**Webinar transcript: Rehabilitation in conflict – Burns**

*This is an edited transcript of the webinar. Minor changes have been made for clarity, readability, and accessibility. The content has been structured to support translation tools and screen readers.*

**Opening remarks**

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**Pete Skelton (World Health Organization)**

Good evening, good afternoon, good morning, wherever you're joining us from.

Welcome to our sixth session on rehabilitation in conflict. I'm delighted that today's session is going to be focused on burns. We have an incredible panel who are going to be talking to you from Interburns.

Thank you again to World Physiotherapy for hosting this webinar series.

My name is Pete Skelton from the World Health Organization. It's my job to introduce the administration for the webinar to you before we progress on to our expert speakers for the day.

Thank all of you for attending today. Great to see so many people.

We have the session on burns this evening followed by fractures on Wednesday evening, hosted by World Physiotherapy with speakers from ICRC. So, make sure that you've registered appropriately for the fracture session as well if you're interested.

Without further ado, I'm going to hand over to colleagues and friends from Interburns and Gaelle Smith.

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**Gaelle Smith (Interburns)**

Thank you Pete and good day. Good evening. It's lovely to be here with you all.

I'm Gaelle, a physiotherapist that has been involved in burns care in different settings and has had the opportunity to work with Interburns, Humanity & Inclusion and Research Africa within this field.

I have been part of Interburns for several years. For those of you who aren't aware of the work Interburns does, it was founded in 2006 by Professor Tom Potokar, who joins us today. Interburns focus on training and capacity building in low-resource settings to reduce mortality and morbidity from burns injuries.

I will be moderating this session, and we'll be filtering questions for the Q&A which will happen after the presentations. Just to make you aware, there are some images and photos of burns patients that may be quite alarming. So just to prepare you for those.

Our presenters for this session are Professor Tom Potokar and Doctor David Schieffelers.

Professor Potokar is a plastic surgeon and founded Interburns in 2006, leading the development of an integrated approach to capacity building and quality improvement in burn care and prevention in low-resource environments. Interburns has programmes across Asia, Africa and the Middle East.

Dr Potokar has been a very active humanitarian worker since 1990, starting his career there with MSF, Médecins Sans Frontières, has subsequently worked with several different organisations and

recently retired as chief surgeon at the International Committee of the Red Cross, where he was specialising in treating war wounded victims.

Over those last 30 years, Tom has delivered training, undertaken several service evaluations and provided direct clinical care in many countries around the world, including the West Bank and Gaza, where he has been 16 times since 2018. And despite having retired, he has remains very active and has just returned from supporting in burn injuries in Lebanon.

Doctor David Schieffelers is a physiotherapist with a rehabilitation science background and a PhD in burns rehabilitation from the University of Antwerp. David is currently a university lecturer in the European School of Physiotherapy in the Netherlands. His clinical and research expertise concerns the early rehabilitation of burn injuries across various settings, and he has worked in various crisis contexts such as Ukraine and Lebanon.

In addition to his work with Interburns, David has been leading World Burns Week, a world awareness campaign addressing global disparities in burns, which we'll discuss towards the end of the session.

I'm just going to set the scene a little bit. It's been mentioned throughout the series that in situations of conflict, injury patterns are often complex, with burn injuries often not being isolated. So, rather than just one or two cases, there are enough for it to be seen as a mass casualty event that will often overwhelm already fragile health systems.

And as recently published by the World Health Organization, there have been more burns injuries increasing globally, with various factors impacting those including conflict, displacement, and industrial hazards.

We have also seen a large increase in the way burns patients are treated and a lot more positive impact. There has been a shift from mortality to mobility in these patients and as the survival rates improve, the focus of care must also shift to the recovery of patients, advocating for the vital role that rehabilitation and all the professionals involved play in burns care.

So just to re-emphasise that rehabilitation is not an afterthought and does need to start from day one.

Before we delve into what rehabilitation offers for burns patients, we must understand the burns injuries and the medical management in conflict. I will hand over to Professor Tom Potokar to lead us through this presentation.

**Professor Tom Potokar (Interburns)**

Thank you very much, Gaelle, and good evening, good morning, good afternoon to everyone who is watching. I am glad that you have made the effort to come and join this webinar.

I am just going to give a brief introduction to the medical care of patients with burn injuries in conflict. This is obviously a huge topic, so I am not going to go into detail, but what I really want to do is get across some of the key principles around optimising the outcomes for patients.

The best way to look at this is to think about what affects the outcome in a patient with a burn injury.

There are three main contributory factors: the patient, the context, and the injury.

If we think about patient factors, these are quite straightforward. We need to think about the age of the patient, because extremes of age tend to worsen the outcome of burns.

We need to think about any significant medical history, whether they are suffering from chronic medical conditions such as diabetes, high blood pressure, cancer, or infectious diseases, but also if they anaemic or if they have malnutrition.

We must consider their medication history, their pharmacological history, as certain drugs, such as steroids, can impact on the outcome.

And then we review their social situation, the patient's family support, their home background. Do they have a home to go back to? In conflict scenarios, this is not always the case.

These are the main patient factors to consider, but underneath are many sub factors that also influence the outcome.

If we look at the injury factors, the classic ones are the extent of the burn, the depth of the burn and the site of the burn. And to this we must also add associated injuries.

In conflict settings, whilst we can still get domestic burns or normal civilian burn injuries such as scald injuries, as we know from recent conflicts, there is also a significant increase in direct trauma-related conflict from blast injury. This means many patients will have combined injuries and polytrauma.

In non-conflict scenarios, most burns are isolated burn injuries, whereas in conflict a lot of them will be associated with other injuries. These can be complicated blast injuries with extensive open fractures and shrapnel wounds, head, chest, and abdominal wounds etc. Or they may be simple, just a few shrapnel wounds, for example.

