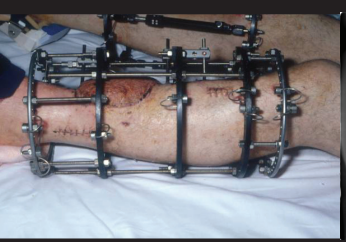
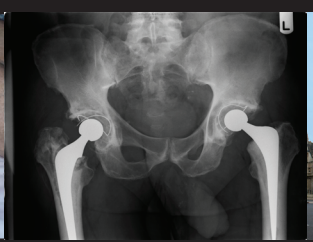
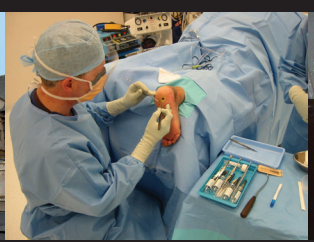
The Oxford Bone Infection Unit

8th Annual Oxford Bone Infection Conference (OBIC)

Thursday 21st & Friday 22nd March 2019

Examination Schools
High Street
Oxford OX1 4BG

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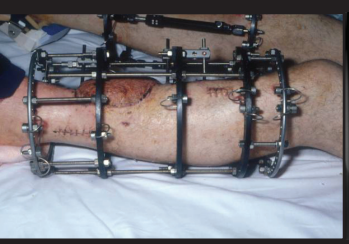
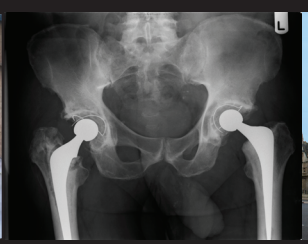

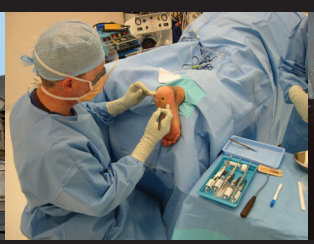


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INTRODUCTION

Dear Colleagues and Friends

It is a great pleasure and privilege to welcome you to the 8th Oxford Bone Infection Conference.

A founding premise of OBIC is that successful management of complex bone and joint infection depends upon multidisciplinary team working; we hope that this meeting helps to promote and facilitate this process. We are delighted to be able to introduce several international experts in the field of orthopaedic infection and are particularly proud to welcome Professor Thorsten Gehrke from Hamburg, Germany as the Cierny-Mader speaker.

The programme provides an opportunity for debate, discussion and the exchange of ideas. In response to feedback from previous years, we have tried to incorporate greater opportunity for delegates to present their own work and for interaction between the disciplines represented.

The conference venue, Oxford University Examination Schools, was designed and built by Thomas Jackson between 1876 and 1881. The building stands on a part of the site of the Angel Inn, which is reputed to have been the first Inn in England. Each year thousands of undergraduates sit their exams in this historical Grade II listed building, which is commonly known as the "Schools". They must wear traditional 'sub-fusc', black and white attire which is an Oxford tradition that is still rigidly enforced.

Networking and social opportunities including a drinks reception and conference dinner at Exeter College, a short walk from the conference venue. Exeter College, founded in 1314, is one of the oldest of 38 constituent colleges of Oxford University; notable alumni include J.R.R. Tolkien and Sir Roger Bannister, athlete and neurologist. Exeter College served as a film location for parts of the 2007 film The Golden Compass, based on alumnus Philip Pullman's novel Northern Lights.

We would sincerely like to thank all of the speakers and delegates for their contribution to OBIC 2019, and our commercial sponsors without whom this meeting would not have been possible. Please make a special effort to meet with the sponsors' representatives.

We also would ask you to complete a feedback survey which will be sent to you by email after the conference. We hope you have an enjoyable and educational meeting.

Maria Dudareva and Matt Scarborough on behalf of the organising committee

The Bone Infection Unit, Oxford

The Bone Infection Unit at the Nuffield Orthopaedic Centre is part of Oxford University Hospitals (OUH) NHS Foundation Trust. It remains dedicated to the investigation and treatment of all aspects of bone and joint infection, including chronic long-bone osteomyelitis, diabetic foot infections, spinal osteomyelitis and orthopaedic device-related infection. In addition to serving the local population, it is a tertiary referral centre for patients across the UK. The centre of activity of the unit is a 26-bed dedicated inpatient ward. Each patient is under the combined care of a consultant infection physician and a specialist orthopaedic surgeon (together with trainees in both specialities). A significant number of cases also require input from plastic surgeons. The multi-disciplinary team includes specialist outpatient parenteral antibiotic therapy (OPAT) nurses, dedicated musculoskeletal radiologists, physiotherapists, occupational therapists and ward staff. The BIU is an ESCMID collaborative centre and runs observer programmes through ESCMID and by direct communication. There is a research group with public on-going projects relating to both medical and surgical management of orthopaedic infection. The unit is closely integrated with infection control and the OUH departments of adult and paediatric infectious diseases and microbiology.

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PROGRAMME: THURSDAY 21ST MARCH

TEAMS, TECHNIQUES AND TOOLS

08:30	*Registration & refreshments*	
	SESSION 1	**Chairs: Dr Matt Scarborough & Mr David Stubbs**
09:00	Welcome	Dr Matt Scarborough, *Oxford*
09:10	**Putting the patient first**	
	Who owns the operation?	Dr Robert van der Wal, *Leiden*
09:30	**Bones, bugs and drugs:**	
	Current opinion in:	
	a) surgical management of BJI	Mr Martin McNally, *Oxford*
	b) laboratory diagnostics for BJI	Dr Bridget Atkins, *Oxford*
	c) medical management of BJI	Dr Alex Soriano, *Barcelona*
10:20	Introduction of sponsors	
10:30	*Tea / coffee, poster viewing and exhibition*	
	SESSION 2	**Chairs: Dr Andrew Brent & Mr Ben Kendrick**
11:00	**Controversies in DAIR**	
	Who to DAIR?	Dr Marjan Wouthuyzen-Bakker, *Groningen*
	How to DAIR?	Professor Olivier Borens, *Lausanne*
11:30	**Techniques in reconstruction**	
	Bone defect management – growing new bone	Mr Jamie Ferguson, *Oxford*
	Soft tissue techniques - mind the gap!	Mr Alex Ramsden, *Oxford*
12:00	**Amputation**	
	When to salvage and when to sacrifice?	Mr David Stubbs, *Oxford*
	Surgical options and innovations for prosthetic limbs	Professor John Skinner, *London*
	Living with prostheses – a patient's view	Mr James Anderson
13:00	*Lunch, poster viewing and exhibition*	
	SESSION 3	**Chairs: Dr Lucinda Barrett & Mr Martin McNally**
14:00	**Free papers 1-A**	**SOUTH SCHOOL**
	Atypical *Mycobacterium* infection of sternoclavicular joint: a unique case	Dr Marjan Raad, *Ashford*
	Resolution of osteoarticular destruction in tuberculous arthritis of the hip	Mr John Williams, *London*

Free papers 1-A (continued)

Isolated osteomyelitis of hand by *Mycobacterium chelonae* abscess complex: a mysterious hand infection in a Louisiana lumberjack	Dr Sergio Navarro, *Oxford*
A major pain in the hip – destruction of the left acetabulum and femoral head secondary to *Mycobacterium tuberculosis*	Dr Dominic Haigh, *Manchester*
The value of Bone-Infectious Disease MDT in providing expedited, unfragmented, evidence-based care of high risk patients	Dr Andrew Logan, *London*
A rare presentation of osteomyelitis - diagnostic challenges	Dr Eibhilin Higgins, *Galway*

Chairs: Dr Matt Scarborough & Mr David Stubbs

14:00 **Free papers 1-B** **EAST SCHOOL**

Outpatient management of bone and joint infection in 2 Scottish Centres 2016-2018	Dr Catriona Sykes, *Airdrie*
HIV seroprevalence in total joint arthroplasty in a single urban institution in South Africa	Dr Wofhatwa Ndou, *Johannesburg*
Review of peri-prosthetic joint infection after total hip arthroplasty managed with cemented custom-made articulating spacer (CUMARS)	Dr Jonathan Quayle, *Brighton*
Clinical outcomes with complex bone infections acquired abroad	Dr Sathyavani Subbarao, *London*
A high rate of early and late complications linked to pre-operative viral load and obesity exists in HIV-infected patients undergoing total knee arthroplasty	Dr Philani Ntombela, *Johannesburg*
Is there a need to change perioperative antibiotic prophylaxis during antibiotic therapy and iterative debridement for orthopedic infections?	Dr Ilker Uçkay, *Zurich*

15:00 **Workshops and complex cases**

A.	**Foot and ankle** Mr Con Loizou, Dr Chema Lomas	**EAST SCHOOL**
B.	**Prosthetic joint infection** Mr Ben Kendrick, Dr Bridget Atkins	**SOUTH SCHOOL**
C.	**Interpreting data in orthopaedics** Dr Andrew Brent, Mr Abtin Alvand	**ROOM 6**

16:00 *Tea / coffee, poster viewing and exhibition*

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SESSION 4 **Chairs: Mr Martin McNally & Dr Matt Scarborough**

16:30 **Referrals and networks**

Who needs tertiary care?	Dr Andrew Hotchen, *Cambridge*
How commissioning works	Mr Jamie Ferguson, *Oxford*

17:00 **Cierny-Mader Lecture**
To communicate excellence and innovation in the multidisciplinary management of bone and joint infection

Outcomes of the 2018 International Consensus Meeting on Musculoskeletal Infections	Professor Thorsten Gehrke, *Director Helios ENDO-Klinik, Hamburg*

Supported by the British Infection Association

17:30 *Close*

Social Programme

17:45	**Medical Oxford – a guided walk**	Dr Maria Dudareva / Mr Martin McNally
18:30	**Drinks Reception** - Exeter College	*All welcome*
19:30	**Conference Dinner** - Exeter College	*Admission by pre-booked ticket only*

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CHALLENGES AND PROGRESS

08:00	*Registration*	
	SESSION 5	**Chairs: Dr Bridget Atkins & Mr Martin McNally**
08:30	**The Bone and Joint Infection Registry**	Professor Mike Reed, *Northumbria*
09:00	**Therapeutic advances**	
	Microdialysis assessment of antibiotic efficacy in bone	Dr Mats Bue, *Aarhus*
	Bacteriophage therapy: hype or hope?	Dr Andrej Trampuz, *Berlin*
	Local therapy: evidence in prophylaxis and treatment	Professor Mike Reed, *Northumbria*
10:00	**Free papers 2**	**Chairs: Dr Lucinda Barrett & Mr Alex Ramsden**
	A multicentre retrospective audit of native vertebral osteomyelitis cases	Dr Isobel Ramsay, *Cambridge*
	Adverse drug reaction to teicoplanin is associated with the dose administered, but not renal function, obesity or serum level	Dr Hoi Ping Mok, *Cambridge*
	The use of biomarkers and cell count in the diagnosis of periprosthetic joint infection	Mr Alisdair Felstead, *Frimley*
	The impact of the gentamicin-eluting injectable synthetic bone substitute, CERAMENT G, in the treatment of diabetic toe amputation for chronic bone infection	Mr Michael Field, *Frimley*
	Overweight and underdosed? Is there an issue with current prophylactic antibiotic policy in orthopaedic elective surgery? A single-centre study in a major UK tertiary centre	Miss Claire Hemingway, *Cambridge*
	Causative organisms in septic arthritis, osteomyelitis and prosthetic joint infections; are we using appropriate empirical antibiotic therapy?	Dr Catherine Peutherer, *Cambridge*
	The microbiology of chronic osteomyelitis: implications for antibiotic choice	Dr Maria Dudareva, *Oxford*
11:00	*Tea / coffee, poster viewing and exhibition*	
	SESSION 6	**Chairs: Dr Charlie Woodrow & Mr Roger Gundle**
11.30	**New horizons**	
	Culture free diagnostics	Dr Teresa Street, *Oxford*
	Nuclear imaging – indications/cost effectiveness	Dr Geertje Govaert, *Utrecht*
	Bespoke reconstruction - 3D printing	Professor Alister Hart, *London*
	Why do implants fail?	Professor John Skinner, *London*
12:30	*Lunch, poster viewing and exhibition*	

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	SESSION 7	**Chairs: Mr Jamie Ferguson & Dr Matt Scarborough**
13.30	**Guidelines and protocols**	
	International guidelines on PJI	Mr Jason Webb, *Bristol*
	Oxford surgical protocols for osteomyelitis	Mr Martin McNally, *Oxford*
	Fracture related infection	Dr Mario Morgenstern, *Basle*
14:30	**Best free papers**	
	A comparison of intraoperative frozen section and alpha defensin lateral flow test for diagnosing periprosthetic joint infection	Dr Irene Sigmund, *Vienna*
	Antibiotic therapy for two weeks vs four weeks after surgical drainage for native joint septic arthritis of the hand - a randomized non-inferiority trial	Dr Ilker Uçkay, *Zurich*
	Infected tumour endoprosthesis: does two stage stage revision remain the gold standard?	Mr Ian Crowther, *Newcastle*
	Systematic review of 316 animal models of bone infections – a call for improved quality	Associate Prof Louise Kruse Jensen, *Copenhagen*
	Do low levels of serum 25[OH]D increase the risk of orthopaedic infection? A case-control study	Mr Alexander Zargaran, *London*
	Antimicrobial choice in culture-negative bone and joint infections	Dr Mariam Lami, *Oxford*
	Antibiotic associated morbidity in patients with orthopaedic infections over a one year timeframe at Addenbrooke's Hospital, Cambridge	Mr Dipesh Morar, *Cambridge*
15.30	**Putting patients first**	
	Act local – think global	Professor Chris Lavy OBE, *Oxford*
15.45	**Prizes and close**	Mr Martin McNally & Dr Matt Scarborough
16:00	*Depart*	

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BIOGRAPHIES

Mr Abtin Alvand

Abtin Alvand is a Consultant Orthopaedic Knee Surgeon at the Nuffield Orthopaedic Centre (NOC) and Honorary Senior Clinical Lecturer in orthopaedic surgery at the University of Oxford (NDORMS). He graduated from University of London completed his higher surgical training in Trauma and Orthopaedics on the Oxford programme. He also completed a PhD (DPhil) at the University of Oxford which was titled "Improving Surgical Learning and Performance at Unicompartmental Knee Arthroplasty". Abtin was appointed as NIHR Academic Clinical Lecturer at the University of Oxford in 2015, and Honorary Senior Clinical Lecturer in 2017. He undertook two post-CCT sub-specialist clinical fellowships focusing on complex hip and knee surgery in Oxford (NOC) and Stanmore (Royal National Orthopaedic Hospital). He was European Bone & Joint Infection Society (EBJIS) Travelling Fellow in 2017 and also completed a fellowship focusing on peri-prosthetic joint infection at the Rothman Institute (Philadelphia, USA) with Prof J Parvizi. Abtin was appointed in Oxford as a Consultant Orthopaedic Knee Surgeon in 2018. His clinical and research interests focus on peri-prosthetic joint infection and revision knee arthroplasty.

