



**Education and Travel Bursary Report**

Country visited	United States of America
City or town	Columbus, Ohio and St Louis, Missouri
Hospital/unit/clinic	<p>Columbus, Ohio – Ohio State University Hospital East, Ohio State Outpatient Care Upper Arlington, Nationwide Children’s Hospital, and Arthur G. James Cancer Hospital</p> <p>St Louis, Missouri – Washington University and Barnes-Jewish Orthopaedic Centre in Chesterfield, Shriners Hospitals for Children – St. Louis, and Barnes-Jewish Hospital South St. Louis.</p>
Dates visited	<p>Columbus, Ohio – 11<sup>th</sup> to 18<sup>th</sup> June</p> <p>St Louis, Missouri – 8<sup>th</sup> to 12<sup>th</sup> July</p>
Please give an overview of what you saw / did	<p><b>Visit 1 – Columbus, Ohio</b></p> <p>I had arranged to meet Dr. Amy Moore to learn more about peripheral nerve surgery and especially nerve transfers, including those for the lower extremities. I also visited Dr. Bjorklund to learn more about the Children’s Hand Surgery set up in the USA, and also Dr. Souza to learn about advances in amputation surgery, RPNI, TMR, and osseointegration.</p> <p>On the first day of my visit, I met Dr. Moore at Ohio State University Hospital East for an elective surgery list. This hospital is known for serving the health needs of Columbus’ near East Side which has historically been an underserved community, making it a vital part of the local healthcare system.</p> <p>The first case of the day was a patient that had had a previous right hamstring repair done at an outside facility and sustained an injury of the sciatic nerve. He had debilitating pain in the common peroneal nerve and tibial nerve distributions. We performed decompression of the common peroneal nerve, superficial peroneal nerve, and tibial nerve (proximally and at the tarsal tunnel). This was a great case and in particular it was great to learn more about the proximal tibial nerve decompression. Proximal tibial nerve compression is more common than it is recognised, e.g. patients with deep calf pain with negative dopplers for DVT, persistent problems in the plantar aspect of the foot</p>

after tarsal tunnel release etc. It was great to learn Dr. Moore's modification on this procedure.

The second case was a young man with bilateral thoracic outlet syndrome (TOS), and previous right-side decompression with great results. He underwent decompression of the left thoracic outlet. This was an excellent case as we discussed the indications for TOS decompression, the different surgical approaches to the plexus, and intra-operative strategies e.g. first rib resection, scalene muscle resection, pec minor release etc. There have been a number of recent papers on this topic in JHS (both European and American) and it was great to discuss the evidence base. This was also particularly useful as I am currently performing a systematic review on paediatric TOS.

We used a product called Zynrelef for both these cases. This is a combination of Bupivacaine and Meloxicam. It is a gel which can be applied into the operative field at the end of the procedure. The benefit is constant analgesic relief which lasts from three to five days. This product is an alternative to giving a postoperative regional anaesthetic block and has a longer duration of effectiveness. It is certainly a product that I will be looking to incorporate into my practice.

The second day of the visit was at the Outpatient Care centre in Upper Arlington. This is a suburban area located just northwest of downtown Columbus. Here, I attended a major nerve injury clinic with Dr. Moore. This was a fantastic experience as I got to see a wide array of patients with different neuropathies. One patient was a young gentleman who had a long-standing ulnar nerve injury and subsequent clawing of the little and ring fingers. We discussed in detail the different anti-claw procedures and Dr. Moore explained her preferred technique of using the four-tailed ECRB with PL grafts; the technique was published in AAHS just that month.

We also saw a patient with Parsonage Turner syndrome who had partial posterior interosseous nerve (PIN) and ulnar nerve weakness. They had undergone supinator to PIN (SPIN) supercharged end-side (SETS) transfer as well as anterior interosseous nerve (AIN) to ulnar nerve SETS transfer with good early results. This was great to see, as in our unit we have traditionally done end-end nerve transfers. There was another very interesting patient who had a left arm replant, but he also had a pan-plexus injury on the same side. He also had osteomyelitis of the elbow with exposed metalwork and a history of



muscular dystrophy. This generated a lot of thoughtful discussion with the patient because even if the elbow can be salvaged, then the options for re-animation through extra-plexal transfers and free functioning muscle transfer (FFMT) are extremely limited with the history of muscular dystrophy. The patient was referred to the local orthopaedic team to expedite treatment of the elbow as the patient wanted to try everything first to save the arm. We also saw a patient who had undergone a hamstring repair at an outside facility and sustained an injury to the sciatic nerve. She had no tibial or peroneal function below the knee but had normal femoral nerve function. She was listed for exploration of the sciatic nerve, reconstruction with sural nerve graft, and vastus medialis to gastrocnemius transfer. With this transfer, having at least a functioning gastrocnemius muscle would provide ankle plantarflexion and proprioception thereby helping to improve the patient's gait. Dr. Moore has modified her technique for doing this procedure over the last 10 years. I was able to attend the surgery for this patient the following week. We saw several other very interesting cases and I took many notes. We also discussed working on a collaborative project together looking at peripheral nerve transfers in older patients.