The extent of the burn is obviously important in influencing the outcome, but it is difficult with burns as the extent, the depth and the site are all interconnected and interdependent.

For example, is a burn that may be 30 or 40% a serious or significant burn? Well, it does not just depend on the surface area, because if it is a deep burn, then it is certainly a genuine problem. However, if it is all entirely superficial, then that is much less of a problem, and the outcome is likely to be much better.

But it is not just the depth of the burn, because for example, with a 2-3% full thickness burn, the outcome also depends on the site of the burn. If that is in the middle of somebody's face and it is a full thickness burn, then clearly that is going to significantly influence the overall outcome. If it is, for example, on the middle of the back or the thigh, it is going to have less influence.

These are the injury factors, and I think the one that is the most significantly different in conflict settings is the increase in associated injuries, particularly with respect to blast.

Finally, and perhaps the most significant difference in the impact and outcomes of burns in conflict, comes from the context of the burn.

Some of these scenarios here and some of these points that I have listed are typical in many low-resource and fragile environments.

The main one is human resources. In conflict, human resources are often significantly reduced. This may be due to people having fled the country, been refugees, been displaced, where borders and front lines cross access to burn services, meaning that the human resource is in the wrong place.

There's lack of training in many places where there's conflict, but also during conflict, the amount of training and capacity building that can be delivered is significantly reduced.

So, for all these reasons, the human resources are reduced and that will have an impact.

Materials and equipment are also significantly impacted, depending on the specific political, geopolitical and security situation. But there is inevitably a decrease in the amount of materials and equipment that are available.

The physical infrastructure can also be affected, and we have seen this recently, particularly in the last 5 to 10 years, where health infrastructure is damaged, destroyed, or disabled. Not just hospitals, but also the pre-hospital system.

Power supplies are often disrupted, which can have number of consequences, including making the sterilisation of equipment more difficult. Even simple things like lighting and water supply can be affected.

Security is an obvious one and this affects all stages from pre-hospital care to in the hospital.

This is also linked to the access of services, as patients may find it difficult to access any available services. The number of patients being supported by these services often goes up dramatically and when there is a mass casualty event, people can arrive in large numbers. This can then overwhelm the system and the possibility of referring patients elsewhere becomes extremely difficult, if not impossible.

For all of these, the context of conflict impacts significantly on the overall outcome.

What are the basic principles we need to follow?

Without going into technical detail, we have learnt that keeping it simple and keeping it safe is the key to getting good outcomes for patients. And for that we need to go back to the basic principles.

What are we trying to achieve?

Preventing infection, which is the main cause of complication and death if the patient survives the initial injury. We are also trying to promote the healing of the wound, whilst avoiding unnecessary complications.

How do we do that?

If we look at the three environments; the pre-hospital, emergency room, and hospital environments, we can identify what we need to do at each stage.

We will look briefly at the point of injury in the emergency room and then the hospital inpatient care.

At the point of injury, the key things are safe access, a rapid assessment of the patient, and because we are talking about a conflict setting, that often involves catastrophic bleeding, you need to check ABC; airway, breathing, circulation, as these patients will often have other injuries.

This is a situation where ‘scoop and run’ is the priority. Do not overstay and try to avoid unnecessary interventions at the scene, which is a highly dangerous environment. You do not want to be hanging around.

Next in the emergency room. It is about keeping it simple and straightforward, repeating the primary survey, doing a secondary survey. Even if the patient has arrived within 3 or 4 hours, you still clean and cool the wound and provide fluids.

I am not going to go into detail, but a large burn over 20% needs fluid.

The reality is that all the formulas for how much fluid is needed are not that helpful, as the staff are not there to monitor the patients. There is also a lot of confusion about how much to give, so it is much more around clinically observing the patient, and it is better to give a little less fluid than too much fluid.

Complete standard procedures like tetanus tox, analgesia, simple dressings and then referral, transfer the patient if possible based on their clinical scenario.

The key things to avoid are antibiotics, unless the associated injury requires them, because this will just lead to multi-resistant infections.

You need to avoid fluid overload, which in this environment causes more problems than too little fluid.

And initially you should avoid topical agents, unless there is a long transfer, because this can make the wound more difficult to assess afterwards.

In hospital care, sticking to basic principles and keeping it simple and safe has the best outcome.

This is not the environment for doing fancy surgery, whether that's complicated flap surgery or doing extensive excision and grafting of large surface areas exceedingly early.

That is completely out of place in the conflict environment. So, it is a case of doing dressings every one to two days under general anesthetic or sedation, debriding shrapnel wounds, and delayed primary closure.

You do not want to close these wounds initially, as that leads to many, many problems. However, you can alternate topical agents, such as betadine, flamazine, acetic acid or vinegar. These are all extremely effective.

Mobilise the patient early, support their nutrition and then, as the patient recovers, you can do stage grafting of the deeper areas.

It is quite a different approach from how we would manage a single patient in a high-resource environment. To recap, avoid fancy techniques, avoid unnecessary antibiotics, do not skin graft too early and do not close wounds primarily.

It is very much about a safe and straightforward way of doing things, and we have seen in-person from working in in Gaza and in Lebanon, that with this approach, you can get particularly satisfactory results.

That is all I am going to say about medical management, and I will hand over to David, who will continue with the rehabilitation side. Thank you.

**Doctor David Schieffelers (Interburns)**

Thanks, Gaelle, and thank you Tom for this quick introduction to burns and the medical side of things. Now I will take you through the rehab side.

On this slide, you can see some of the challenges that we face with burns in conflict, categorised into non-clinical on the left and clinical on the right.

For the non-clinical ones, the first challenge is an issue of access. Tom already explained that, but obviously it is to do with safety, logistical infrastructure, financial factors and so on.

And often that might lead to delayed presentation of the patient to a burns unit or to the facility where you will be treating that patient. That will have direct impact on the rehabilitation.