Dr Bridget Atkins

Dr Bridget Atkins is a full time NHS Infection Consultant (Microbiology, Virology and Infectious Diseases). In addition to clinical work, her other local roles include:

- Physician, Bone Infection Unit (BIU), Oxford University Hospitals NHSFT
- ID/Micro Training Programme Director (HEE Thames Valley)
- Hon Senior Lecturer, Oxford University

She has a major interest in bone and joint infections, including laboratory diagnostic methods, the multidisciplinary management of these complex infections, the patient pathway and the optimal delivery of bone infection services.

Dr Lucinda Barrett

Lucinda Barrett studied medicine at Cambridge and University College London and completed postgraduate training in London and Oxford. She was appointed as a Consultant in Clinical Infection at Oxford University Hospitals in 2016, and one of her roles is as a Consultant Physician on the Bone Infection Unit. Lucinda is also Deputy Clinical Lead for the OUH Microbiology Department.

Professor Olivier Borens

Olivier Borens, MD is Head of the Unit of Septic Surgery and Head of the Orthopaedic-Trauma Unit of the Department for the Musculoskeletal System of the University Hospital (CHUV) in Lausanne (Switzerland). He received his medical education at the University of Basel and specialized in Orthopaedics and Traumatology at the hospitals of Liestal and Lausanne. After a one-year-fellowship at the Hospital for Special Surgery in New York his work concentrated on the traumatology of the acetabulum and the pelvis and on infections of the musculoskeletal system, especially following joint replacement.

Olivier is intensely involved in scientific activities and regularly invited to present at national and international conferences. His research focuses on the prevention, diagnosis and treatment of periprosthetic infections, biofilm, local antibiotics and minimally invasive techniques in traumatology, among others.

Among others he is president of AOTrauma Switzerland, incoming president of the Swiss Orthopaedic Society, founder and former president of the Swiss expert group on orthopaedic infections as well as former board member of the European Bone and Joint Infection Society (EBJIS). He takes active part in the education of medical students and the training of under- and post-graduate physicians. His publication list includes more than 100 journal articles, several book chapters and a great number of abstracts.

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Dr Andrew Brent

Andrew Brent is a Consultant and Honorary Senior Clinical Lecturer in infection in Oxford, and one of the Oxford Bone Infection Consultants. His research interests include invasive bacterial infections and sepsis; musculoskeletal infections; and tuberculosis.

Dr Mats Bue

Mats Bue studied medicine at Aarhus University, Denmark, and has in January 2019 submitted his PhD dissertation entitled "Bone, intervertebral disc and subcutaneous adipose tissue pharmacokinetics of vancomycin obtained by microdialysis". For the past 6 years, he has worked with the development and application of microdialysis for sampling of antimicrobials in different orthopedically relevant settings. He is one of the founders of the microdialysis orthopedic research group in Aarhus, which steadily have expanded over the last years.

Mr Jamie Ferguson

Jamie Ferguson is an Orthopaedic Consultant working in Oxford. He undertook his surgical training in Manchester and Oxford. He completed additional fellowship training by spending a year in Malawi, travelling to the USA on a Limb Lengthening and Reconstruction Society Fellowship and visited the Ilizarov Institute in Kurgan, Russia. He undertook further training in the Bone Infection Unit, Oxford before being appointed. His time is shared between the Bone infection Unit and the Trauma Department. He has a special interest in managing long bone osteomyelitis and reconstructing bone defects, with a particular interest in the investigation of outcomes with the use of local antibiotic carriers.

Professor Thorsten Gehrke

Professor Thorsten Gehrke has been the Medical Director at HELIOS ENDO-Klinik in Hamburg since 2005. Furthermore, he is the head physician in the fields of orthopaedics and surgery in the ENDO-Klinik. He completed his training as a specialist in orthopaedics at the Christian Albrechts University in Kiel. From 1993 to 1995 he was assistant physician at the ENDO-Klinik in Hamburg. He has been at the ENDO-Klinik without interruption since 1999, first as a senior physician from 1999 to 2002, and then as chief physician from 2002 to 2005.

His area of specialisation is primarily hip and knee orthopaedics, as well as complete aseptic and septic revision replacement surgeries in the field of endoprosthetics. Already early on in his career, he specialised in this field and he has an outstanding national and international reputation, particularly in the treatment of infections and the so-called 'single-stage exchange procedures'. For many years now, he has performed complicated operations in all parts of the world – including in Arabian countries, Asia, Russia and South America – on a regular basis. In 2013 he organised the world's largest Consensus meeting concerning periprosthetic infections, which took place in Philadelphia in August of the same year with the participation of 400 experts from 56 countries. The results of this meeting have since been disseminated in numerous articles and books, and many European, American and Asian countries have now adopted corresponding guidelines for the treatment of infections.

Furthermore, Professor Gehrke is a member of numerous national and international professional societies, such as the American Knee Society and the International Hip Society. He holds professorships at the Universities of Santiago de Chile, Buenos Aires and Shanghai. Also noteworthy is the fact that HELIOS ENDO-Klinik is the only German clinic that is a member of the International Society of Orthopaedic Centers (ISOC). Founded in 2006, the society consists of the 18 currently leading orthopaedic centres worldwide.

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Dr Geertje Govaert

Geertje Govaert studied medicine at the University of Maastricht in The Netherlands and qualified as a general surgeon in 2006 at the Academic Medical Centre (AMC) Amsterdam and affiliated hospitals. Subsequently, she joined the non-governmental organisation 'Doctors without borders' (Médicins Sans Frontières, MSF). With MSF she did two rotations, at the Government Hospital in Kambia, Sierra Leone and at the Emergency Hospital in Dohuk, Iraq.

In 2008 Geertje started her subspecialisation as trauma surgeon by becoming a Trauma Fellow in general surgery at Liverpool Hospital in Sydney, Australia, followed by a two-year fellowship traumasurgery at the Maastricht University Medical Center (MUMC). In 2010 she took the European Trauma Examination (UEMS/EBSQ) in Berlin, becoming a Fellow of the European Board of Surgery. In 2011 she obtained her Dutch qualification as trauma surgeon. Because of a poor Dutch job market for surgeons, she decided to take on another fellow position in Australia, at the Orthopaedic/Trauma Department of Princess Alexandra Hospital in Brisbane. Next, she was appointed Trauma Surgeon at University Medical Center Groningen (UMCG) where she worked as a staff surgeon for four years. Besides her duties in Groningen as a general trauma surgeon, Geertje developed a passion for pelvic fractures and septic surgery.

Since 2016 Geertje works as a Trauma Surgeon at University Medical Center (UMC) Utrecht. Also in 2016 she became a member of the board of the Dutch Trauma Society.

Mr Roger Gundle

Roger Gundle is Consultant Orthopaedic Surgeon to the Nuffield Orthopaedic Centre, Oxford University Hospitals. He has wide experience of hip and knee surgery with particular expertise in the surgical management of inflammatory joint diseases and prosthetic joint infection and has been part of the Oxford Bone Infection Unit from its inception. Prior to appointment as Consultant in Oxford in 1995 he was Clinical Lecturer in Orthopaedic Surgery to the University of Oxford for seven years during which time he gained a doctorate for research on human bone cell biology. He is Honorary Senior Clinical Lecturer in Orthopaedic Surgery to the University of Oxford and a Fellow of University College Oxford, teaching anatomy to undergraduate students and clinical surgery to graduate medical students.

Professor Alister Hart

Professor Alister Hart is a Consultant Orthopaedic Surgeon, specialising in hip and knee problems, and Director of Research at the Royal National Orthopaedic Hospital (RNOH) NHS Trust in Stanmore, London, UK.

Dr Andrew Hotchen

Andrew Hotchen is an Academic Clinical Fellow in Trauma and Orthopaedic Surgery at Addenbrooke's Hospital, Cambridge. His clinical research interests are in bone infection and limb reconstruction. Over the last 4 years, he has worked under the supervision of Mr Martin McNally (University of Oxford) and Professor Parham Sendi (University of Bern), to develop a new classification for long bone osteomyelitis. This classification system offers a structured and evidence-based approach to assessing patient and disease factors, to guide decision making for specialist referral. Andrew has designed and set-up the prospective CONCERTO (**C**omparison **O**f a **N**ew **C**lassification system of osteomyelitis for **E**arly **R**eferral, **T**riage and patient reported **O**utcomes) study that serves to assess the application and utility of BACH. Andrew has recently been awarded a Royal College of Surgeons Research Fellowship and an award from the Orthopaedic Research Trust to investigate the immune contribution to joint injury. Andrew is a member of EBJIS and has presented work at the last 3 EBJIS meetings in Oxford, Nantes and Helsinki.

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BIOGRAPHIES

Mr Ben Kendrick

Ben Kendrick is a Consultant Hip and Knee Surgeon at the Nuffield Orthopaedic Centre specialising in primary and revision arthroplasty, with particular emphasis on the treatment of periprosthetic infection. During his training in the Oxford Deanery he undertook a DPhil at the Botnar Research Centre researching fixation in unicompartmental knee replacement.

He regularly teaches medical students, in both small groups for clinical tutorials and larger groups for lecture/discussion based sessions. From a higher surgical training perspective, he teaches on both the Oxford and Miller FRCS(Orth) examination courses with a focus on adult pathology and basic science.

Professor Chris Lavy OBE

Chris Lavy qualified at St Bartholomew's Medical College in 1982 and became a Consultant in 1992 at The Middlesex Hospital and University College Hospital in London. In 1996 he left to work in Malawi, where he helped to set up two orthopaedic hospitals, national orthopaedic surgical and clinical officer training, and an international clubfoot programme. He also co-founded the College of Surgeons of East Central and Southern Africa (www.cosecsa.org), which now has 14 member countries.

In 2006 he returned to the UK, where he is Professor of Orthopaedic and Tropical Surgery and Consultant Orthopaedic and Spine Surgeon at the University of Oxford. He holds an honorary chair at the London School of Hygiene and Tropical Medicine. He was an elected council member of The Royal College of Surgeons of England 2011-2016 and was chair of the International Affairs Committee. He is past chairman of World Orthopaedic Concern, and was medical director for CURE International, which supports children's orthopaedic surgery in resource-poor countries. He is a trustee for CURE UK and Global Clubfoot Initiative. Professor Lavy was awarded an OBE in the New Year Honours List 2007 for services to orthopaedics.

He was a commissioner for the milestone report Lancet Commission on Global Surgery 2015, and he has led several health partnership projects linking University of Oxford with COSECSA and other partners in Africa, to develop training and research partnerships in primary trauma care, clubfoot treatment, orthopaedic surgery, and district hospital surgical care (www.surgafrica.eu). He has helped to set up the inter-disciplinary Oxford University Global Surgery Group (www.globalsurgery.ox.ac.uk), and is now building a children's orthopaedic unit in Zimbabwe.

Mr Constantinos Loizou

Constantinos Loizou is a Consultant Orthopaedic Surgeon at the Nuffield Orthopaedic Centre at Oxford with a specialist interest in elective conditions of the adult foot and ankle as well as the diabetic foot and bone infection. He also has an interest in foot & ankle ultrasound and he is CASE accredited. He qualified from the University of Cambridge and undertook his specialist training at the East of England. He is fellowship trained in adult foot & ankle surgery, having spent a year at Oxford (Nuffield Orthopaedic Centre) and six months in Australia (Melbourne Orthopaedic Group). He has a basic science background having studied molecular & cell biology at the University of Bath and gained a PhD in clinical biochemistry from the University of Cambridge.

Dr Chema Lomas

Jose Lomas is a Consultant in Infectious Diseases, working in the Oxford University Hospitals NHS Foundation Trust since 2014 where he shares his activity at the Bone Infection Unit, in the Nuffield Orthopaedic Centre.

Being a member of the Bone Infection Unit involves a multidisciplinary approach to those patients with complicated bone and joint infections, in a close relationship with orthopaedic (limb reconstruction, hip and knee, foot and ankle) and plastic colleagues, through combined ward rounds, joined outpatient clinics and also regular MDT meetings, supporting them by offering expert advice on the appropriate selection and duration of antimicrobial therapy.

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BIOGRAPHIES

Mr Martin McNally

Martin McNally is the Lead Surgeon in the Oxford Bone Infection Unit at the Nuffield Orthopaedic Centre, Oxford University Hospitals, UK and Honorary Senior Clinical Lecturer at Oxford University. He spends almost all of his time in infection management. He was trained in Northern Ireland, USA and Oxford. He has a particular interest in bone reconstruction in osteomyelitis, infected fractures and non-unions. He runs research projects in outcome of treatments for bone infection, diagnostic methods and local antibiotic delivery systems. He has published over 100 peer-reviewed papers, reviews and book chapters and contributes regularly to instructional courses and international meetings on bone infection and limb reconstruction. He is President of the European Bone and Joint Infection Society and President of the Girdlestone Orthopaedic Society.

Recent articles:

McNally MA. Decision-making in infected nonunion: is the surgery more important than the condition? Invited Editorial *Bone Joint J* 2016; 98-B: 435-436.

Ferguson J, Diefenbeck M, McNally M. Ceramic biocomposites as biodegradable antibiotic carriers in the treatment of bone infections. *J Bone Joint Infect* 2017; 2: 41-54.

McNally M, Ferguson J, Kugan R, Stubbs D. Ilizarov treatment protocols in the management of infected non-union of the tibia. *J Orthop Trauma* 2017; 31: S47-54.

