So that's your nightmare scenarios which hopefully we won't have too many of or none at all. Um, but we can play a role in trying to minimise that, reduce some. And then thinking about our basics, um, in terms of anatomy, when you are assessing and maybe and you can, um, uh, helps you to have a, have a look and, and, and identify some missed, uh, peripheral nerve injuries. Um, and then just how we go about our basic assessment for our patients to be able to plan treatments and prioritise

softening scar tissue. I mean, that's with, with all your patients, right? Um, with trauma injuries preventing the contractors and, uh, controlling the pain and trying to desensitise the patients, not going to do his exercises or want to move it. If we don't teach him techniques to try and reduce that pain and desensitise and then think always about function, how to incorporate that that affected limb as well and make the person more functional. Okay. So I know that was really rushed in the end, but I am aware of time. Okay. I'll stop. Let me stop sharing.

[00:55:15] Thank you, Debbie, for such a comprehensive and clinically rich presentation. Um. My apologies. Your exploration of peripheral nerve anatomy and rehabilitation techniques has been incredibly valuable, um, especially in the context of emergency care. And you've given us practical insights that can be applied even in challenging conditions. Um, I'm aware of the time, Um, as I mentioned earlier, we have had one question, but if anybody has any other questions, could they please post them in the Q&A function and we can answer them after the session? Um, Debbie, there was a question about somebody asking what the time frame for the acute phase would be. I don't know if you have any questions. Any thoughts on that?

[00:56:11] Sorry. Does someone want to ask in terms of, of the acute phase or pair or just for, for treatment?

[00:56:20] It's not clear. I assume it's um, I'll see if anybody's written any, any more detail. Uh, the acute phase, I, I could imagine it would be sort of the surgical part. Um, difficult to know if the person who wrote that could ask a more detailed question. It would be really appreciated. Um. I'm just saying. Is there any other questions? Um, I can see people putting their details in the chat, which is really helpful for us to be able to follow up. Um, I can also post in the, uh, the link to the subsequent webinar that will be taking place on the 9th of April, at the same time, hosted by World Physiotherapy. Um.

[00:57:17] Thank you.

[00:57:18] Again, thank you. Debbie. I can see that there are questions coming in. Um, we are out of time, sadly. But people. Um, would everybody please ask their questions? Uh, and we've got clarification on what we mean by the acute phase. So we'll be able to answer you following the session. Thank you for asking your questions. Um, we'll be

very happy to to follow up, um, and and post our responses as part of this video when it's uploaded. Um, following the session. Um, again, it's been really important that, that you've been able to attend everybody. And Debbie, again, thank you for the work that you're doing and also the presentation that you've taken time out to prepare and help share and support people who are working in these, um, challenges and situations and the communities that we work with to. So I will thank everybody for attending. Um, we look forward to seeing you at future webinars. Um, and following up with you, everybody who's left their contact information. So on that note, we will thank you. Um, and we will see you soon. And thank you again, Debbie. We'll speak soon.

[00:58:35] Thank you very much.