Patients come in with existing complications such as contractions, infections etc. So, the challenges on the left impact the factors you see on the right as well.

Now, in conflict, as we already heard, there is a high chance that there might be associated injuries next to the burn injury, particularly if there is a mass casualty event.

So, if our capacity is overwhelmed, there is an elevated risk of overlooking those associated injuries, especially because the burn injury is often the most visual injury at first.

Sometimes that could mask other associated injuries, so it is important to be aware of that, and carry out a proper assessment of the patient when they are presenting.

Malnutrition is something we will touch a bit more later, but just to introduce it, as well as some of the more non-clinical aspects such as access to clean running water, which could be an issue, particularly when it comes to infection prevention and controlling more on the clinical side.

If there are limited resources such as the staff-to-patient ratio, there will be a need for more triage for assigning various levels of priorities to patients. We must do with different consumables and, and with nutrition, which are important for patients. We will talk a little bit more about that later.

One of the issues that we face in in the rehabilitation of burns patients is that often there is a lack of awareness of the importance of rehabilitation, particularly in the acute phase – meaning rehabilitation is often not prioritised, due to any of the reasons on the right side of the table on the slide. You can also see a point there that often it has perceived as being unsafe.

If you have a patient with open wounds, still bleeding, many therapists and rehab staff would be hands off, not going to touch this patient, they must rest, they are in pain, they need to be comfortable. These are some of the reasons that rehabilitation in burns is often not prioritised.

With limited resources, we often see patients being discharged too early for us to follow up on their recovery, on the burn injury and on their functionality.

And that is problematic because the length of the rehabilitation, which can take years, is something that goes beyond the hospital phase and comes with higher expense, which if you are in an area of ‘out of pocket payments’ this could be an issue.

Lots of patients, once they are hospitalised, and if they have open wounds, they think their wounds are eventually just going to heal. They think they will need surgery, maybe not with dressings, but that eventually it is going to heal, and things are going to go back to how they used to be.

However, patients are often not aware of the impact of scarring. That requires a lot of patient education. And because of access issues as well as being potentially displaced, it is also difficult to maintain follow-up with patients, particularly in this phase, where they need that rehabilitation, that scar management and so on.

So clinically, we see all these various aspects that are challenging in rehabilitation. These are primarily ones that we see in the acute phase. And in addition to the first three that I have mentioned, there is the challenge that patients often have a lot of pain, as well as fear and other psychological challenges, which are difficult to cope with.

And together with the hesitation that we often see to rehabilitate those patients, they are potentially undergoing a lot of immobilisations from surgical procedures and from other aspects of the burn care, which could lead to complications associated with bed rest and immobility.

One of those complications, one of the most severe complications, is scar contracture, where it becomes difficult to maintain range of motion and physical function.

We are going to go into some of these aspects in the next few slides, but first, I wanted to go over a bit of a definition.

Now rehabilitation burns particularly used to start now of discharge, which usually coincided with the moment that the wounds are closed. So, all the surgical wound care had been completed, and they have been discharged from a surgical perspective, discharged from hospital. Then rehabilitation starts.

Now what have advocated for, for several years, although the implementation has been lagging, is that we want to move this old definition towards early rehabilitation – because rehabilitation starts now of admission.

We will go over what that looks like. I would like to focus on this early point and what that includes.

There are several different tools that as a therapist and as rehab staff, as a part of that rehab team, you can make use of. This is the toolbox, and I would like to go over each of these, or most of these, in the next few slides.

The most crucial point here is that rehabilitation starts on admission, it is really the first point of contact. And some of you might say 'yes, but only if the patient is medically and hemodynamically stable,' but we can start with respiratory care, positioning, and compression.

The next slide is an overview of the respiratory roles that are part of rehabilitation.

Now this has many different causes and reasons, not just in patients that have an inhalation injury, having inhaled smoke or other substances that may have caused an injury to the lungs, but also postoperatively, just like in other patients that are bedridden.

We need to assess, screen, and then treat the patients to their respiratory level.

Now, these techniques are no different in conflict than in any other conditions, so we are not going to go over them, but this is just a good overview of what possibilities there are and what the aims are as part of the rehabilitation on the respiratory side.

One of the main parts of a burn injury that we want to treat is oedema, or in fact, we want to manage oedema and the rehabilitation of oedema, and the role of rehabilitation staff here is primarily to elevate the injury and elevate the part of the body part that has oedema, particularly the limbs,

This facilitates return of the fluid to the heart, which can be achieved through positioning and splinting.

We want to mobilise the patient and the goal should be active movement to reactivate that muscle pump and then compression, which can be achieved through bandaging of all the different body parts.

There is many reasons why oedema occurs in burn patients. On the left side of the slide, you see some of the predisposing factors in burn patients, particularly there in severe burn patients. This oedema is not only local but can also be systemic – a generalised oedema.

Here, a lot of the fluid moves into the interstitial space and that has a devastating impact on the patient, particularly in the acute phase. This increases pain, reduces function and joint range of motion, but also deepens the burn wound, and that has an enormous impact on wound healing.

So, the oedema compresses, and reduces our blood supply, making exchange of all the different cells that are required for wound healing more difficult. So, it is important to manage oedema when it occurs in the patient.

And sometimes it might only occur a few days after the initial injury, therefore it is important to monitor for oedema in your patient, as well.

We have already talked a little bit about positioning in terms of elevating for oedema management, but positioning, of course, is also particularly important in burns patients for other reasons.

You can see on the slide, a knee or a lower limb of a patient that has been positioned in a flex position. Now, if that is positioned like that, it will heal like this as well, meaning that they will develop

a scar contracture, which means that this patient will not be able to move out of that flex position. Now that is obviously something that we want to avoid.

Here you could see some examples of hand burn, particularly here at the dorsal side of the hands, if that is not positioned well, the scar contracture can end up as extreme as you can see here in the picture.