Metsemakers WJ, Morgenstern M, McNally MA et al. Fracture-related infection: A consensus on definition from an international expert group. *Injury* 2018; 49(3):505-510.

Morgenstern M, Athanasou NA, Ferguson JY, Metsemakers WJ, Atkins BL, McNally MA. The value of quantitative histology in the diagnosis of fracture-related infection. *Bone Joint J* 2018; 100-B: 966-972.

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Dr Mario Morgenstern

Mario Morgenstern graduated from medical school in Munich, Germany in 2008 and performed his residency in orthopaedic-trauma surgery in the Trauma Center Murnau, Germany. With a research fellowship in 2012 in the AO Research Institute Davos, Switzerland he could lay the foundations for his scientific focus in the field of musculoskeletal infections. Since then, he has been involved in various experimental and clinical research projects investigating prevention, pathophysiology, diagnostics and treatment of bone and joint infections. Since 2016, he has been working at the University Hospital Basel, Switzerland as an Orthopaedic-Trauma Surgeon with a special interest in the treatment of non-unions and fracture-related infections (FRI). In 2016, he was given the opportunity to work for three months in the orthopaedic-trauma unit of the University Hospital Jimma, Ethiopia. In a combined research and clinical visiting fellowship at the Oxford Bone Infection Unit in 2017, he could gain experience in the treatment of bone infections and limb reconstruction.

As co-organizer, he participated in the FRI Consensus Group (endorsed by *AO Foundation, Orthopaedic Trauma Association, European Bone and Joint Infections Society and Pro-Implant Foundation*), which proposed in a first consensus meeting in late 2016 a consensus definition for FRIs and compiled in a second consensus meeting in 2018 diagnostic and treatment recommendations for FRIs. This FRI definition was endorsed in July 2018 by the *International Consensus Meeting on Musculoskeletal Infections* (Philadelphia, USA), which he attended as a delegate.

He is a member of the *European Bone and Joint Infections* Society, *AOTrauma*, and executive board member of the *Swiss Society for Biomaterials and Regenerative Medicine* (SSB+RM).

8TH ANNUAL OXFORD BONE INFECTION CONFERENCE

Thursday 21st & Friday 22nd March 2019

BIOGRAPHIES

Mr Alex Ramsden

Alex Ramsden is a Consultant Plastic and Reconstructive Surgeon based in Oxford, UK. He is a specialist in reconstruction lymphoedema and orthoplastic infection. He completed research (MD) in London at the University of London, specialist surgical training in Northern England and a microsurgical fellowship in Melbourne, Australia. He has worked as a Consultant in Oxford University Hosptials NHS Trust since 2010. The majority of his work takes place in the Bone Infection Unit in the Nuffield Orthopaedic Centre. He was a NHS Leadership Fellow in 2012 and European Bone and Joint Infection Society (EBJIS) Travelling Fellow in 2016. He was awarded a BAPRAS Travelling fellowship in 2013 to visit Isao Koshima in the University of Tokyo to study supermicrosurgery. In 2016-7 he was Vice Chair of the British Lymphology Society and has recently spent a period of study in Sloan Kettering Memorial Hospital in New York regarding lymphnode transfer and University Hospital Malmo studying liposuction for lymphoedema.

Professor Mike Reed

Following medical school in Newcastle and his MD in Sheffield, Mike trained in Trauma and Orthopaedics in the North of England, and completed fellowships in New Zealand. In 2012, he was chosen to represent Britain as an ABC Fellow.

Currently, he is a fulltime Hip and Knee Replacement Surgeon, with trauma commitments within a busy Trauma Unit.

At Trust level, Mike has run improvement programmes in hip fracture care, infection prevention and enhanced recovery. He is the Clinical Director at Northumbria leading a high performing team, supported by a group of committed and talented colleagues.

His research, supported by industry, charity and government funding, focuses on clinical outcomes and on his specialist interest in infection prevention, diagnosis and management. With Northumbria, he is leading large national collaboratives on hip fracture care and enhanced recovery. In addition, Mike supervises basic science research at Newcastle University, which focuses on vitamin D and infection, and particularly biofilm modification with an extracellular DNAse. He is also Chief Investigator for clinical trials on clinical outcomes and infection prevention at the Universities of York and Oxford.

Mike's interests include travelling, running, and spending time with friends and his two children, Ben and Anna.

Dr Matt Scarborough

Matt studied medicine at Queens University Belfast and undertook post graduate training mainly in London and Oxford. He currently works as a consultant physician in clinical infection and general medicine at Oxford University Hospitals NHS Trust. His research interests include orthopaedic infection, bacterial meningitis and blood stream infections.

Professor John Skinner

John Skinner was appointed a Senior Lecturer at the Institute of Orthopaedics in 1999 and also a Consultant at the Royal National Orthopaedic Hospital. His surgical practice is divided between bone and soft tissue tumours and hip and knee surgery.

Dr Alex Soriano

Alex Soriano is the Chief of Infectious Diseases Department of Hospital Clinic of Barcelona, Spain. He has authored over 200 publications, and his current research with the Hospital Clinic study group focussing on the treatment and management of bacteraemia due to Gram-positives and infections related to orthopaedic implants. Dr Soriano is the current Chairperson of the Implant Infections Study Group for the European Society of Clinical Microbiology and Infectious Diseases and Board member of the Executive Committee of Euroepan Bone and Joint Infection Society.

8TH ANNUAL OXFORD BONE INFECTION CONFERENCE

Thursday 21st & Friday 22nd March 2019

BIOGRAPHIES

Dr Teresa Street

Teresa is a Senior Laboratory Scientist with the Modernising Medical Microbiology research group, part of the Nuffield Department of Medicine at the University of Oxford. Based at the John Radcliffe Hospital, research within MMM focuses on developing molecular methods to detect infections directly from clinical samples. Teresa's interests are centred around applying these novel molecular diagnostic methods in the case of prosthetic joint infections.

Teresa obtained her BSc and PhD from the University of Bath and has been a member of the MMM group since its inception in 2009. She is also a Departmental Lecturer in genetics for the Human Sciences undergraduate degree at the University of Oxford.

Mr David Stubbs

David Stubbs is a full time Orthopaedic Consultant at the Nuffield Orthopaedic Centre. His workload is divided equally between joint replacement and limb reconstruction surgery with a special emphasis on bone infection and problem fractures. He trained in Sheffield and Oxford and completed fellowships in Oxford and Sydney in limb reconstruction and joint replacement respectively.

Dr Andrej Trampuz

Dr Trampuz is an internationally renowned infectious diseases expert, active in the clinical and research field of bone, joint and implant infections. During his postdoctoral research fellowship at the Mayo Clinic in Rochester, Minnesota, USA (2001-2004) he developed the sonication procedure of implants for improved infection diagnosis. Currently, he is Assistant Professor for Infectious Diseases at the Center for Musculoskeletal Surgery at Charité University Hospital in Berlin, Germany, where he heads the interdisciplinary Septic Surgery Unit and the Biofilm Research Laboratory. The research group consists of 19 scientists, working on novel diagnostic and treatment strategies against biofilms. He authored 189 peer-reviewed publications, 12 book chapters and is the founder of the PRO-IMPLANT Foundation, supporting research, education and clinical consultation of bone and implant infections (www.pro-implant-foundation.org). Through the observership program, over 100 clinicians and scientists visited the Charité hospital in the past 5 years.

Dr Robert van der Wal

Robert van der Wal was born on the 20th of January 1982 in Vlaardingen, the Netherlands. He graduated from secondary school in 2000, where after he started to study Biomedical Sciences at the University of Leiden. In 2001 he started Medical School at the same University. During his internships he started his research on meniscal allograft transplantation under supervision of Dr Ewoud R.A. van Arkel. After obtaining his medical degree in 2007 he started working as an intern at the Department of General Surgery of the Medical Center Haaglanden (MCH) in The Hague (supervisor Alexander J.C. de Mol van Otterloo, MD, PhD). He was trained at the Department of General Surgery Albert Schweitzer Hospital Dordrecht (supervisors Rob J. Oostenbroek, MD, PhD and Peter W. Plaisier, MD, PhD), the Department of Orthopaedic Surgery and Trauma MCH (supervisor Ewoud R.A. van Arkel, MD, PhD) and the Department of Orthopaedic Surgery Leiden University Medical Center (supervisor Prof. Rob G.H.H. Nelissen, MD, PhD). The author received a study grant from the Research Fund of Medical Center Haaglanden (Wetenschapsbeurs 2014) to work on his research project after finishing his Orthopaedic Surgery in June 2015. During this period he was able to spend three months full time on his thesis about meniscal allograft transplantation. Since the first of October 2015 he works as an Orthopaedic Surgeon at the Department of Orthopaedic Surgery at Leiden University Medical Center. Here he develops himself further in the diagnosis and treatment of patients with bone sarcomas and patients with prosthetic joint infections.

BIOGRAPHIES

Mr Jason Webb

Jason Webb is the Clinical Lead of the regional Prosthetic Joint Infection Service at the Avon Orthopaedic Centre, Southmead Hospital, Bristol. He has undertaken fellowships both in Bristol and at the Endoklinik in Hamburg. He was awarded the Rothman Ranawat Traveling Fellowship in 2015. He was a member of the International Consensus Meeting on PJI in 2018. His MD thesis concerned the behavior of antibiotic loaded bone cement. His ongoing research, teaching and clinical interests lie within the field of prosthetic joint infection.

Dr Charlie Woodrow

Charlie Woodrow has worked as an infectious disease and general internal medicine physician in Oxford since 2011, initially as an Honorary Consultant and now as a full-time NHS Consultant. Most of his specialist training took place in London, following which he obtained an MRC Clinician Scientist Fellowship to undertake research on antimalarial resistance. This led him to spend a number of years in Thailand, co-ordinating clinical and basic science projects across southeast Asia. He has an interest in drug resistance mechanisms and the relationship between genetic, in vitro and clinical drug resistance phenotypes.

Dr Marjan Wouthuyzen-Bakker

Marjan Wouthuyzen-Bakker is an infectious disease specialist working at the Medical University Center Groningen, in Groningen, the Netherlands. She has been involved in the treatment of patients with orthopaedic infections since four years. In collaboration with orthopaedic surgeons and medical microbiologists from the Netherlands she is actively involved in improving the care of PJI patients in the Northern region of the Netherlands by means of the NINJA network (Northern Infection Network Joint Arthroplasty). Her research area mainly involves the improvement of diagnosis and treatment of PJI. Marjan is part of the advisory board of the Journal of Bone and Joint Infection, and participates in the ESCMID Study Group of Implant Associated Infections (ESGIAI).

PUTTING THE PATIENT FIRST

WHO OWNS THE OPERATION?
Dr Robert van der Wal

The use of a mobile app for postoperative wound care after (total) joint arthroplasty: perceived usefulness and ease of use

Aim: Early discharge of patients after (total) joint arthroplasty leaves patients responsible for monitoring their postoperative wound by themselves. This might result in a delayed presentation of postoperative complications. The use of a mobile woundcare app by patients after arthroplasty might result in (1) earlier report of complications, (2) an increase in patient satisfaction and (3) insight in the incidence of postoperative wound leakage. Therefore, the ease of use and perceived usefulness of using a postoperative mobile woundcare app in patients after (total) joint arthroplasty was investigated.

Method: A cohort study was conducted in 2017 in 2 Dutch Hospitals. Eligible cases were all consecutive patients that received a (total) joint arthroplasty and who owned a smartphone. During the first 30 postoperative days, patients filled in daily reviews of their wound and took a photo of the wound. Based on the patients review, an underlying algorithm calculated daily a score that prompted a mobile alert if needed, which advised patients to contact the hospital. Patients filled in a form on day 30 and day 90 in order to registeroccurrence of any postoperative wound complication. On day 15 and 30, patients were requested to fill in a questionnaire evaluating the perceived usefulness and the ease of use of the App.

Results: Of 127 eligible patients, 30 (24%) did not have a smartphone. Of the remaining 97 patients, 69 patients (71%) were included. Median age was 68 years (range 33-90). Forty-one patients (59.4%) used the app until day 30. On average the app was used for 19.1 days (95% CI 16.6-21.5). Nine patients (13.0%) stopped using the app directly after the first or second day. The overall mean grade on a scale of 1 (strongly disagree) to 5 (strongly agree) was 4.2 for ease of use and 4.1 for perceived usefulness. The scores on day 30 were comparable to day 15. One patient (1.4%) developed a prosthetic joint infection.

Conclusions: The introduction of a mobile woundcare app resulted in a high overall satisfaction rate with respect to ease of use and perceived usefulness. Daily use of the app did not lead to more stress. Currently, a nationwide cohort study is set up to implement the mobile wound care app in Dutch hospitals to improve patient care. The app will then also be used to investigate the association between duration of postoperative wound leakage after (total) joint arthroplasty and the development of prosthetic joint infection.

BONES, BUGS AND DRUGS: CURRENT OPINION IN ...

SURGICAL MANAGEMENT OF BONE & JOINT INFECTIONS
Mr Martin McNally

Surgery has a central role in many musculoskeletal infections. Eradication of infection without surgery is only rarely possible, in early acute infections without dead bone, implants or biofilm.

Surgery should follow structured investigation and optimisation of patients with relevant co-morbidities. In chronic infections, it is often safe to delay definitive surgery until these issues have been addressed. Good preoperative planning, together with a clear view of the pathogenesis of the infection will often allow a single stage, patient-friendly treatment.

During surgery, several important components must be delivered:

1) Harvesting of uncontaminated, representative samples
2) Excision of dead bone
3) Stabilization of unhealed infected fractures or bone defects
4) Management of dead spaces created by resection, implant removal or infection
5) Restoration of a healthy soft-tissue envelope
6) Provision of appropriate antimicrobial therapy

Delivery of each of these elements involves decision-making processes, which are common to fracture-related infections, prosthetic joint infections and native osteomyelitis. These will be discussed with clinical examples.

LABORATORY DIAGNOSTICS FOR BONE & JOINT INFECTIONS
Dr Bridget Atkins

Patients with complex bone and joint infections often have unsatisfactory interactions with the healthcare profession, sometimes having the wrong diagnosis, the wrong orthopaedic surgery, poor soft tissue management and the wrong antimicrobial treatment. Even if three out of four elements on this list are correct, the outcome may still be poor. Sometimes all the elements are correct but they have not all been done at the same time. Patients may end up with multi-drug resistant organisms, drug side effects, pain, disability, leaking wounds, long hospital stays, depression and disillusionment with the medical profession.