On the third day of the visit, I spent time at the Nationwide Children's Hospital in downtown Columbus. This is one of the largest and amongst the highest ranked children's hospitals in the country. It also has one of the largest paediatric research facilities in the US – the Abigail Wexner Research Institute. I attended a theatre list with Dr. Bjorkland who is a paediatric plastic surgeon with specialist interest in children's hand surgery. She works alongside Dr. Pop who is an orthopaedic surgeon also with a specialist interest in children's hand surgery. One of the main cases was a child from a family with an autosomal dominant history of polysyndactyly of the hands. They underwent correction of the left thumb duplication with corrective osteotomies, as well as bilateral third webspace syndactyly releases. It was great to see this case to discuss the different techniques in syndactyly release and thumb duplication correction. It was interesting to hear their experience with using hyaluronic acid dermal matrix after syndactyly release. I also learnt more about the CoULD registry and participating centres.

The following day was a Research Day that Dr. Moore had organised. It was incredible to see so many medical students and residents present their papers. There was a very strong culture of research and

innovation. There was a fantastic keynote guest lecture by visiting professor Dr. Benjamin Levi on heterotopic ossification (HO). I learnt about the different types of macrophages, the different genes that are up-regulated in patients that get HO, the role of TGF-B, and the link to inflammation. There was a lot of interesting discussion and Dr Souza pointed out that in patients with blast injuries/amputations, those that had early definitive cover with fasciocutaneous flaps, had much less HO. There was also discussion about timing of excision of HO and the recommendation was to do this ideally after 6 months. These were all highly useful learning points for me. I learnt that local plastic surgery research presentation days are an excellent way to showcase all the work trainees are doing in the units and promote excellence. We are now holding similar days in the Yorkshire Deanery.

In the afternoon I joined Dr. Bjorklund in the paediatric plastic surgery clinic at the children's hospital. This clinic had a mix of patients with hand trauma and congenital hand differences, and many were follow ups. One of the most interesting patients in that clinic was a young child with a unilateral acrosyndactyly but no other features of Apert's Syndrome. He had undergone an Abdel-Ghani dorsal flap for first webspace reconstruction. This generated a lot of interesting discussion about the use of free flaps (which is the preferred option in our unit) vs. local flaps for the management of the first webspace. We also had very interesting discussion about free flap monitoring in very young children.

I took the weekend to enjoy exploring Columbus and seeing the different areas including Short North Arts District, German Village, and Downtown Columbus. I also enjoyed running along the popular Olentangy trail which is a 13.6 mile route that follows the Olentangy river.

On the Monday I was in clinic with Dr. Souza at the Outpatient Care centre in Upper Arlington. This was a fantastic clinic for me to learn a lot more about limb reconstruction and the use of amputation as means of reconstruction to allow the best possible prosthetic options. I learnt many new things in this clinic including the advantages of OI over conventional prostheses, different types of OI systems (e.g. OPRA, e-OPRA, SISA, and ITAP), differences in the screw fit vs press fit systems, minimal length of bone required for OI etc. With screw-fit OI systems, the skin flap over the bone is completely thinned to dermis in order to make a robust adherence and so there is less granulation tissue around the implant and thus less risk of chronic



infection. It was great to see a patient who had recently undergone this procedure and how well the skin flap had healed despite being very thin around the bone/implant interface. I also learnt the importance of ensuring the correct level of amputation in order to ensure maximum benefit from prosthetics. For example, one patient had a low trans-tibial amputation. In this case, he could not walk on the stump as it was too short, and he was not getting the benefit of a proper below knee amputation (BKA) prosthesis. Therefore, he was listed for surgery to revise the amputation level to a conventional BKA. I also learnt about the use of amniotic membrane in nerve decompressions. It has been shown to help reduce pain and recurrence especially in patients that have had previous procedures and failed treatments. There were many other very interesting patients that we saw including those requiring free vascularised fibula transfers for intercalary defects of the humerus, and another patient requesting a rotationplasty for a non-union of the distal femur despite a previous free non-vascularised fibula from another centre. This was overall an excellent clinic and learning opportunity, especially as we have a limb loss clinic in Leeds and OI for the upper limb is another very important reconstructive option for our patients.