There's a couple of high-risk areas that we can identify in burns patient where those scar contractures cause a lot of disability, and as you can see, these are the face, the neck, the hands, and the axilla.

Those are the parts of the body where a lot of skin mobility and flexibility is needed for range of motion, so making sure that, if you have a patient with a burn to that location, we need to be careful how we position the patient and how we treat them.

We need to be aware of how to manage and prevent scar contractures. That is important because scar tissue can only stretch 15% and normal skin, prior to the injury, can stretch up to 60%. So, scar tissue is a lot less flexible, not less mobile.

This is particularly an issue in children. Scars do not grow, so we want to be aware of these locations particularly with paediatric patients.

People develop scarcity when they have been left in positions where they are comfortable, s are usually the embryonic position, so we need to prevent that. The way that we can position a patient is with these, as you can see on the slide, this is what is known as the aeroplane position.

We want to abduct the shoulders to 90° when external, externally rotate them and horizontally abduct them, particularly if there is a burn injury to the chest, and there are various positions for the elbow, which we want to have extended.

There is another position for the hands, as we do not want to have that safe position of immobilisation, the POSI position, and then depending where the injury is, we might also want to position the neck and the legs in a certain way.

So, the legs, as you already saw in the previous slide, should be extended, slightly abducted and slightly externally rotated as well, if possible. Now, there are many ways to do that.

Here you can see how, in a bit more of a higher income setting, with nice boots and a particularly good hospital bed. But you should try to make use of anything that you have, from pillows to tables, that are around. We can make use of those, make use of various kinds of materials for slings. Try to use anything that will promote infection control, which is important to position a patient.

Well, now just a couple of pointers. If there is an injury to the neck, to the interior neck, to the front of the neck, then we want to position the patient without a pillow under the head, but a pillow, or a roll, under the neck. This means their neck is in an extended position because what you want to do is to elongate the position or the area of the burn, so it heals in an advantageous position.

If the burn is on the backside of the neck, you want to do the opposite, so there is no one-size-fits-all rule for positioning, except to focus on function with the burn injury and the location of the burn injury.

Depending on where the burn is, you position a patient’s hands in this way, which can be achieved with a roll or a towel, to avoid some of these contractures that you see here in this baby/toddler on the right side of the slide.

One thing I would like to recommend you do is to make use of an individualised positioning chart. This chart can include a picture of the patient, how you would like to position them, and instructions for achieving this.

That position might also need to change over time, so think about pressure prevention and then that can be communicated to the nursing team, to the family, whoever else is around when you as a rehab team are not around.

Positioning sometimes is not successful because the position is painful, so the patient might consciously or subconsciously move out of the position. In this case, splinting is indicated to be able to achieve that safe position, that anti-contracture position.

Another reason to do this is if you want to protect range of motion of the joint, if you want to protect that deformity in the stretch of scar areas, but also if you want to protect a graft - we are going to go into those later.

But where grafts are being placed, there is a certain time, in the first five days, especially, that they are fragile. If it is a different type of graft, the patient might also need to be immobilised for a longer period. In that case, splints can be fabricated for a patient are indicated and preferably, we would use them before the scar contraction has developed.

Now just some examples for a neck. Here you can see a neck splint that has been created with suction tubes, you do not need fancy thermoplastic materials if you do not have those around. There's different ways that we can make use of other materials for splints and a neck collar can provide that stretch of the interior neck and the parts that you want to be stretched.

If it is for the hands, we can, for example, also create a splint, I think you can see here from some form of plastic that has been molded to the patient's hand and wrist position.

On the right side of the slide, there is a QR code for some more innovative solutions from around the world, which can be used in lower or low-income settings and where there's limited resources.

Now besides positioning and splinting, what we also need to do to prevent contractures is actively and passively mobilise the patient's burn. This should happen as early and as quickly as possible. Passively, we should be able to mobilise the area, and this can be done under general anaesthesia or under sedation and under analgesics control.

Here you can see how that can be done. But really, you want to stretch the burnt area.

Now there's a couple of contraindications to this to stretching the burnt area and that is if the graft is still fragile, 5 days post-grafting, or if there are other associated injuries such as fractures and exposed tendons that are making the mobilisation contraindicated.

Now of course, at this point you are wondering how we treat a patient that has undergone grafting surgery.

If the burn wound area is deep enough or extensive enough, it needs to be grafted because it will not heal by itself. One of the most common grafts you see in a burn care setting is a split thickness graft.

Now based on this, after a split thickness graft, you want to know where the graph is located. This is your first question.

Does it cross a joint or is it near a joint? Yes or no.

If it is not near the joints, we do not need to immobilise the patient. We need to check if the graft has taken, if it is a good graft quality and if it is not near joints, we can progressively mobilise that with compressing the burn, the graft. Use bandages around it to ensure that the graft stays in place and is not being moved away from the wound bed, and then progressively mobilise the patient. That can be done after two days of immobilisation.

If there is a graft that is near the joints, then we want to immobilise that area for five to seven days. After those five to seven days, we want to check during the dressing changes if the graft has taken. Maybe because of an infection the graft has not taken, but if it has taken, then we can go over progressively mobilising.

The main point here is that if the splint thickness graft is near or over a joint, we need to immobilise it for five to seven days. Make sure that you always consult with the surgeon because the surgeon knows how good the graft is and what kind of graft was used, and how the graft was being fixed. So, working together with the surgeon, you can decide how and when to progressively mobilise the patient.

Also, we need to understand that this immobilisation does not mean bed rest and not moving at all. It just means we cannot move the affected body part, but we can still work with unaffected body parts. They do not need to decondition with the time.

One small point here about the donor site. With the graft, skin is taken from a healthy part of the body, a split-thickness - half of the skin has been taken to transplant onto the burn wound area. That part can be mobilised right away, but is often extremely painful, so be aware of that.