Getting the diagnosis right is important – both anatomically and microbiologically. Risk factors for less common cause of osteomyelitis should be determined and an interactive relationship with the laboratory developed. Pre-op biopsies can sometimes be considered however meticulous intra-operative sampling, good laboratory processing and accurate interpretation of results is crucial. No lab test will work well if surgical sampling is not expertly performed. This should be off antibiotics with no touch technique, separate sterile instruments and from multiple sites. Histology should always be performed. In the microbiology laboratory, prevention of contamination whilst adequately disrupting biofilm, using enriched media, culturing for an adequate duration and performing appropriate identification and antibiograms are vital to an accurate diagnosis. Sonication and molecular tests can be considered but their place routinely is still under evaluation.

Surgery should only be performed by a surgeon experienced in infection management and should take into account the patient's aims and expectations. For some patients infection eradication is paramount, for others, mobility or alleviation of pain. Soft tissue management by is as important as the bones so units plastic surgeons need to be an integral part of the team. Intra-operative and post-operative antibiotic therapy should be rational and managed with skill – whilst not causing harm to the patient. Clinical progress must be adequately monitored. Failure means a complete re-assessment, not simply prolonging antibiotics. Much of this should be delivered through multidisciplinary specialist bone infection units where infection doctors manage the triage of referral, inpatient care, antimicrobials and discharge planning working closely with their surgical colleagues.

SPEAKER ABSTRACTS: THURSDAY

MEDICAL MANAGEMENT OF BONE & JOINT INFECTIONS
Dr Alex Soriano

Medical management of bone and joint infections requires a multidisciplinary approach, however, physicians (internal medicine, infectious diseases specialists, clinical microbiologists) traditionally have considered that their opinion, particularly about the need to operate an infected or potentially infected patient, is generally more accurate than the surgeon's opinion and this attitude is not helpful for creating a team. How to deal with this and what could be the role of physicians? I propose 6 points for ID to approach this question and develop a good team that is of great interest in the era of multi-drug resistant microorganims where the management of antibiotics is even more complicated and its necessary to evaluate new antibiotics.

CONTROVERSIES IN DAIR

WHO TO DAIR?

Dr Marjan Wouthuyzen-Bakker

Acute prosthetic joint infections treated with DAIR have different failure rates, varying between 10-60% according to literature. Although the time frame in which a DAIR procedure is performed is of influence, several host factors, the causative microorganism(s) and its susceptibility to antibiotics determine the chance of treatment success as well. Therefore, these factors should be taken into consideration when choosing the initial surgical approach. The implementation of preoperative risk scores; like KLICC score for early acute PJI and CRIME80 score for late acute PJI may aid in the decision to choose the right surgical approach.

KLIC-score[1] (early acute PJI)			CRIME80-score[2] (late acute PJI)		
Variable	**Description**	**Score**	**Variable**	**Description**	**Score**
K	Chronic renal failure (kidney)	2	**C**	COPD CRP > 150 mg/L	2 1
L	Liver cirrhosis	1.5	**R**	Rheumatoid arthritis	3
I	Index surgery (revision surgery or prosthesis indicated for a fracture)	1.5	**I**	Index surgery (prosthesis indicated for a fracture)	3
C	Cemented prosthesis C-reactive protein >115mg/L	2 2.5	**M**	Male gender	1
			E	Exchange of mobile component	-1
			80	Age > 80 years	2

KLIC-score[1] (vroege PJI)		CRIME80-score[2] (laat acute PJI)	
Score	**Chance DAIR failure (%)**	**Score**	**Chance DAIR failure (%)**
≤ 2	28%	-1	22%
2.5 – 3.5	37%	0	28%
4 – 5	49%	1 – 2	40%
5.5 – 6.5	55%	3 – 4	64%
≥ 7	86%	≥ 5	79%

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HOW TO DAIR?
Professor Olivier Borens

Infection after total joint arthroplasty happens even if all possible preventive measures have been taken. Once the diagnosis of infection made, different surgical options can be chosen in order to reach the best possible result for the patient. Depending on the duration of symptoms, local and general condition of the patient as well as the possibility to use antibiofilm antibiotics different surgical options exist. The treating team has to choose between maintaining the prosthesis by performing a DAIR procedure or to proceed with a one- or two stage exchange of the implant. By preserving the implant, bone stock can be preserved and the surgical insult to the patient is less important. Recovery after a DAIR operation as well as long-term functional result and patient satisfaction are better than if an exchange procedure is performed. The success of a DAIR procedure is however directly related to the quality of the surgical procedure as well as to correct patient selection.

A couple of rules should be meticulously followed during DAIR procedures in infected TJA.

The most important being exchange of mobile parts, aggressive excision of infected , badly vascularized tissue and the use of local and systemic AB.

TECHNIQUES IN RECONSTRUCTION

BONE DEFECT MANAGEMENT - GROWING NEW BONE
Mr Jamie Ferguson

The management of segmental long bone infection is challenging. To eliminate infection, it is critical to resect all necrotic bone. Various techniques have been proposed to address segmental bone loss following resection of non viable bone in osteomyelitis and fracture related infection.

In this talk we focus on the Ilizarov Method and discuss some of the important factors in aiding decision making in treating these defects. These include the location of the bone involved, the size of the defect following debridement and the degree of stiffness of the non union.

SOFT TISSUE TECHNIQUES - MIND THE GAP!
Mr Alex Ramsden

Soft tissue reconstruction in bone and joint infection remains a challenge for many treatment centres. Units either don't have access to reconstructive surgeons or Plastic Surgeons are reluctant to get involved. These are challenging cases and require effective joint working between Plastic and Orthopaedic teams to provide effective surgical solutions that are optimised for each individual patient. Soft tissues and wound coverage needs to be an integral part of a successful treatment protocols. A range of options are available to surgeons for rapid wound healing whilst reducing risk and patient morbidity.

WORKSHOPS AND COMPLEX CASES

FOOT AND ANKLE
Mr Con Loizou / Dr Chema Lomas

PROSTHETIC JOINT INFECTION
Mr Ben Kendrick / Dr Bridget Atkins

INTERPRETING DATA IN ORTHOPAEDICS
Dr Andrew Brent / Mr Abtin Alvand

These three workshops will provide an opportunity for interactive discussion around the management of upper limb, foot and ankle or fracture related infection. Much of the discussion will revolve around illustrative case histories that highlight the challenges, tips and tricks, and progress in each sub-specialty. The workshops will be facilitated by both surgical and infection specialists, and active participation of delegates is both welcomed and encouraged.

REFERRALS AND NETWORKS

WHO NEEDS TERTIARY CARE?
Dr Andew Hotchen

Osteomyelitis is a complex disease and carries a significant burden for patients. Specialist knowledge and treatment principles are essential for the successful management of complex patients. Therefore, referral to specialist centres should be made at a timely point in the management pathway. In order to stratify patients into those requiring early referral and those who do not, we have developed and validated a classification system that can be utilised in secondary care. Using a multi-disciplinary approach based on systematic review, we hypothesised four key variables that may offer prognosis and guide referral to a specialist treatment centre. These are (i) the bone involvement, (ii) the anti-microbial options, (iii) the coverage of the soft tissue and (iv) the host status. This gave us the acronym BACH. By assessing each of these variables for an individual patient, the decision regarding need for specialist referral can be made. This talk will discuss the variables included in the classification system and how these can influence referral to tertiary care and patient reported outcome measures.

HOW COMMISSIONING WORKS
Mr Jamie Ferguson

There is an increasing recognition of the benefits of managing complex infection in a multi-disciplinary setting. We look at some of the financial implications of setting up and running dedicated bone infection centres. We share our experience of the peculiarities of the current coding and tariff system and the challenges faced in running sustainable services for the future. We also share some of the take home lessons that we can learnt along the way.

CIERNY-MADER LECTURE

OUTCOMES OF THE 2018 INTERNATIONAL CONSENSUS MEETING ON MUSCULOSKELETAL INFECTIONS

Professor Thorsten Gehrke

The name Delphi derives from the Oracle of Delphi and was developed in the beginning of the Cold war to forecast the impact of technology on warfare. General Henry H. Arnold had ordered the creation of a report for the United States Army Air Corps on technological capabilities that could be used in future warfare. Very soon it became apparent that forecasting methods, technological approaches, and quantitative models could not be used, as little "scientific evidence" had been published in this field. To overcome these limitations, the Delphi method was developed by Project RAND during the 1950 and 1960s.[1] The Delphi method continues to be used by the military today and has found its way into the scientific and medical communities.[2]

The exact description of the Delphi method that was utilized in the first ICM meeting has been previously published[3] and the document or executive summaries has also been published in various venues.[4-6] The second ICM also followed similar steps with the entire process being supervised by Dr. W. Cats Baril. The seed for the second consensus meeting was set in soil in June 2016, when at the request of many experts from around the world, we decided to proceed with the second meeting. Thirteen specific steps were followed:

Step 1 (June 2016): **Selection of Delegates**. This step aimed to gather the experts from around the globe, with no country overlooked, who could lend their expertise to the consensus process. The delegates were identified based on their publication track record in the field (at least five publications within the last five years), specialty society nominations, or their clinical expertise (high volume) in taking care of patients with orthopaedic infections. The search identifed 953 delegates who were sent invitaions. Some of the delegates did not respond to the invitation (63) or declined to participate (21), leaving 869 potential delegates to participate.

Step 2 (Dec 2016 to April 2017): **Identification of Issues**. The delegates were then asked to send in between 5 and 10 questions (issues) in the field of orthopaedic infections that they felt needed to be explored. A total of 3210 questions were received.

Step 3 (April 2017 to August 2017): **Ranking of Questions**. The collected questions were then sent to the delegates again and they were asked to prioritize them. In this process, we did not deliberatly remove duplicate questions and did not make any changes to the "writing" of the questions. We believed that "duplications" perhaps represented the higher priority of a question.

Step 4 (August 2017): **Evaluation of Ranked Questions**. Once the ranking had been received, the duplicate questions were removed, and the stem of each question was rewritten according to the Delphi method. This step was necessary to remove "suggestive" words such as "what is the role of…?" as opposed to "Is there a role…?" This left us with 652 questions that comprised the final set of questions to be explored.

Step 5 (August 2017 to November 2017): **Assignment of Questions**. The final set of questions were then assigned to at least two delegates per question based on the publication track record of the delegate or the desire of a delegate to research a specific question. The delegates were given specific instructions on how to conduct research on the topics presented in each question and how to write up the responses.

Step 6 (December 2017- February 2018): **Systematic Review**. During this time period the delegates were actively engaged in researching a specific question and preparing the preliminary document related to each question. The two delegates assigned to each question were working independently for all workgroups except for the Shoulder group, who decided to work together. No published work in the English langauge were meant to be missed during this process.

Step 7 (February 2018 to April 2018): **Inter-delegate Discussions**. The document received from one delegate was then sent to the other and both delegates were made aware of each other's write up and research. The activity was coordinated centrally to create one document that was acceptable by both delegates. Over 6,000 emails were exchanged during this process alone.

Step 8 (April 2018 to June 2018): **Document Merging/Editing**. All received documents were reviewed, written up, checked to remove plagiarism, references updated, and the English language edited.

Step 9 (June 2018 to July 2018): **Document Evaluation by All Delegates**. Although the documents generated were posted on the website (www.ICMPhilly.com) for many months and available for view by EVERYONE (including the public), the final document was sent to the delegates and they were asked to review any and all questions that were posted live on the website. We received numerous comments from delegates during this period and implemented any and all appropriate changes to the document prior to the meeting.

Step 10 (July 2018): **Final Pre-Meeting Review/Editing**. The entire document was reviewed by the internal editorial team and some additional changes were made. The latest publications, up until June 30, 2018, were also checked and added to relevant sections.

Step 11 (July 25 to 26, 2018): **Pre-Vote Discussion**. All delegates who had traveled to Philadelphia met in their workgroup and discussed some of the questions in their field. The questions were divided into four categories: 1) Highly clinically relevant with little evidence supporting the recommendation; 2) Highly controversial and clinically relevant; 3) Highly relevant and with great supportive evidence for the recommendation; and 4) Not clinically highly relevant with or without supportive evidence. During the meeting, questions from categories 1 and 2 were discussed.

Step 12 (July 27, 2018). **Voting**. All questions were presented on a screen and the delegates were allowed to vote in real time. The results of voting appeared on the screen shortly after the vote. There were three possible responses to each recommendation: agree, disagree, or abstain. The process of voting was clearly explained by Dr. Willy Cats-Baril clearly to the delegates prior to voting.

Step 13 (August 2018 onwards): **Dissemination of Consensus Document**. Following the meeting the voting results were implemented into the document. The document was additionally reviewed by outside editors of Journals, in particular Dr. Michael A. Mont and his fellow Dr. Nipun Sodhi, Dr. Thomas Bauer, and Dr. Chick Yates. The delegates were given the opportunity to review the final document over a four week period and to provide any additional feedback. All suggested and appropriate changes were implemented into the document. The final document was then sent to various journals for publication as well as for publication in a consolidated book form. The final document is also being translated into different languages.

As can be seen from the above, the delegates were very engaged at every step of the way in generating the consensus document. It is clear, however, that a complex process like the one above, may fall victim to some shortcomings and errors. We made every effort to minimize those as much as possible. We also attempted to be inclusive of all experts from around the world. We are certain that we may have missed some very deserving experts, who should have been part of this process. We apologize in advance to those experts whom we missed, to the readers who will have to endure some errors in the document, to the authors of reports that may have been missed unintentionally, and to anyone else who may feel perturbed because of our shortcomings. We hope that the document that is generated will serve the orthopaedic community for years to come and improve the care of our patients.

We wish to thank Orthopedic Research and Education Foundation (OREF) and the American Association of Hip and Knee Surgeons for their generous donation to support the consensus document.

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The Hip and Knee Section and General Questions were published in J of Arthroplasty

To access the full document please download ICM Philly App on Apple Store and for Androids.