The final day of the visit was again with Dr. Moore at the Ohio State University Hospital East. We had two sciatic nerve explorations. The second case was that of the patient we had seen in clinic the week before – she had a hamstring repair at an outside hospital and awoke with no tibial or CPN function and severe neuropathic pain. It was great for me to see Dr. Moore's approach to the sciatic nerve which is muscle splitting through an oblique incision over the buttock and a separate incision in the inferior gluteal crease. Through this we were able to identify a bone anchor that was tethering the sciatic nerve to the ischium. The damaged section of nerve was excised and reconstructed with sural nerve graft using conventional techniques. However, it was really interesting for me to see the vastus medialis to gastrocnemius nerve transfer. I learnt about the VMO and VML branches to the vastus medialis and how to achieve direct coaptation to the gastrocnemius branch. We took lots of intra-operative photos and we are planning to write up the revised technique. This case was especially useful for me as the following week we had our own patient who required vastus medialis and obturator nerve transfers and I was able to utilise what I had learnt.

## Visit 2 – St Louis, Missouri

I had arranged to meet Dr. Goldfarb and Dr. Wall to learn more about children's hand surgery, and Dr. Brogan and Dr. Dy to see a wide array of upper limb surgery.

Day 1 began at 5:45am. I met with Dr. Goldfarb at the Eric Newman Education Centre where we then made our way to the Barnes Jewish Hospital to the anatomy dissection room which was named in honour of Dr. Manske. Here we had teaching for 1 hour with the fellows and residents on topics they had selected e.g. dorsal approach to the wrist and SL ligament reconstruction. Some of the other faculty also joined in via Zoom and gave their experiences and answered questions from the trainees. This was a fantastic teaching session and a model which I am now implementing in Leeds for regular cadaveric teaching.

We then headed to the Orthopaedic Centre in Chesterfield where Dr. Goldfarb had a busy clinic of over 50 patients. The clinic began at 7am and ran through to 4pm. The clinic had a predominantly adult population but there were some paediatric referrals. There were patients with acute trauma e.g. UCL injuries, hand fractures, radial head fractures etc. There were also patients with more chronic conditions e.g. osteoarthritis and inflammatory arthritis, trigger digits, and some patients with congenital differences e.g. triphalangeal thumb etc. It was great to see the clinic set up as it was run extremely efficiently. Patients were brought into multiple clinic rooms and if they needed procedures such as dressing changes, wound debridement, or steroid injection etc. then this was prepared by the staff before review so there was no delay. Patients would fill out PROM questionnaires before being seen and these were via computer adaptive testing (CAT) and the results were directly loaded onto EPIC which is their electronic record management system. There was a separate room with a mini c-arm to allow for immediate radiographs and decision making. If patients required surgery, then the PA would complete the paperwork as well as schedule the patient. All of these aspects made the clinic run very efficiently and I am gradually implementing some of these features into my own clinical practice.

On the second day, I attended Shriners Children's Hospital. It was great to learn about the history of the organisation. It was established by the Shriners International fraternity in 1872 by a group of philanthropists. The first hospital opened in 1922 and there are now



22 hospitals across the US. One of the key concepts is that these hospitals treat children regardless of the family's ability to pay. The day began at 7am where I attended Indication Rounds. This was a short meeting where the trainees presented all the previous weeks operations and the upcoming operations this week to Dr Goldfarb and Dr Wall. This was a great opportunity to discuss upcoming complex cases and reflect on whether they would have done anything different on previous cases. Following the Indication Rounds, I had a meeting with Dr. Goldfarb and Dr Wall to discuss some of the research projects we were all working on and to learn more about the CoULD registry i.e. how it was set up, how it is maintained, what data is collected, how the data is processed etc. They have a regular research meeting and again this is something I am implementing in my unit.

I attended the children's hand surgery clinic here with Dr Goldfarb and Dr Wall. We saw many patients with a diverse array of conditions including ulnar dysplasia, radial dysplasia, cleft hand, arthrogryposis, camptodactyly, triphalangeal thumbs, Poland's syndrome etc. There was also a child that was referred for consideration of nerve/tendon transfers following a rare form of Guillain Barre Syndrome which was descending in nature but not Miller Fisher Syndrome. I took many notes and learnt a great deal of tips and tricks in managing these patients. Again the clinic was run very efficiently in a similar way to the previous day.