Mobilisation can also take place and should take place in the operating theatre or during dressing changes. The reason for that is that it is during that time that the bandages, the dressings are off and you can inspect the burn wound.

So, we know where the burn is located. Does it cross a joint? Does it not cross a joint? You can see if there has been good grafting surgery done. You can look at the quality of the graft. Has it taken? Does it look good? Is there infection present, yes, or no?

And most of all in terms of treatment, depending on the level of sedation and paralysis, you can do some mobilisations that are pain free. Often pain will limit and restrict you from what mobilising a patient's burn wood. If it is safe, keeping in mind the grafting protocol, we can do pain free mobilisations, in the OR and during dressing changes, even if they do not take place in the OR, but under sedation.

This is a good, because we can understand where the graft is located, the joint involvement, what it looks like, and most of all, this is also a very important role for you, if you are a therapist and not used to working in the OR, or being present during sedation and anaesthesia, it is a great moment to interact with the surgical team, the nursing staff and to communicate with them.

Ask what is possible with the patient. How we do dressings after the patient has been operated on or after the dressings have been changed, so that we can have some dressings that enable movement and function and just really to be part of that multidisciplinary team and to get them on board with rehabilitation.

Of course, there is so many negative effects of bed rest, I have just listed them here on the left side. But these are common and are not exclusive to burn patients. One of the key issues here is that with burn patients, there might be a need to immobilise them and for them to have bed rest, but it is limited. And that is limited to surgical immobilisations, for some of the fractures, some of the other poly-trauma that they have.

But once those have been resolved, it is safe to really activate the patient and mobilise them. So, it is important to not let pain dictate what we do and what we do not do, but to be informed about the negative effects and try to counteract this terrible combination of burning injury and bed rest.

Now, muscle wasting is one of the negative consequences of bed rest. In a burn injury patient, it is even worse, because these patients are burning more calories after the injury than they used to

before. Some of that energy they need for wound closure and for healing from the breakdown of muscle. Being immobilised with bed rest, you see a lot of burn patients lose a lot of that muscle mass.

The more muscle mass is lost, the more severe the complications. And one of the worst parts is the decreased immunity and increased risk of infection.

Earlier, Tom was talking about how infection prevention is one of the most important aspects of burn care and wound healing. So, closing the wounds and the less muscle we have, the more difficult it is for the wounds to close. And this is something that we see in conflict areas, where patients already come in emaciated with little muscle mass left because of malnutrition.

The key here is to prevent muscle wasting, to have good nutrition for wound closure, and to mobilise the patient as early as possible. Part of that mobilisation is also active exercise - we want to get the patient up; we want to mobilise them as quickly as possible.

In this image, you can see patients who are being mobilised, who are ambulating, who are learning how to walk again. You can see aerobic training and strength training with TheraBands. There are many ways, and if they are within the limitations of what is safe and what is possible, then we should be able to move them and exercise with them.

Strength training and aerobic training is all indicated in burns patients to prevent muscle wasting. This needs to be done as early and often as possible, it should also be done as functionally as possible as well.

We have covered the faces of these patients, but if they were not covered, you would be able to see that these patients are not happy. They are not happy to move, because it might be painful, however, it is so important to really encourage them and motivate them to do it because it improves mood, increases independence, and increases overall well-being of the patient, as well as prevents complications of scar contractions.

It is difficult to move with burns patients, and pain is just one of the factors. Fear, of course, is another one, and there's often bulky dressings around as well, which may be limiting some of the range of motion and some of these movements. The burn wound might have dried up a little bit, so the dressings might cause a bit of shearing and a bit of movement of that healing wound, which might be painful.

There might already be some scarring and some scar contractions present. Patients might be systemically unwell. And then of course, many people do not realise how important it is to move, because there are beds in hospital, and they think what else I would do but lie down on them and rest until I am well again or until I am healed again.

So that is sometimes what the patient is thinking, but also perhaps the family, so that is something that we really want to want to change, and we need to educate the patient and their family. Then we have the surgical procedures that we have already talked about, so just to go over some of these.

Pain is a key aspect. We need to manage pain before we can exercise and mobilise the patient, so one of the quite simple things that we do, is we try to get a pain score and then give analgesics half an hour prior to the exercise session - the timing of exercise really matters.

Keep in mind that there are some procedures during the recovery of a burns patient as well, such as dressing changes and other procedures that might be painful. So, make sure that the timing of the exercise session keeps that in mind. For this, it is important to coordinate and to communicate with the treating doctors and the nursing team.

Next, we need to educate the patient, the family and everybody around, and reassure, encourage, and play. There are other techniques that have been used, particularly during some of these painful procedures. This could be relaxation therapy, imagery, virtual reality if that is available to you. They are all things that have been shown to have an impact on the patient's pain perception and then their cooperation doing some of these procedures, including exercise. Pain should never be a reason not to exercise.

It is incredibly important to play - not just for children, but also for adults. So, if you can make something fun or exciting, then we can stimulate movement.

Just one thing I wanted to show here, although we will not be able to go into detail about paediatric burn care, if there is an injury to the anterior side of the neck here in the chest, you don't want to have a game where the child is pulling a toy with string, because that encourages flexion. We want to have a balloon, something where the patient must hit above the head, so the patient can stretch the affected area.

It is so important that you try to keep in mind the location of the burn injury and adapt the treatment.

Just one example of what dressings could look like if they are done in a way that does encourage movement of the fingers. And sometimes, if you want to mobilise all the fingers on the hands, but you have dressings such as this on the left side, there is little that we can do with that.

This is just an example of how important communication is with the staff that are in charge of doing those dressings, so if you are present during the dressing changes and you can communicate with them, say 'I would like to have the web spaces free,' or 'is it possible to do dressings where the patient is able to train their fine motoric skills'.