Wondering if your patient has PJI? Try the **PJIDx** App. Based on new definition of PJI.

THERAPEUTIC ADVANCES

MICRODIALYSIS ASSESSMENT OF ANTIBIOTIC EFFICACY IN BONE
Dr Mats Bue

Adequate antimicrobial dosing is essential for prevention and treatment of orthopaedic infections. Therapeutic concentrations must be achieved in target site, i.e. at the site of infection or where infection is to be avoided. Making valid measurements of antimicrobials in e.g. bone tissue is, however, a difficult task. We apply microdialysis for sampling of antimicrobial concentrations in bone and soft tissue, which allows for dynamic assessment of antimicrobial pharmacokinetics following common routes of antimicrobial administration in different orthopedically relevant settings. We believe that the choice of antimicrobial treatment should not only be based on the characteristics of the infectious bacteria and plasma concentrations, but also on the specific tissue pharmacokinetics of the drug. This talk will present an overview of the work we have performed over the past 6 years in our research group.

BACTERIOPHAGE THERAPY: HYPE OR HOPE?
Dr Andrej Trampuz

In the era of increasing antimicrobial resistance and microbial persistence on implants, lytic bacteriophages became an interesting alternative strategy to treat biofilm infections. In this lecture, in vitro and experimental data will be summarized, with focus on potential future treatment strategies. Available phages, their biofilm activity, interaction with antibiotics, isolation, amplification, characterization and purification process will be reviewed. In additional, first clinical experience in patients with bone and joint infections, as well as safety and regulatory aspects will be presented.

LOCAL THERAPY: EVIDENCE IN PROPHYLAXIS AND TREATMENT
Professor Mike Reed

NEW HORIZONS

CULTURE FREE DIAGNOSTICS
Dr Teresa Street

Current culture-based diagnostic techniques for prosthetic joint infections can have low sensitivity, with prior antimicrobial therapy and infection by fastidious organisms particularly influencing culture results. What if these infections can be diagnosed without the need for culture? Metagenomic whole-genome sequencing (WGS) direct from clinical samples is emerging as a valuable tool for diagnosis of bacterial and viral infections. Recent advances in sequencing technology offer the potential to translate metagenomic WGS into a same-day diagnostic tool. In this talk I will discuss the concept of culture-free diagnostics, and describe our current research using nanopore sequencing technology to diagnose prosthetic joint infections from sonication fluid.

NUCLEAR IMAGING - INDICATIONS/COST EFFECTIVENESS
Dr Geertje Govaert

It is difficult to treat a disease that has not been properly diagnosed. One of the challenges of orthopaedic trauma care is that the most accurate and cost-effective diagnostic pathway for diagnosing a fracture-related infection (FRI) has not yet been established. There are three indications to request diagnostic imaging for the surgical workup of a patient with diagnosed or suspected FRI.

1) to acquire more certainty about the presence or absence of FRI;
2) to image the surgically relevant details of the disease such as its extension and the presence of sequestra, cloacae, sinus tracts and/or subcortical abscesses;
3) to establish the degree of fracture healing and implant stability.

In this presentation the available literature results for nuclear imaging techniques for FRIs are discussed for the three most commonly used nuclear medicine techniques: the three phase bone scan (with SPECT-CT), white blood cell scintigraphy (also called leukocyte scan) with SPECT-CT and 18F-fluorodeoxyglucose (FDG)-PET/CT. Emphasis is on how these techniques are able to answer the diagnostic questions from the clinicians (trauma and orthopaedic surgeons), their cost-effectiveness and which technique should be used to answer a specific question.

BESPOKE RECONSTRUCTION - 3D PRINTING
Professor Alister Hart

WHY DO IMPLANTS FAIL?
Professor John Skinner

GUIDELINES AND PROTOCOLS

INTERNATIONAL GUIDELINES ON PROSTHETIC JOINT INFECTION
Mr Jason Webb

Prosthetic joint infection (PJI) represents a complex clinical conundrum. Its treatment incurs great financial cost to healthcare systems and personal cost to the patients involved. The approach to management has transformed in the last 15 years with a move towards bespoke treatments based on patient/surgical/pathogen factors. Numerous international institutions/societies have produced guidelines and protocols to help guide management from prevention through to surgical treatment and aftercare. This lecture will aim to discuss the pros and cons of these guidelines. This lecture will aim to apply a pragmatic approach to use of the guidelines in PJI.

OXFORD SURGICAL PROTOCOLS FOR OSTEOMYELITIS
Mr Martin McNally

Osteomyelitis is a complex condition, with many facets of treatment. In Oxford, we have developed protocols which help to focus the team on delivering important elements of treatment in a standardized way. These make it easier for new team members and trainees to become familiar with our work.

Protocols also allow serial assessment of the effects of our treatment. We have modified each protocol over time as we learn more about the condition. In recent years, new treatments, new products and results of novel research have been incorporated into our protocols. This has facilitated better understanding of how any particular diagnostic method or treatment impacts on outcomes.

FRACTURE RELATED INFECTION
Dr Mario Morgenstern

Fracture-related infection (FRI) remains a challenging complication that creates a heavy burden for orthopaedic trauma patients, treating physicians, as well as on healthcare systems. Until recently, there was a lack of a clear definition for FRI as well as standardized diagnosis and treatment recommendations for FRI. In order to address this issue, an international expert group has been convened in late 2016 and developed a consensus definition. In a second consensus meeting in February 2018 the *FRI Consensus Group*, (endorsed by the *AO Foundation*, the *Orthopaedic Trauma Association*, the *European Bone and Joint Infections Society* and the *Pro-Implant Foundation*) updated the FRI definition, based on newly available literature data, and drafted recommendations on general management concepts, diagnosis, treatment as well as outcome measurement of FRIs.

The FRI definition consists of two levels of certainty around diagnostic features. Criteria could be confirmatory (infection definitely present) or suggestive. Five confirmatory criteria were defined: fistula, sinus or wound breakdown; purulent drainage from the wound or presence of pus during surgery; phenotypically indistinguishable pathogens identified by culture from at least two separate deep tissue/implant specimens; presence of microorganisms in deep tissue taken during an operative intervention, as confirmed by histopathological examination; presence of more than five neutrophil polymorphs per high-power field, confirmed by histopathological examination. Furthermore, a list of suggestive criteria was defined. These require further investigations in order to look for confirmatory criteria.

This FRI definition was endorsed in July 2018 by the *International Consensus Meeting on Musculoskeletal Infections* (Philadelphia/USA).

Title **Atypical *Mycobacterium* infection of sternoclavicular joint: a unique case**

Authors Marjan Raad, Kamalpreet Cheema, Ranjit Sehjal, Siddharth Viriani, Jai Relwani

Address *William Harvey Hospital*

Abstract

Introduction: A 34 year old fit and well British female of right hand dominance, presented with a one year history of pain and swelling over her left sternoclavicular joint (SCJ). She described the pain as a constant ache, with no radiation, and exacerbated particularly by movements above head height. The SCJ pain had also been limiting with work and activities of daily living.

On examination she had a full range of movement in her shoulder, which was pain free. She was only tender on direct pressure of the SCJ.

Investigations: Her bloods showed mildly elevated inflammatory markers with a negative rheumatological screen. X-Ray revealed degenerative changes. CT showed well-marked sclerosis of the proximal end of the left clavicle. The MRI revealed an abnormal signal in the proximal clavicle and adjacent sternum. A nuclear medicine scan showed a focal increased uptake at the left SCJ.

She had an aspiration and biopsy of the medial end of the left clavicle under general anesthesia. The patient made a good recovery from theatre and her wounds had healed well at three month follow-up.

Treatment: She was commenced on long term anti-tuberculosis drug therapy: clarithromycin, rifampicin, and ethambutol. Her MRI 27 months later showed bone marrow edema surrounding the left SCJ in keeping with early degenerative changes.

Conclusion: Atypical *Mycobacterium* infections of the musculoskeletal system follow a chronic course. *Mycobacterium* have challenges in both diagnoses and treatment, therefore it is of upmost importance to have atypical *Mycobacterium* as a differential diagnosis.

Title **Resolution of osteoarticular destruction in tuberculous arthritis of the hip**

Authors John Williams, Dimitrios Karadaglis

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Abstract

A 51 year-old male Nepalese Gurkha presented with a six-month history of left hip pain and 3 kilograms weight loss. He denied any other systemic symptoms, fevers or unwell contacts. He had moved to the UK in 2008, worked as a security guard and was otherwise fit and well. On examination there was a 6x6cm smooth mass over the adductor canal. He was afebrile and not clinically unwell. Bloods demonstrated CRP 51, WCC 8.9. ESR 104. Plain radiography was unremarkable.

A subsequent MRI demonstrated synovial thickening and an extensive fluid collection around the hip joint. Aspiration was performed and medical therapy commenced which led to improvement in symptoms.

He was re-admitted from clinic 3 months later with worsening hip pain and a new iliopsoas collection of fluid. This was drained under CT-guidance. An XR demonstrated progressive osteoarticular destruction. He was kept under regular outpatient surveillance. Two years later, the patient was completely asymptomatic from his hip and had returned to work as a security guard. Serial XRs demonstrated almost complete resolution of the apparent bony destruction of the femoral head, with some residual acetabular reaction. The patient remains currently asymptomatic 7 years on.

Title **Isolated osteomyelitis of hand by *Mycobacterium chelonae* abscess complex: a mysterious hand infection in a Louisiana lumberjack**

Authors Sergio Navarro[1,2], Jacob Becker[3], James Stafford[2]

Addresses *[1]University of Oxford. [2]Baylor College of Medicine, Houston, USA. [3]University of Texas - San Antonio, USA*

Abstract

We report the case of a patient who developed an infection of the left phalanges in the absence of recognized trauma. The infection did not respond to initial empirical antibiotics, and required multiple incision and drainages, before initial left 3rd digit amputated at the distal interphalangeal joint. Wound cultures initially grew *Staphylococcus aureus* and *Staphylococcus epidermidis*, and the wound was treated with another course of antibiotics. The infection spread to the wrist and arm. The patient underwent further debridement of L middle phalanges and histopathologic examination of the bone was consistent with acute and chronic osteomyelitis involving the margins, and examination of the tissue revealed necrotizing granulomas with areas of gram-positive cocci in clusters. A new pathology was suspected, and a new antibiotic regiment was given. The patient responded well to a new combined antibiotic treatment. The clinical presentation was confirmed by surgical biopsy. The recovery of this patient after subsequent identification of the organism with surgical debridement and antibiotic treatment at 6 months was interesting for objectifying full muscle recovery.

Title **A major pain in the hip - destruction of the left acetabulum and femoral head secondary to *Mycobacterium tuberculosis***

Authors Dominic A Haigh, Hamzah Z Farooq, Katherine MB Ajdukiewicz

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Abstract

A 68-year-old-gentleman presented with worsening left hip pain exacerbated by movement over two months; he had started to use a stick. He had night sweats, fatigue and weight loss of 4 kg. He had recently visited Zambia, from where he was originally. He had fallen at the age of nine years, and since this he had experienced left hip pain and white discharge until 11 years previously, when he had had an arthroscopic washout and reduction. The discharge initially stopped, but recurred sporadically. There were no respiratory or gastrointestinal symptoms. He had no known infective contacts nor significant medical history.

On examination, there was generalised wasting of left lower limb. There was limitation of all hip movements, but no pain on active or passive movements. The left lower limb was shorter than the right. Sensation and reflexes were intact, and pulses were present. The chest was clear to auscultation, and there was no lymphadenopathy nor abdominal organomegaly. He was pyrexial at 38°C.

Blood tests showed a mild anaemia and a normal white cell count. There was a slightly elevated adjusted calcium concentration of 2.67 mmol/L.

Plain radiography showed erosions of the left acetabulum and femoral head. Magnetic resonance imaging demonstrated a large, peripherally-enhancing synovitic mass in the left hip joint with chronic erosions of the acetabulum and femoral head. As this mass was extensive, contrast computed tomographic angiography was requested. This demonstrated close proximity to the left external iliac and common femoral arteries. Chest radiography was unremarkable.

Title	**The value of Bone-Infectious Disease MDT in providing expedited, unfragmented, evidence-based care of high risk patients**
Authors	Andrew Logan, Kapil Sugand, Garth Allardice, Tumena Corrah, Muhammad Alam, Hassan Hirji
Address	*Northwick Park Hospital, London North West Healthcare NHS Trust, London*

Abstract

Purpose: To assess the value of Bone-Infectious Disease MDT in providing expedited, unfragmented care in high risk patients.

Methods: Surgical, Infectious Disease, Microbiology and Radiology input in Bone-Infectious Disease MDT.

Results: A 31 year old female patient presenting with 2 day history of worsening right hip pain on background of intravenous drug use and self-administration into thigh 4 days previously. A 6x6 cm fluctuant abscess noted over greater trochanter (CRP 237 WCC 26). X-ray pelvis showed significant soft tissue swelling around right hip and gluteal region, with gas density seen within, appearances suggestive of self-injection or necrotising fasciitis. Patient developed septic shock and urgent incision and drainage, debridement, and wash out was performed with evidence of extensive fasciitis, myositis and tendonitis and concerns about extension of collection. Meropenem and clindamycin was commenced for suspected necrotising fasciitis. The Bone-Infectious Disease MDT discussion allowed critical treatment decisions from constituent teams. Microbiology report showed polymicrobial growth and Infectious Disease provided an updated antibiotic plan. Radiology expedited an enhanced CT abdomen pelvis which showed 5cm gas and fluid filled collection in the right gluteal muscles with no evidence of extension beyond the gluteal region. A final wash out was performed without further exploration. Patient was stable on discharge with plan to complete course of oral antibiotics, and continue VAC dressing in community.

Conclusion: This case demonstrates the value of a Bone-Infectious Disease MDT in providing rapid access to specialist opinion with expedited, unfragmented, evidence-based care of acutely unwell high risk patients.

Title	**A rare presentation of osteomyelitis - diagnostic challenges**
Authors	Eibhlin Higgins, Catherine Fleming
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Abstract

Introduction: We present the case of EG a previously healthy 30 year old male who presented with osteomyelitis of his 3rd and 4th toe with persistent symptoms despite culture directed antimicrobial therapy and surgical intervention.