The following day we were back at the Orthopaedic Centre in Chesterfield with Dr Goldfarb in theatre. This was an excellent theatre list with 12 cases scheduled including carpal tunnel decompression, cubital tunnel decompression and anterior transposition, metacarpal ORIF, phalangeal K-wiring, elbow ORIF's, wrist arthroscopies, TFCC repairs, ulnar shortening osteotomy etc. It was great to see the list run so efficiently by utilising two theatres side by side; the anaesthetists would block the next patient and as one case was finishing, the scrub team would set up for the next case in the adjacent theatre. This is a model that we use in our unit also for hand trauma and it works very efficiently. I was particularly interested in the set up for the wrist arthroscopy and the use of cannulated screws for the metacarpal fixation. We had great discussion throughout the list about each case e.g. anterior transposition with cubital tunnel

	<p>release and the pros/cons of subcutaneous vs submuscular techniques.</p> <p>On the Thursday, I attended Barnes-Jewish Hospital to join Dr. Brogan in theatre. This was another excellent diverse operating list. There were a couple of trauma cases including a 4<sup>th</sup> and 5<sup>th</sup> CMCJ fracture dislocation which required K-wiring as well as a distal radius fracture requiring ORIF with a volar plate. Another case was that of a patient who had septic arthritis of the wrist and had undergone extensive debridement of the carpus and insertion of cement spacer. He had been lost to follow up for some time but then returned for his second stage removal of the spacer and wrist fusion using iliac crest bone graft and a Synthes fusion plate. One patient underwent AIN to ulnar motor nerve SETS transfer and EIP to APB tendon transfer. The last patient underwent cubital tunnel decompression, anterior transposition, and AIN to ulnar motor nerve SETS transfer. I learnt a lot of tips and tricks observing these cases. In particular the technical aspect of making the perineural window for the SETS transfer to work. It was great to talk to Dr. Brogan about his experience with peripheral nerve transfers and the evidence on SETS transfers. We also discussed research projects and are planning to collaborate on a multicentre study.</p> <p>Thursday evening, myself and the orthopaedic resident working with Dr. Goldfarb were invited round for dinner. This was a really great opportunity to meet Dr. Goldfarb's family, and the food was terrific!</p> <p>On the last day of the visit, I was back at Barnes-Jewish Hospital to join Dr. Brogan and Dr. Dy for a brachial plexus reconstruction case. The patient had sustained a pan plexus injury following a motorbike accident. He underwent fusion of the right wrist and free functioning gracilis muscle transfer for elbow flexion and finger flexion. The FFMT was powered by the spinal accessory nerve. This was a great case for me to see as the gracilis was taken with a skin paddle and the fascial sleeve. Including the fascia makes the skin paddle more reliable and also preserves a nice gliding plane for the muscle.</p>
<p>What were the best things about the visit?</p>	<p>I learnt advanced techniques in peripheral nerve surgery. It was incredibly useful to apply the knowledge I learnt by seeing the vastus medialis to gastrocnemius nerve transfer to our own case just the following week. I will also be utilising all the knowledge I learnt regarding SETS transfers in my practice. The Research Day was thoroughly enjoyable and a great way to showcase all the hard work</p>





	<p>the trainees have been doing. The cadaveric dissection teaching session was excellent and something I am actively setting up locally. It was incredible to see the different set ups in Columbus and St Louis and just how leading centres in hand surgery run highly efficiently. Both cities were a lot of fun and it was great to explore them and dine at some great restaurants.</p>
What problems did you encounter?	Nil
What accommodation was provided?	<p>Whilst in Columbus, I stayed in an AirBnB in the University District. This was a great location with trendy restaurants and a great atmosphere. It was also fairly equidistant to the different hospitals I visited.</p> <p>In St Louis, I stayed in a hotel in Chesterfield. This was an ideal location as it was close to the Orthopaedic Centre. The Children's Hospital and BJH South were only 15 minutes drive away and parking in Chesterfield was free and easy. There were some great hiking and cross country running trails nearby also.</p>
Do you have an anecdote about your visit you can share?	<p>Whilst watching the AIN to ulnar motor nerve transfer with Dr. Brogan, I noticed that the pronator quadratus (PQ) muscle could be used as a free flap for a small defect as the anterior interosseous artery would provide a decent pedicle length and the donor site morbidity would be low. Dr Brogan explained that they had actually used the PQ as a free flap for a small ankle defect just recently and it had done very well!</p>
Would you recommend this to someone else?	<p>Absolutely. The BSSH Education and Travel Bursary is an exceptional resource which helps surgeons to visit other centres of excellence, refine their own practice, and improve efficiency and effectiveness in their own departments. It allows for long lasting international working relationships.</p>
How did this experience add to your development as a Hand Surgeon?	<p>Gave me a vision of how some of the best centres for plastic and hand surgery operate. I gained many strategies to improve efficiency in our department. I saw a broad spectrum of adult and paediatric hand surgery and learnt many tips and tricks in management and surgery of a wide array of conditions. I made connections with leading hand surgeons and will be working on collaborative projects together.</p>
Your name:	Ibrahim Natalwala

Hospital/Unit	Leeds Teaching Hospitals
Contact email: (optional)	ibrahim.natalwala@nhs.net