So, communicating within the multidisciplinary team is incredibly important. And this is a good gateway to my next slide, because often, in your rehab team, you have so many different professions with different expertise and different priorities. How can you pull in the same direction and not tighten the knot even more? Teamwork during an emergency is essential.

And patients really need to hear the same message from all members of the burn team consistently, particularly when it comes to exercises and rehabilitation that require patient cooperation, but even when it comes to positioning. If the patient is in an ICU setting, they are sedated, we need to communicate and ensure that we are all pulling in the same direction - burn rehabilitation really requires multidisciplinary team approach.

I just want to highlight one thing about scarring. We have already talked about contractures, but here you can see some of the risk factors and one of the problems with scar contractions and all the other pathological scarring, is that there is prolonged wound healing. This can happen with infection and for many other reasons, which is of course relevant in a conflict setting where there is a loss of resources, even a lack of power and water or access to good dressings, sterile dressings.

This could really impact your reputation, because there might be a risk of graft failure, repeated graft surgeries, and so prolonged immobilisation. So, infection prevention is also critical for preventing scarring.

Just one very quick slide on the nutrition aspect of burn care. We already mentioned that burns patients, particularly severe burn patients, are hypermetabolic. That means they are burning and requiring more calories at rest than before the injury - sometimes up to 1.5 times as much.

So, nutrition is incredibly important when it comes to wound healing and is something that we really need to encourage. There are many aspects of scar management, which I do not unfortunately have the time to go into. They will be for another session, but there are many different techniques that are

important now that the patient is being discharged. You of course would like to inform them of those things.

And one of the most important things to realise is that scar management requires long-term monitoring. The scar is usually most active around six months post injury. That is usually the time that the patient has already been discharged, when they are at home - that is when the scar starts growing, and might become a problem. So that is when we want to be able to see the patient again and make sure that the scar is being managed correctly.

We'll have a few resources on that as well later on, at the end of the presentation, but ultimately, if we rehabilitate the patient on time, early, as well as adequately, we can avoid a lot of complications, which might have led to disability independence, stigma and social integration and difficulty returning to work. This also encourages the perpetual cycle of poverty that burns patient are often in.

And that impacts the quality of life of the patient. So, we need to remember that everything we can do in this early phase has an enormous impact long-term.

Looking at all the ICF structures, the body functions and structures, activities, and participation in them is crucial here. Just a reminder of this early rehab toolbox - all these interventions, all these techniques, are part of the toolbox and show you when to use them with what patient.

I hope that with this presentation you are a little bit more able to make that decision and understand what it entails. But make sure that you start as soon as possible.

I did skip over the MHPSS part, but hopefully we can get a chance to talk about that another time, but in summary, burn trauma can cause significant complications and potentially lifelong disability.

Early rehabilitation is key to optimising these outcomes, and we can do that through appropriate positioning, splinting if necessary. We need to activate activity and coach activity and mobility from the point of admission onwards.

And we need to consider the role of MHPSS - mental health and psychosocial support - for those who are unfamiliar. Every staff member and patient has their own role in rehabilitation. It is a multidisciplinary team approach, and we need to ensure adequate follow-up for good scar care and management.

We would like to quickly go into a case study and for that I would like to really hone everything in and help you apply this knowledge to a clinical scenario. I would like to give the floor back to Tom.

**Professor Tom Potokar**

Thank you very much, David.

I will just introduce this case briefly and then hand over to David to pose some questions about the management. This was a young man in his thirties who sustained injury after an air strike. He sustained deep burns to both lower limbs and a few smaller burns elsewhere. But the main injury was to both lower limbs. Originally, the plan had been to amputate the left leg because the burn was so deep, but thankfully they managed to salvage it.

This patient was being treated at a facility that managed burns, but it was not a formal burns centre in any way, and he came to us after having been in hospital for eight months.

During these eight months in an active conflict area, he had not got out of bed at all. He came to us with the left leg grafted, which had taken well, but a very edematous leg and the left ankle was fixed in position. It was exceedingly difficult to get any movement in the left ankle and the right leg.

He had had the toes amputated, as you can see, but he still had an extensive wound on that right leg that was open, granulating and passing behind the knee and across the foot, including on the sole of the foot. So again, the foot was fixed.

He had not been out of bed at all for eight months, and I will hand over to David to pose some questions, hen after we have discussed that, I can say what we did and we can show then outcome.

**Doctor David Schieffelers**

Yes, thanks for introducing the patient, Tom.

One of the questions to consider here, when we see this patient, is, what are the areas where we would expect contractures?'

If you look at the patient, we will assess both knees, left and right. Potentially you might not see this here, but if the burn areas are also on the inside of the thighs, we might even look at abduction as well, so the hips, knees, ankles, and foot mobility is where I would be looking when it comes to risk areas for contraction.

Now this patient in fact already came in with contractures, significant contractures of the ankle particularly which were really fixed in dorsiflexion - in implanted flexion, and really in a little bit of inversion as well. So, really in this equinus a position of the ankle and of the foot.

The kind of position that we recommend for this patient is a position where the knees are extended, where the legs are at hip level, a little bit abducted, and where the ankle is as much as possible, in this plantigrade position.

When the patient's leg is straight, we do not want that foot to drop down, which we would manage with a splint - that is what we did.

We fabricated a splint as you can see here, which together with the help of the patient, we set. This was for the right leg, which was pulling that foot into dorsiflexion.

The patient wore that splint as much as possible, even when they were sleeping, as well as during the day, so we could stretch all the tissues that were causing that a plantar flexion contracture.

We were also trying to activate the patient, get them to sit up and put pressure on that foot once it was safe to do so, so that gravity from the patient's own body weight stretched the same area into the same position that we wanted to achieve.

So, when would we start mobilizing this patient? Well, if the patient presents like this, I will mobilise right away. Of course, we need to keep in mind pain and potentially if it is too painful, the patient might not cooperate and would not allow the movements.