Case: This patient initially presented with pain, swelling and discharge in his left 3rd toe. He had sustained a laceration to his toe 8 weeks pre-admission. He underwent a MRI which demonstrated changes consistent with osteomyelitis of his left 3rd and 4th toes. Bone sample cultured methicillin sensitive *Staphylococcus aureus*. He was treated with 6 weeks IV flucloxacillin with subsequent oral consolidation due to persistent symptoms.

He subsequently developed left sided chest discomfort and was referred to respiratory physician due to abnormality on chest radiograph. Due to persistent pain and swelling at orthopaedic follow up he underwent amputation of the 3rd and 4th digit of the left foot. He represented post operatively with pain and swelling at the stump site. MRI imaging and biopsy yielded a unifying diagnosis.

Title **Outpatient management of bone and joint infection in 2 Scottish Centres 2016-2018**

Authors Catriona Sykes[1], Claire Mackintosh[2], Neil Ritchie[3], Andrew Seaton[3], Claire Vallance[3]

Addresses *[1]University Hospital Monklands, Lanarkshire. [2]Regional Infectious Diseases Unit, Western General Hospital, Edinburgh. [3]Queen Elizabeth University Hospital, Glasgow*

Abstract

Methods: This is an observational study of 118 patients treated in NHS Lothian and NHS Greater Glasgow and Clyde between March 2016 and January 2018 for 7 conditions – diabetic foot/ stump infection, infected joint replacements (hip, knee and shoulder), vertebral osteomyelitis, osteomyelitis of other bones, native joint septic arthritis and infected orthopaedic metalwork.

Results: The major finding of this study is that shorter courses of intravenous antibiotic were not associated with worsened outcome even in a population with multiple comorbidities and complex infection. In this analysis, the median duration of intravenous antibiotics used was 19 days in those patients with full resolution of infection.

Discussion: The treatment of bone and joint infection has begun to change in line with results from the OVIVA study, and increasing oral regimes are likely to be advantageous in reducing time in hospital, reducing complications of indwelling lines and improving convenience for patients. In this study, intravenous antibiotic courses were considerably shorter than standard practice of 6 weeks.

This highlights that selected oral antibiotics may be used effectively in complex, comorbid patients as well as in clinical trial settings and adds to the evidence base for oral treatment of bone and joint infections.

Title **HIV seroprevalence in total joint arthroplasty in a single urban institution in South Africa**

Authors Zia Maharaj, Wofhatwa Ndou, Jurek Pietrzak, Nkhodiseni Sikhauli, Lipalo Mokete, Dick van der Jagt

Address *University of Witwatersrand, Johannesburg, South Africa*

Abstract

Background: The prevalence of immunocompromised patients undergoing total joint arthroplasty (TJA) is increasing worldwide as a consequence of advances in treatment. HIV is presenting in an older population group and concerns of higher rates of infection, early failures and dangers posed to healthcare workers exist.

Methods: The seroprevalence of HIV in 676 non-haemophilic patients undergoing total hip arthroplasty (THA) and total knee arthroplasty (TKA) at a single sub-saharan urban academic institution was prospectively assessed. All patients undergoing TJA from January 2016 – June 2018 were counseled and offered HIV testing pre-operatively. HIV ELISA tests were performed on all consenting patients awaiting TJA. The CD4+ count and viral load was measured for all HIV-infected patients.

Results: 71 patients (10.5%) of awaiting TJA were HIV-positive. 52 (14.8%) of 352 patients undergoing THA and 19 (5.86%) of 324 patients undergoing THA were HIV-infected. 62 patients (9.1%) refused HIV screening. 5 patients (7%) were newly diagnosed and initiated on highly active anti-retroviral therapy (HAART). All other HIV-infected patients for TJA were on pre-existing HAART. The average CD4+ counts for THA and TKA was 286 (56-854) and 326 (185-1000) respectively.

Conclusions: The seroprevalence of HIV in patients undergoing THA is higher than those undergoing TKA and the reported average in the general population (12.6%). This may reflect the high association between both HIV and HAART and AVN of the hip. Our findings predict a significant burden on arthroplasty services in the future. Routine testing may, however, allow optimization prior to elective surgery.

Title	**Review of peri-prosthetic joint infection after total hip arthroplasty managed with cemented custom made articulating spacer (CUMARS)**
Authors	Jonathan Quayle, Ahmed Barakat, Aaina Mittal, James Gibbs, Mark Edmondson, Philip Stott
Address	*Brighton and Sussex University Hospital, Brighton*

Abstract

Introduction: Peri-prosthetic joint infection (PJI) is a devastating complication after total hip arthroplasty (THA). The use of custom-made articulating spacers (CUMARS) has been described for use in the first of two stage treatment but no reports examine results of this technique outside the original unit. We report our outcomes of managing PJI using CUMARS.

Methods: Patients undergoing 1st stage revision for THA PJI using the Exeter standard stem (150mm), standard all-polyethylene acetabulum and antibiotic loaded cement between 2011-2018 were identified. Medical records were assessed for demographics, initial microbiological and operative treatment, complications, eradication of infection and subsequent operations. No post-operative restrictions were enforced. 2nd stage revision was undertaken in the presence of pain or subsidence.

Results: 54 patients underwent 1st stage revision using this technique. Average follow up was 3.9 years (range 0.5 – 7.2). Infection was eradicated in 43 (81%) patients. 3 patients have chronic infection managed with suppressive antibiotics, 4 patients died before eradication confirmed, 2 patients await confirmation of eradication, 1 lost to follow up. Complications occurred in 7 (13%) patients - 4 dislocations, 2 late peri-prosthetic femoral fractures, 1 infected haematoma. 4 patients required repeat 1st stage. 2nd stage revision was performed in 19 patients (35%).

Conclusion: The management of THA PJI is challenging. The use of the CUMARS technique allows mobility, local antibiotic delivery and maintenance of length to assist 2nd stage revision. It also achieves eradication of infection in a high proportion of patients and may negate need for 2nd stage revision in some patients.

Title	**Clinical outcomes with complex bone infections acquired abroad**
Authors	Sathyavani Subbarao[1], Hamed Mazoochy[2], Caryn Rosmarin[1], Benny P Cherian[1], Vris Alexandros[2], Nima Heidari[2]
Addresses	*[1]Division of Infection, Bart's Health Trust, London. [2]Department of Orthopedic Surgery, Bart's Health Trust, London*

Abstract

Background: Limited clinical data exists regarding the management and clinical outcomes of multi-drug resistant (MDR) long bone infection (LBI) following previous orthopaedic surgery. However, with increased global travel and thus, opportunistic acquisition of MDR organisms, this will be an increasing problem.

Aims: To review microbiology, management and clinical outcomes of complex LBI acquired abroad.

Methods: We retrospectively reviewed notes of all patients referred with LBI. Data regarding microbiology, intrafocal and systemic antibiotics, and outcomes were collected.

Results: 78 patients with LBI were referred between 2014-2018. 17/78 had their primary orthopaedic procedure abroad. From these 17, preoperative screening found 3 MRSA, 1 multi-drug resistant (MDR) *Pseudomonas aeruginosa* and 1 carbapenemase-resistant organism (CRO).

Focal antibiotics were used in 14/17 patients. Delivery systems included PMMA, calcium sulphate (STIMULAN), and combinations of hydroxyapatite and calcium sulphate(CERAMENT). Antibiotics present in these carriers included single or combinations of gentamicin(13/17), vancomycin(12/17), meropenem(3/17), colistin(2/17) and amikacin(1/17). All intrafocal therapy was targeted where microbiology was known.

Deep tissue samples (median=3) were obtained in all 17 patients; 15 had a positive culture. In 6/15(40%), resistant organisms were isolated; (2 ESBL Enterobacteriaceae, 1 MRSA, 1 *Stenotrophomonas maltophilia*, 1 CRO and 1 MDR *Pseudomonas aeruginosa*). Patients were treated between 2-6 weeks of intravenous followed by prolonged oral antibiotics, targeted according to bacteriology. All patients were disease free at follow-up (median=9 months).

Conclusions: Antimicrobial resistance presents management challenges in complex bone infections. Appropriate screening and targeted intrafocal and systemic antibiotic therapy can achieve good outcomes.

Title	**A high rate of early and late complications linked to pre-operative viral load and obesity exists in HIV-infected patients undergoing total knee arthroplasty**
Authors	Jurek Pietrzak, Philani Ntombela, Jade Courcal, Nkhodiseni Sikhauli, Dick van der Jagt, Lipalo Mokete
Address	*University of the Witwatersrand, Johannesburg, South Africa*

Abstract

Introduction: The use of active antiretroviral therapy (HAART) has changed the course of patients infected by the human immunodeficiency virus (HIV). However, a paucity still exists in the literature regarding the outcomes of TKA in HIV-infected patients.

Materials and Methods: The aim of this paper was to assess the outcomes of TKA in HIV-infected patients in a sub-Saharan academic hospital. We retrospectively reviewed the outcomes of 29 HIV-infected patients who underwent 36 TKAs from January 2014- January 2018.

Results: There were 22 females and 8 males with an average age of 59.6 years. The average BMI was 33.8. The average pre-operative CD4+ was 674 and 19 patients had an undetectable viral load (VL) at the time of TKA.

The overall complication rate was 33.3% (n=12) which included 8 early (<6 weeks) and 4 late complications (>6 weeks). There were 4 surgical site infections (SSIs) and 4 late deep infections. There were 4 DAIR procedures. There were 3 patients that underwent 2 stage revision TKA (1 failed DAIR, 2 chronic deep infections). Septic sequelae were not related to pre-operative CD4+ count but to high pre-operative VL and obesity (BMI >40). HAART was not initiated on 3 of 4 late deep infections. The 30-, 60 and 90-day readmission rate was 13.9%, 2.8% and 2.8% respectively.

The satisfaction rate was 75.8% (n=22 patients).

Conclusion: A significantly high rate of complications exist in HIV-infected patients undergoing TKA. There is a high rate of both early and late infective complications linked to high pre-operative viral load but unrelated to CD4+ count.

Title	**Is there a need to change perioperative antibiotic prophylaxis during antibiotic therapy and iterative debridement for orthopedic infections?**
Authors	Ilker Uçkay[1], Lydia Wuarin[2], Mohamed Benkabouche[2], Thorsten Studhalter[1], Benjamin Lipsky[3]
Addresses	*[1]Balgrist University Hospital, Zurich, Switzerland. [2]Geneva University Hospitals, Geneva, Switzerland. [3]University of Washington, Seattle, USA*

Abstract

Objective: The appropriate antibiotic prophylaxis for surgery on infected sites or for those undergoing current antibiotic therapy is unclear.

Methods: Single-center cohort study examining iterative SSIs that occurred in already infected adult orthopedic patients.

Results: 2480 first episodes of various orthopedic infections (median patient age 56 years, 833 immune-suppressed): implant-related (n=648); osteo-articular (n=1153); and, 1327 soft tissue. The number of debridements ranged between 1-15 interventions per episode.

Upon iterative intraoperative tissue sampling, we detected pathogens in 507 cases (507/862; 59%), of which 241 (242/507; 48%) were the same species found at the index debridement. However, 266 were previously undetected contaminant species (based on our clinical judgement) that did not require modifying antibiotic therapy. In terms of new pathogens, there were 265 new SSIs (11% of the cohort) and in 174 cases (7% of cohort) these organisms were resistant to current antibiotic therapy.

In multivariate analysis, current antibiotic administration was associated with new SSIs (odds ratio 1.6, 95%CI 1.2-2.2) occurring after the 2nd or later debridement. However, we were unable to define the most appropriate supplementary prophylaxis to prevent further SSIs. The new pathogens were heterogeneous types, including Gram-positives and Gram-negative species, fermenters and non-fermenters, methicillin-resistant and methicillin-susceptible.

Conclusion: A new SSI with a causative pathogen resistant to currently administered antibiotic therapy occurred in 7% of our patients during iterative (after the 2nd) debridement for orthopedic infections. Preventing these SSIs probably relies on carefully considering the indications for re-debridement and using optimal surgical technique, rather than on the broadening of antibiotic prophylaxis.

Title **A multicentre retrospective audit of native vertebral osteomyelitis cases**

Authors Rachel Bousfield[1], Isobel Ramsay[1], Ben Warne[1], Emma Nickerson[1], Elinor Moore[1], David Enoch[2]

Addresses *[1]Cambridge University Hospitals, Cambridge, [2]Public Health England, Cambridge*

Abstract

Introduction: Native vertebral osteomyelitis (NVO) is an uncommon but important diagnosis. There are no standardised UK guidelines for its management and current UK practice is poorly described.

Aims:
1) To evaluate the management of NVO in centres throughout the UK with respect to the 2015 Infectious Diseases Society of America (IDSA) guidelines
2) To further characterise this patient cohort and identify risk factors predictive of treatment failure.

Method: We conducted a multicentre retrospective audit through the National Infection Trainee Collaborative for Audit and Research (NITCAR). Sites collected demographic, clinical and treatment data for a maximum of ten consecutive adult cases presenting in 2015 and 2016. These data were compared to 8 IDSA audit standards for investigation, treatment and follow up.

Results: Across 40 UK hospitals, 288 patients were included (66% male, median (IQR) age 64 (50-73). All patients received appropriate baseline imaging. In patients with no microbiological diagnosis on blood culture, 53% proceeded to biopsy where an organism was identified in 53% patients. In cases with a non-diagnostic initial biopsy, only 19% proceeded to a second biopsy. Overall, *Staphylococcus aureus* was identified in 31% cases, other organisms in 32% cases and no microbiological diagnosis in the remainder. 79% patients received ≥6 weeks of appropriate antibiotic therapy. Charlson comorbidity index was the only risk factor significantly associated with treatment failure (p=0.005).

Conclusion: UK practice in management of NVO is variable. Biopsy has a high diagnostic yield. Comorbid patients are more likely to fail treatment and may be targeted by enhanced follow-up.