We try to do as much as possible to actively think about pain management, like with analgesia prior to exercise sessions, but we also need to think about doing mobilisation when the patient is in the OR, when there is already sedation and anaesthesia, so we can work pain-free.

**Professor Tom Potokar**

Thank you for that, David. All those points you have raised are critical and that was what was what was done.

Just to add to that. One of the potential barriers was this large granulating, slightly mucky wound. To come back to what I was saying at the beginning about keeping it simple, keeping it safe, in the environment this patient was in, we know that there was a lot of antibiotic resistance.

This wound was a little bit mucky, but there was no sign of systemic infection in any way. There was no cellulitis or anything like that, so we did standard post-admission intensive dressings, daily dressings under sedation and analgesia, for two to three days.

It was evident from the dressing type that it looked as if he had pseudomonas because it was a little bit green, so we treated him with vinegar dressings. We then took him to theatre, debrided, gave it a particularly good scrub, scraped down the granulation tissues, and then applied a meshed split skin graft, autographed immediately the same day, and sutured it in.

At that stage the patient was not on antibiotics and to be honest with you, the wound swab was not relevant, as it was a clinical decision. The wound is going to be clean, and as healthy at the end of the operation than at any other point of time.

So, we applied a skin graft straight away. He was then immobilised with, as David said, a splint behind the knee to keep it in extension. At 5 days, the wound was checked, it was 100% graft take, everything looked fine.

He clearly required dressings for a few more days, but once that wound was then covered, that meant that it was less painful, he could start to have less bulky dressings, more compressive dressings and all the actions that David talked about in terms of mobilising and getting him up were able to be performed, even in theatre initially under general anaesthetic, getting any movement in his ankles was extremely difficult.

But I am pleased to say that subsequently, this gentleman is now up, he can stand, he has even got some movement in his ankles. And as you can see, he is starting to make some tentative steps towards walking.

**Doctor David Schieffelers**

Yes, thanks for explaining that, Tom. And just to add to the barriers, one of the physios has informed us that one of the main barriers that they experienced with this patient was that the patient has lost all hope.

There is some depressive symptoms in this patient as well. And I know we did not touch on MHPSS and mental health and psychosocial social support, but of course, after going through such trauma and having been hospitalised for eight months, mostly in a bed, you would lose all hope.

One of the profound changes that we have seen is trying to make rehabilitation relevant for the patient. Ask them what it is that they want to achieve. This patient wanted to be able to go outside again, to be able to walk again, so these are great goals to work towards.

And with that, the patient started to become more motivated, and we started to see the patient being able to, with the wheelchair, go outside, move and stand.

And that was key, as much as the mental health aspect was a barrier to the invitation before, it became a facilitator afterwards as well - so do not ignore that aspect in rehabilitation.

We have a couple of more interactive Q&A questions that we thought would be good to quickly think about. If you look at this question, are open wounds a contraindication to range of motion exercises?'

If you had to say agree or disagree, I hope that you would disagree because open wounds in most cases are not a contraindication. They are not a general conjugation to range of motion exercises.

Of course, if there is a graft over that open wound, which is still healing and still fragile, then it is a contraindication and if there's other associated injuries. But in general, just like with this case, if there is an open wound, then it is safe to mobilise.

During the first five days after a split thickness graft, mobilisation of the grafted area should be avoided. I hope that you can say after this presentation that it is mostly correct.

In general, however, if the area does not cross a joint and if you have been able to fixate the graft with a particularly good compression bandage, then it is safe to move that patient a bit. But again, still be careful of too much shearing force on the patient.

**Professor Tom Potokar**

If I can just add to that, David. Yes, you are right. When it is over a joint, we need to keep it immobilised because otherwise there is a risk of hematoma, shearing, and graft loss.

However, when it is on, let us say, the lower limb but not crossing a joint, then with appropriate supervision in ensuring that the graft is firmly adherent. Personally, I do not use staples. I would always use suturing to hold the graft in place, and it is important to make sure that the dressing is firm, to keep everything in place and prevent shearing.

If that is the case, then as I say, with appropriate supervision to make sure the dressings are not moving around and that the patient is not overdoing it, then it is possible to get patients up earlier.

And it is a good thing to get them up earlier. But as I say, so long as it is not crossing a joint.

**Doctor David Schieffelers**

And with that, I am going to go to the Q&A.

We have some fantastic questions. Unfortunately time-wise we will not be able to go through them all. I know Tom and I have answered a few, but the plan will be to send in replies to the questions we do not answer to World Physiotherapy who can share them.

I think one of the first questions is something we did not have time to mention, but there is a question here about what rehab professionals can use for objective measures for functional recovery and quality of life outcome in burn survivors, knowing that advanced assessment tools are not available.

Now we could point out a few of the outcome measures that are used, but not ones that are objective. So again, it depends what function you are looking to measure, be it walking with a 6-minute walk test, but there are a few common ones in the world of burns.

**Professor Tom Potokar**

Indeed, the general ones are looking at the body function structure, range of motion, strength.

But burn-specific, you can look at the functional assessment. There is something called functional assessment of burn score, which is FABS. And that is something that is used that gives you an idea of the functional status of the patient.

And then is there a question about the quality-of-life aspect as well? So, there are some general scales such as the SF 36, which assess the general scope of the patient's health-related quality of life, but then more burn specific ones, which are called the burn specific health scale. There is a brief version of that as well. So that is the BSHS.

There is a question that caught my eye, it is a nice one for you both to discuss if there is already a skin contracture across a joint, like in the case study, how much physio rehabilitation do we try before surgical release or surgical methods are then discussed and necessary?

**Doctor David Schieffelers**

Whilst it is always nice to give a simple, direct answer, in some cases, it is not possible. And burn contractures are slightly more complex issues, where it is not always easy to have direct surgery.

There are a lot of factors that need to be considered when deciding whether the best option is rehabilitation, splinting, stretching exercises, versus surgical interventions, which can themselves create a whole host of different surgical interventions.