Title **Adverse drug reaction to teicoplanin is associated with the dose administered, but not renal function, obesity or serum level**

Authors Hoi Ping Mok[1,2], Theodore Gouliouris[2], Tanya Porter[2], Anna Mayhew[2], Christine Walker[2], Reem Santos[2], Sian Coggle[2], David Enoch[2], Emma Nickerson[2], Elinor Moore[2]

Addresses *[1]University of Cambridge. [2]Addenbrooke's Hospital, Cambridge*

Abstract

Teicoplanin is an antibiotic active against a range of Gram positive organisms. It has a long half-life, thus offers convenient once daily dosing and is a key agent used in the treatment of bone and joint infection in the outpatient parenteral antibiotics therapy (OPAT) setting. We adopted a dosing regimen of teicoplanin that resulted in a higher total dose administered and noted an increase in incidence of adverse drug reactions associated with this regimen. Retrospective analysis of patients on the OPAT database revealed that the incidence of adverse drug reaction is related to the dose administered. The rate of adverse drug reaction is one in 8.6 episodes of OPAT at 600mg daily increasing progressively to one in 3.5 at 1200mg daily. Further analysis with a case control study revealed that adverse drug reaction is related to the total dose, which is related in turn to the weight of the patient (as a result of weight based dosing), but not obesity, renal function or serum level of teicoplanin. Additional research is needed to assess the therapeutic benefit of high dose teicoplanin compared with lower doses. Until such evidence emerges, we conclude that high dose teicoplanin should be used with caution.

Title	**The use of biomarkers and cell count in the diagnosis of periprosthetic joint infection**
Authors	Alisdair Felstead, Manjula Meda, Sebastian Sturridge
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Abstract

We report on the performance of a simple algorithm using a combination of synovial fluid white blood cell count (WBC) and C-reactive protein (CRP) to aid in the diagnosis of prosthetic joint infections. This was compared with an alpha defensin test (AD).

Sixty-six synovial fluid samples were collected prospectively in patients with suspected PJI. All samples were tested by: WBC counts and CRP test; and on 37 of these with AD test. Clinical diagnosis of infection was based IDSA definitions.

Of 66 samples tested, 20 samples were categorised as clinically infected. Combination of WBC count and CRP yielded a sensitivity of 95% and specificity of 100%. Only one patient, who had a chronic infection with *S. epidermidis* and *S. warneri*, had a CRP and WBC count that was falsely negative (<5mg/L and 93 X 106 cells /L respectively). AD test was used on 37 samples (of which 20 were infected). Sensitivity of this test alone was 85% and specificity 90%. There were 2 falsely positive AD test results (one of whom had a metal on metal prosthesis) and 3 false negative results (2 *E. coli* infections and one patient with chronic infection with *S. epidermidis* and *S. warneri*).

Use of a combination of synovial fluid WBC count and CRP (both of which can be performed using simple and inexpensive laboratory tests), has a sensitivity of 95% and 100% specificity in the diagnosis of PJI. AD test may be useful on some occasions when near patient testing result may affect patient management.

Title	**The impact of the gentamicin-eluting injectable synthetic bone substitute, CERAMENT G, in the treatment of diabetic toe amputation for chronic bone infection**
Author	Michael Field, Natasha Morrissey, Oliver Chan, Nicholas Ward, Alex Wee
Address	*Frimley Park Hospital, Frimley*

Abstract

Purpose: To assess the impact of the gentamicin-eluting injectable synthetic bone substitute, CERAMENT G, in the treatment of diabetic toe amputation for chronic bone infection.

Methods: We retrospectively reviewed all cases of diabetic toe amputation in our institution where CERAMENT G was used. We also identified a cohort of patients who underwent diabetic toe amputation for chronic bone infection where no local antibiotic eluting agent was used. Time to wound healing, radiological evidence of progression of bone infection and re-operation rate were assessed in both groups.

Results: Patients undergoing diabetic toe amputation for chronic bone infection with the use of CERAMENT G demonstrated a lower incidence of radiological evidence of progression of bone infection and a lower re-operation rate within 90 days.

Conclusions: CERAMENT G demonstrates potential benefits in diabetic toe amputation for chronic bone infection.

Title	**Overweight and underdosed? Is there an issue with current prophylactic antibiotic policy in orthopaedic elective surgery? A single-centre study in a major UK tertiary centre**
Authors	Claire Hemingway[1], Jordan P. Skittrall[2], Elinor Moore[2]
Addresses	*[1]University of Cambridge Medical School, Cambridge. [2]Department of Infectious Diseases, Addenbrooke's Hospital, Cambridge*

Abstract

Purpose: This project focussed on antibiotic prophylaxis in orthopaedic surgery. There is known association between higher BMI and higher surgical site infection (SSI) rate, and we wanted to identify whether this was a feature of antibiotic underdosing rather than a physiological issue (e.g. wound closure).

Methods: We collected data of BMI/weight/height, antibiotic/s used and dosage in adults (18+) undergoing elective orthopaedic operations (excluding arthroscopic procedures), during January - June 2015, in a major UK tertiary centre. Follow-up clinical letters and notes were used to collect information about surgical site infections post surgery. A multivariate analysis was performed on this data, using logistic regression.

Results: Preliminary results showed no significant relationship between weight, dosage of antibiotics and infection outcome. 36 of 448 patients developed SSIs post operatively - 12 had BMI>30. Infection rates did not significantly differ from patients of a normal weight, given the same dose and type of antibiotic. As a study of a single centre with low infection rates, this study may be underpowered and current practice in dosing does not allow differentiation between antibiotic effect and direct effect from BMI.

Conclusions: We did not show an increased infection rate for any reason in obese patients – a group shown in larger studies to be at higher risk. For now, we suggest no change to a policy of giving the same antibiotic prophylaxis to normal weight and overweight patients. Increasing antibiotic dose in obese patients is a straightforward intervention lacking evidence, suggesting a possible straightforward trial.

Title	**Causative organisms in septic arthritis, osteomyelitis and prosthetic joint infections; are we using appropriate empirical antibiotic therapy?**
Authors	Catherine Peutherer, Markos Prindezis, Emma Nickerson
Address	*Addenbrooke's Hospital, Cambridge*

Abstract

Background: Bone infections are an important cause of mortality and morbidity. Appropriate and timely antibiotic therapy alongside surgical intervention is essential. Current empirical antibiotic therapy usage is highly variable.

Aim: This project aimed to determine the causative organisms grown in septic arthritis, infected prostheses or osteomyelitis cases over 1 year.

Methods: All patients diagnosed with septic arthritis, osteomyelitis or infected joint prosthesis between 01/01/17 and 31/12/17, and referred to the bone infection service at Addenbrooke's Hospital were identified and their electronic records searched for microbiology results and empirical antibiotic therapy.

Results: During 2017, 65 patients were diagnosed with prosthetic joint infections. Monomicrobial infections were most frequently due to *Staphylococcus aureus* (12/36), coagulase negative staphylococci (CoNS) (9/36) and *Escherichia coli* (4/36). Polymicrobial infections were most commonly due to CoNS (7/14), *S. aureus* (4/14) and *E. coli* (4/14). Vancomycin and tazocin (17/65) then vancomycin and meropenem (13/65) were most often used empirically.

During 2017, 33 patients had osteomyelitis most frequently due to *S. aureus* (9/33). Polymicrobial infections accounted for 42% (14/33). Amongst the 28 patients receiving empirical antibiotics, meropenem and vancomycin (6/28), tazocin and vancomycin (4/28) or tazocin (4/28) were given most.

During 2017, there were 20 patients with septic arthritis, of whom 8/20 grew *S. aureus*, 2/20 streptococci and 2/20 *Staph epidermidis*. Co-amoxiclav (4/20), tazocin and vancomycin (3/20) and vancomycin and ciprofloxacin (3/20) were most used as empirical antibiotics.

Conclusions: Our bone infection antibiotic guidelines can be tailored to the causative organisms seen in our population.

Title	**The microbiology of chronic osteomyelitis: implications for antibiotic choice**
Authors	Maria Dudareva*, Andrew James Hotchen*, Jamie Ferguson, Susanne Hodgson, Matthew Scarborough, Bridget L. Atkins, Martin A. McNally
Address	*Oxford University Hospitals*

Abstract

Microbiology of osteomyelitis was observed in two patient cohorts over a ten year period from a single centre within the UK (n=392), with regard to infection with multi-drug resistant (MDR) bacteria and susceptibility of antimicrobial regimens. Patients with chronic osteomyelitis undergoing definitive surgery from 2013-2017 (n=223) were compared to patients in a cohort from 2001-2004, using the same diagnostic criteria and sampling technique (n=169). Clinical features associated with MDR bacterial infection were analysed using logistic regression. The proportion of MDR infections was similar in both cohorts (15.2% versus 17.2%). There was no change in resistance to glycopeptide / meropenem combination treatment (2.2% vs 2.5%, p>0.9). Single-agent local antibiotic therapy would be expected not to appropriately cover infecting micro-organisms in 23% (vancomycin) or 25% (gentamicin) of patients.

* Contributed equally

Title **A comparison of intraoperative frozen section and alpha defensin lateral flow test for diagnosing periprosthetic joint infection**

Authors IK Sigmund[1], J Holinka[1], S Lang[2], S Stenicka[1], K Staats[1], G Hobusch[1], B Kubista[1], R Windhager[1]

Addresses *[1] Department of Orthopaedics and Trauma Surgery, Medical University of Vienna, Austria. [2]Department of Pathology, Medical University of Vienna, Austria*

Abstract

Aim: The aim of this study was to evaluate the diagnostic value of intraoperative alpha defensin lateral flow test and frozen section for PJI.

Methods: Between January 2016 and February 2018, patients with an indicated revision surgery after a total joint replacement were included. During the revision surgery, synovial fluid alpha defensin was measured qualitatively by using the lateral flow test. For frozen section, tissue samples (median: 3, range: 1-8) were collected, processed and analysed by one of our three specialized pathologists. The Musculoskeletal Infection Society (MSIS) criteria were used for infection definition. Based on receiver operating characteristic analysis, area under the curve (AUC) values of the frozen section and alpha defensin test were compared.

Results: 101 patients (63 women) with a median age of 71 years were included. Of these, 29 patients (29%) were classified as PJI. The overall percentage agreement between frozen and permanent section was 99% (CI: 98 -100) and the Cohen's kappa coefficient was 0.97 (0.94 – 1.0). The sensitivity, specificity and AUC of frozen section was 86% (69 – 95), 93% (84 -97), and 0.9 (0.8- 1.0); and of alpha defensin 69% (52 – 83), 94% (86 – 98), and 0.8 (0.7 – 0.9), respectively. There was a statistically significant difference between the AUCs of frozen section and alpha defensin test (*p=0.006*).

Conclusion: Frozen section yielded very good diagnostic accuracy and outperformed the alpha defensin test in our study. When analysed by an experienced pathologist, frozen section may add value in the intraoperative diagnosis of PJI especially when an infection cannot be confirmed or excluded preoperatively.

Title	**Antibiotic therapy for two weeks vs four weeks after surgical drainage for native joint septic arthritis of the hand - a randomized non-inferiority trial**
Authors	Ilker Uçkay[1], Ergys Gjika[2], Jean-Yves Beaulieu[2], Konstantinos Vakalopoulos[2], Benjamin Lipsky[3]
Addresses	*[1]Balgrist University Hospital, Zurich, Switzerland. [2]Geneva University Hospitals, Geneva, Switzerland. [3]University of Washington, Seattle, USA*

Abstract

Objective: The optimal duration of postsurgical antibiotic therapy for adult native joint septic arthritis of the hand is unknown.

Methods: This was a prospective, unblended, non-inferiority study of patients randomized (1:1) to either two or four weeks of antibiotic therapy after surgical drainage. We excluded implant-related infections and episodes that had a follow-up of <2 months.

Results: Among the 85 hand and wrist septic arthritis cases in the per-protocol analysis, 46 patients received two weeks, and 39 patients four weeks of antibiotic therapy, of which a median of 1 and 2 days (respectively) was given intravenously. Recurrence of infection was noted in 3 patients (4%): 1 in the two-week arm (98% cure) and 2 in the four-week arm (95% cure). There were no differences in the rates of therapy related adverse events between the study arms. Mechanical sequelae (mostly rigidity and pain) occurred in 50% of those the two-week and 55% in the four-week arm. However, only 5 (13%) and 6 (13%), respectively, of these sequelae required further interventions. The median length of hospital stay was significantly shorter in the two-week than the four-week arm (3 vs. 4 days; p=0.01), resulting in a reduction of hospitalization costs of at least 1000 Swiss Francs per episode.

Conclusion: For hand and wrist septic arthritis, two weeks of targeted systemic antibiotic therapy was not inferior to four weeks in the rate of clinical cure of infection, adverse events or post-infectious sequelae, but it significantly shortened the length of hospital stay.

Trial Number: ClinicalTrials.gov (NCT03615781)

Title	**Infected tumour endoprosthesis: does two stage revision remain the gold standard?**
Authors	Ian Crowther, Martin Marsh, Kenneth Rankin
Address	*Newcastle upon Tyne Hospitals NHS Foundation Trust*

Abstract

Background: Limb salvage surgery with endoprosthesis is now possible in 90% of musculoskeletal tumour cases. There are numerous benefits to limb salvage, however the infection rate of 10%-17% has significant implications for the patient and the healthcare system. The recognised gold standard treatment is two stage revision which has a similar infection clearance rate to debridement and implant retention (DAIR) for infected conventional arthroplasty (82% vs 83%). This study compares conventional revision surgery to DAIR for cases of infected tumour endoprosthesis.

Methods: A retrospective study was undertaken of all tumour endoprosthesis carried out at the Royal Victoria Hospital and Freeman Hospital from 2003 to 2017. Data were collected regarding anatomical site, tumour type, length to onset of symptoms, time to diagnosis, causative organism, surgical management and outcome.

Results: 95 patients underwent endoprosthetic replacement of a major bone. The infection rate was 12%. The infection clearance rates were as follows: two stage revision (n=6), 0%; DAIR (n=18), 17%; single stage revision (n=2), 50%; arthrodesis (n=2), 50%. The infection rate, causative organisms, anatomical site and tumour type were similar to those in other studies.

Conclusions: The management of infected tumour endoprosthesis is challenging. Factors including the anatomical site, tumour type and degree of soft tissue resection at index surgery dictate the risk of infection and the subsequent success of eradication. This study found DAIR to be more successful than two stage revision and it should therefore be considered in all infected tumour endoprosthesis cases.