The types of things we need to consider are the age of the patient, how old the burn injury is, how long the burn injury took to heal originally, whether there's a significant difference between the active range of motion and the passive range of motion, what the surrounding skin tissue is like, the general condition of the patient, what other scarring is like - if they have significant scarring elsewhere or if this is unique and is the only scarred area.

So, there are multiple factors that need to be considered. I think I would say as a general principle, there is a move towards more early surgical release of scarring. And you must consider whether there are other scars.

Whenever I review a patient, for example with burn scar, I go through a process of what is called the five Ps.

The first one is the problems. The second one is the priorities. The third one is the possibilities. The fourth one is the patient's perceptions in terms of what they expect and what they hope to achieve.

And then the fifth one is creating a plan of action in collaboration with the rehabilitation team.

**Professor Tom Potokar**

I agree with that fully.

Well, I have a nice one for you here. How do you balance the need for early strength and aerobic exercise in those patients in conflict settings that may not have the nutritional substrate to support it, particularly whilst healing?

**Doctor David Schieffelers**

Again, it is incredibly challenging just because of the context we are in.

But yes, when it comes to, the nutritional status as being one of the barriers, which I think is modifiable in some cases, maybe patients may present with malnutrition as they come in, but at that moment, we need to aggressively and adequately supply nutrition to them to give them enough, not too much, but definitely not too little.

That will provide some form of anabolic stimuli - a stimulus for muscle growth that will support strength training and aerobic training.

At the same time, strength training and aerobic training are also anabolic stimuli, so they also prevent muscle wasting and many of the other internal conditions that come with a burn injury.

Thinking because there's not enough nutrition, we cannot really support strength training and aerobic training, I would not say that that would be the only reason. Of course, it is best if those two can support each other, but if one is not available for whatever reason, we should still do strength and aerobic training because they will help maintain muscle mass which will help speed up wound healing.

**Gaelle Smith**

And a question more directed to Tomo is just in terms of the pathological cause of delay healing of burns, for instance, diabetes? Just maybe a couple of comments on that element.

**Professor Tom Potokar**

Yes, I mean as mentioned at the very beginning, patient factors including associated conditions, whether that's patients that are taking immunotherapy or steroid treatment or who have diabetes or other conditions that can prevent healing wounds.

Specifically with respect to diabetes, trying to ensure good diabetic control - not allowing the glucose, blood sugar levels to become elevated, which increases the risk of infection.

It has been shown that tight glucose control in the initial stages improves outcomes, so specifically with respect to diabetes, which is important to do when possible.

Although you know, in many situations that is exceedingly difficult, due to lack of insulin, lack of monitoring available. With various other conditions, it still comes down to the same principles. All you can do is try and optimise their underlying medical condition with the resources you have and then apply the same principles of preventing infection and trying to support wound healing in the body to heal itself.

By trying to treat those underlying conditions or at least optimise them, as I say within the reality of what you can do then, that will help try and speed up the process. Thank you.

**Gaelle Smith**

I think I might leave questions there but there was a great question asked in terms of how capacity building in conflict areas works.

And I know you had answered that, Tom, in terms of understanding the on-the-job training, working alongside colleagues. And just to point out, I think that all of us, wherever we have been working with burns, have very much been alongside colleagues, reaching out to several types of professionals as well that are not there with us, but to get their inputs.

I know the amount of times I have needed to call an occupational therapist to improve the care of my patients has been numerous. And so, I do think that is about understanding and working together as a team.

I would just like to invite any closing remarks from either one of you before we move to the final.

**Doctor David Schieffelers**

Well, just from my side, I think the important thing I hope that we have managed to get across is that despite the constraints of working within a conflict environment, it is possible to get reasonable if not satisfactory results with burn patients.

It is about getting the basics right, not getting bogged down in over-complex stuff, but just doing the basics and doing the basics really, well. And to do that you need to have everyone contributing. So, you know, it is not just about surgery, it is not just about the dressings and nursing care, or nutrition or rehabilitation.

It is about all of that coming together and working together as a team – that is the best way to achieve that. And as I say with that, it is possible to get reliable results.

I think just to make people aware as well that even outside a conflict situation, a major, significant, extensive full thickness burn is extremely challenging. There must be a level of realism when you

have a constrained environment on top of that. The priority should be trying to achieve the best results in survivable burn injuries, and those that are non-survivable to ensure dignity of care.

That does not mean care, it means providing dignified care to those patients but understanding that the priority must be those patients that have a good chance of survival.

**Professor Tom Potokar**

Yes, I think I will leave it at that as well. I already covered a conclusion slide.

So, again, move and start rehab as early as possible. There is many different tools available. Make use of them. And there is also many resources that I was going to talk us through in a bit.

**Gaelle Smith**

Yes, that would be great.

So just to close this meeting quickly and say a huge thank you to everyone that's attended and those not able to, for anyone listening afterwards to the recording, just to keep reminding you all to advocate for that early rehabilitation, advocate for your patients.

There are some fantastic resources out there that will help you to do that. One element within burns for advocacy is the World Burns Week, which is an annual event that occurs the first week of November and looks at prevention and care of burns, trying to reduce the number of global burns incidents we are seeing and help move towards better outcomes.

Interburns has a vast amount of resources available as well as some other resources that have QR codes. If you come back to the recording, you can go and access these including guidance that is in development called burn care and management in conflict zones.

And as much as it is not as rehab-focused, there is a lot of learning and understanding to get in that.

Finally, there is also a global burns network and WhatsApp group.

If we move onto the next slide, these are just some final resources for you to be aware of that should help you in understanding more about burns care and management, quality improvement, online interactive courses and again, the WhatsApp group, which is a lovely resource and a good way to reach out with your questions to other rehab professionals working in that space.

Thank you very much to everyone.

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