Title	**Systematic review of 316 animal models of bone infections – a call for improved quality**
Authors	Louise Kruse Jensen, Nicole Lind Henriksen, Henrik Elvang Jensen
Address	*University of Copenhagen, Denmark*

Abstract

In the future, anti-infective technologies aiming to fight bone infections are depending on evaluation in reliable animal models. Therefore, it is highly relevant to evaluate the scientific quality of existing bone infection models. In total, 316 large non-rodent animal models (rabbit, pig, dog, goat and sheep) of bone infections were systematically reviewed with regard to study design parameters and methodological quality. Only few differences in study design parameters were registered making the choice of animal species *per se* one of the most important parameters. However, the review demonstrated a substantial lack of study design information (*e.g.* bacterial identity and infection time) in many of the included papers, which hampers reproducibility and continuation of the established work. Histological examination of bone lesions was commonly used, although, a semi-quantitative scoring of lesions was often missing, *i.e.* no objective quantification of outcome. In general, the methodological study quality was found to be low as definition of infection, randomization, power calculations and blinding were only seldom reported (less than 10 % for each parameter). An increased use of blinded quantification of bone changes and microbiology could indeed improve the translational efficacy of test results obtained from animal models of bone infections. This review documents a need for improvement of scientific quality for animal models of bone infections. As such, it might be relevant for bone infection organisations and leaders of research laboratories basing their science on *in-vivo* studies to develop guidelines for uniform reporting of animal models of bone infections.

Title	**Do low levels of serum 25[OH]D increase the risk of orthopaedic infection? A case-control study**
Authors	Alexander Zargaran[1], Alex Trompeter[2]
Addresses	*[1]St George's, University of London. [2]St George's Hospital, London*

Abstract

Background: More than one in two healthy adults in the United Kingdom suffers from low vitamin D levels. Vitamin D possesses immunomodulatory properties, but there is uncertainty over its role in orthopaedic infection. This study assesses whether there is any correlation between serum 25[OH]D concentration and orthopaedic infection.

Methods: A convenience sample of 205 patients was taken in a tertiary referral centre for orthopaedic infection. Serum 25[OH]D concentrations and infection status were recorded and statistical analysis was performed.

Results: 114 patients had an infection. There was no statistically significant difference in age or gender between the two groups. Mean serum 25[OH]D concentration was 39 nmol/L in the group with infection and 59 nmol/L in the group without an infection ($p<0.01$). Overall mean serum 25[OH]D concentration was 48 nmol/L. There was a correlation between low serum 25[OH]D concentration and rate of infection (odds ratio, 5.94; 95% Confidence Interval [CI], 3.24 to 10.92) with a bivariate correlation of -0.338 ($p<0.01$).

Conclusion: This study demonstrates an association between low levels of serum 25[OH]D and increased orthopaedic infection. Orthopaedic inpatients suffered from vitamin D insufficiency, and there was a correlation between higher levels of serum 25[OH]D and lower rates of infection. This suggests that prophylactic supplementation of 25[OH]D may improve outcomes, and provides a foundation for randomized controlled trials to assess its effectiveness in practice.

Title	**Antimicrobial choice in culture-negative bone and joint infections**
Authors	Mariam Lami, Jose Lomas, Nicole Stoesser
Address	*Bone Infection Unit, Nuffield Orthopaedic Centre, Oxford*

Abstract

Introduction: The most common reason for culture-negative bone and joint infections (CNBJIs) is the previous use of antimicrobials, being atypical infections and fastidious organisms a distant cause. Taking into account any other specific drug-resistance problem occurring locally, the most challenging bacteria in this particular scenario is coagulase-negative *Staphylococcus*. Our aim was to describe antibiotic use in CNBJIs at the Nuffield Orthopaedic Centre.

Method: Patients with CNBJIs, including peri-prosthetic joint infections and chronic osteomyelitis, were identified retrospectively between 2012 and 2015. We also collected the antimicrobial resistance pattern of coagulase-negative staphylococcus in our institution during the same period.

Results: 74 patients with CNBJIs were identified. Sixty-one percent of the cases had a previous positive microbiology, being *Staphylococcus* spp. the most common isolated bacteria, with a majority of coagulase-negative staphylococci in the peri-prosthetic joint population. Forty-three% received oral treatment exclusively. The commonest IV antimicrobial was teicoplanin and the most repeated oral combination was ciprofloxacin and rifampicin (53%). On the basis of collected susceptibilities, this combination would cover approximately 60% of our population of coagulase-negative *Staphylococcus*, being more effective any double combination involving doxycycline with either clindamycin or co-trimoxazole. Failure occurred in 8.3% and 28.9% of chronic osteomyelitis and peri-prosthetic joint infections, respectively. Drug-related adverse events presented in 33.7% of the patients, requiring a switch to a different antimicrobial in 25.6% of patients.

Conclusions: Empirical antimicrobial decisions for CNBJIs are especially important in situations where an optimal surgical debridement is not achieved and must consider previous microbiology. Side-effect profile should always be considered.

Title	**Antibiotic associated morbidity in patients with orthopaedic infections over a one year timeframe at Addenbrooke's Hospital, Cambridge**
Authors	Dipesh Morar[1,2], Elinor Moore[2], Emma Nickerson[2]
Addresses	*[1]University of Cambridge. [2]Cambridge University Hospitals NHS Foundation Trust*

Abstract

Introduction: Patients with orthopaedic related infections are often prescribed prolonged antibiotic courses putting them at high risk of antibiotic adverse events (AAEs). This study investigated the frequency and nature of AAEs in orthopaedic related infections over a one year period at Addenbrooke's hospital, Cambridge.

Method: Patients were identified retrospectively using the OPAT and bone infection team databases between December 2016 and November 2017. Inpatient notes, clinic notes and laboratory results for each patient were analysed for AAEs and subsequent management. This data was collected in Excel.

Results: 148 patients with orthopaedic infections, including native septic arthritis, chronic osteomyelitis, polytrauma with infected metalwork and prosthetic joint infections, were identified. 58 patients (39%) had an AAE, with 91 AAEs in total. Linezolid (36% of patients on this antibiotic), teicoplanin (34%) and daptomycin (24%) had AAEs most frequently. The best tolerated antibiotics were doxycycline, co-amoxiclav and gentamicin. Common AAEs were gastrointestinal disturbances (29 occurrences), abnormal liver function tests (22), neutropaenia (15) and rashes (15). There was no significant difference in AAEs in this time period between patients who a past history of AAEs and those that did not (p=0.616). 74 AAEs altered management (switching/ stopping/ dose reduction of antibiotic). No patients died from, or needed intensive care for, AAEs.

Conclusion: The high frequency of AAEs in this cohort will remind clinicians to actively monitor for AAEs and emphasises the importance of full culture sensitivity data in guiding antibiotic switches confidently. This data supports further research into more tolerable antibiotic regimens for orthopaedic infections.

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Poster 012

Title	**Stopping antibiotics after surgical amputation in diabetic foot infections: data from a clinical pathway cohort**
Author	Ilker Uçkay[1], Benjamin Kressmann[2], Anne Rossel[2], Mohamed Benkabouche[2], Benjamin Lipsky[3]
Addresses	*[1]Balgrist University Hospital, Zurich, Switzerland. [2]Geneva University Hospitals, Geneva, Switzerland. [3]University of Washington, Seattle, USA*

Abstract

Objective: The appropriate duration of antibiotic therapy for a diabetic foot infection (DFI) after complete surgical resection is debated.

Method: Using a prospective clinical pathway, we conducted a retrospective cohort cluster-controlled Cox regression analysis of amputated DFI patients with a minimum follow-up of 2 months.

Results: We followed 482 patients who underwent amputation for a DFI for a median of 2.1 years after the index episode. The infections were predominately in the forefoot (n=433; 90%). We diagnosed osteomyelitis in 239 (50%) cases. Surgical amputation involved the toes (n=155), midfoot (280), and hindfoot (47). Additionally, 178 cases (37%) required revascularization.

After amputation, the median duration of antibiotic therapy was 7 days (interquartile range, 1-16 d). In 109 cases (25%), antibiotics were discontinued immediately after surgery because the operating surgeons clinically determined that all soft tissue and/or bone margins of the DFI were clear of infection.

Overall, clinical failure of treatment occurred in 90 (17%) cases, but this was caused by the same pathogen(s) in only 38 cases. By multivariate analysis, neither duration of total postsurgical antibiotic therapy (HR 1.0, 95% CI 0.99-1.01) nor immediate postoperative discontinuation of antibiotic therapy was associated with clinical failure or microbiological recurrence rates (HR 0.9, 95% CI 0.5-1.5).

Conclusions: This large series rom a clinical pathway demonstrated no benefit from continuing post-surgical antibiotic administration after amputation for DFI when the surgeons clinically determined the wound margins as uninfected. Thus, in the absence of suspected residual infection after resection, antibiotic therapy can be discontinued.

Poster 013

Title	**The benefit of mobile parts' exchange in the management of infected total joint arthroplasties with prosthesis retention (DAIR procedure)**
Authors	Ilker Uçkay[1], Stefanie Hirsiger[2], Benjamin Lipsky[3]
Addresses	*[1]Balgrist University Hospital, Zurich, Switzerland. [2]Bern University Hospital, Bern, Switzerland. [3]University of Washigton, Seattle, USA*

Abstract

Objective: The management of prosthetic joint infections (PJI) with debridement and retention of the implant (DAIR) should follow certain principles. Regarding the need to exchange mobile prosthetic parts (e.g. inlay exchange), some authors suggest failing to do this will doom the procedure to failure, while others regard it as optional. And there is limited literature regarding the potential advantages and disadvantages of parts' exchange.

Methods: This was a single-center retrospective cohort study of patients who underwent a PJI and were treated with DAIR and a minimal follow-up of 1 year.

Results: For this analysis we included 112 patients with a PJI (69 total hip arthroplasties, 9 medullary hip prostheses, 41 total knee arthroplasties, and 1 total shoulder arthroplasty).The patients had a median age 75 years, 52 (46%) were females, 31 (28%) were immune-suppressed). After a median follow-up of 2.5 years, 94 patients (84%) remained in remission.

By multivariate Cox regression analysis, the likelihood of remission was unrelated to: type of joint involved; isolated pathogen(s); number of surgical lavages performed; total duration of antibiotic therapy; use or duration of intravenous antibiotic therapy; specific antibiotic agent(s) administered; presence of immune-suppression; or, patient age. In contrast, undergoing an exchange of mobile prosthetic parts was associated with a significantly higher rate of remission (hazard ratio 1.9; 95% confidence intervals 1.2-2.9).

Conclusion: In our retrospective single-center cohort, changing mobile prosthetic parts in patients undergoing the DAIR approach for a PJI almost doubled the "odds" for long-term remission.

Poster 014

Title	**Oral amoxicillin/clavulanate for diabetic foot infections**
Authors	Ilker Uçkay[1], Karim Gariani[1], Benjamin Kressmann[1], Benjamin Lipsky[2]
Addresses	*[1]Geneva University Hospitals, Geneva, Switzerland. [2]University of Washington, Seattle, USA*

Abstract

Objective: Many experts avoid prescribing amoxicillin/clavulanate (co-amoxiclav) for the oral therapy of diabetic foot infections (DFI), especially with osteomyelitis (DFO), because of its relatively poor oral bioavailability and bone penetration.

Methods: Using our clinical pathway for DFI, we conducted a retrospective cohort analysis with a cluster-controlled Cox regression to evaluate patients treated with oral co-amoxiclav with follow-up of <2 months.

Results: Among 794 DFI episodes in 419 patients, 339 had DFO. We performed debridement in all cases, partial amputation in 438 episodes and 234 cases had revascularization. The overall median total duration of antibiotic therapy was 30 days, 5 of which intravenously.

In 431 episodes (431/794; 54%), we used oral β-lactam agents, which was co-amoxiclav in 410 episodes (410/431; 95%), at a median dose of 2000 mg/day. In 136 cases (136/431, 32%), oral β-lactams comprised >50% of the antibiotic course, In 53 cases, we used oral β-lactams directly from the start.

After a median follow-up of three years, the DFI clinically recurred in178 (22%). By multivariate analysis, treatment with an oral β-lactam agent was not associated with clinical remission, whether used as the only antibiotic agent from the start (hazard ratio [HR] 0.9, 95%CI 0.6-1.3), when administered during >50% of the antibiotic course (HR 1.3, 95%CI 0.4-3.3), or when prescribed for DFO (HR 0.9, 95%CI 0.4-2.4).

Conclusion: In our "real-life" experience, oral co-amoxiclav at standard doses was the most frequently prescribed oral β-lactam. Treatment with oral co-amoxiclav revealed similar results to other antibiotics when treating DFI, including DFO.

Poster 015

Title	**Four versus six weeks of antibiotic therapy for chronic osteoarticular infections after implant removal: a randomized trial**
Authors	Mohamed Benkabouche[1], Hervé Spechbach[1], Jean-Michel Gaspoz[1], Ilker Uçkay[2]
Addresses	*[1]Geneva University Hospitals, Geneva, Switzerland. [2]Balgrist University Hospital, Zurich, Switzerland*

Abstract

Objective: The optimal duration of antibiotic therapy for treating chronic orthopedic implant infections after surgical drainage and complete implant removal is unknown.

Methods: This was a single-center, unblinded, prospective trial randomizing (1:1) eligible patients to either four or six weeks of systemic, pathogen-targeted antibiotic therapy. The study was conducted at Geneva University Hospitals.

Results: We analyzed 123 eligible patients (62 in the four week antibiotic arm, 61 in the six week arm) in the intent-to-treat analysis. The patient's median age was 64 years, 75 (61%) were men and 38 (31%) were immune-compromised. The most common types of infection treated included: two-stage exchange procedure for prosthetic joint infection (n=38); orthopedic plate infection (44); infected nail implants (11). The median duration of post-explantation intravenous antibiotic therapy was 4 days. Overall, 120 (98%) of episodes were cured microbiologically and 116 (94%) clinically after a median follow-up period of 1.8 years. During follow-up, four patients had a clinical recurrence with a pathogen other than the initial causative agent. We noted recurrence of clinical infection in 4 patients in the four week arm and 3 patients in the six week arm (4/62 vs. 3/61; $\chi 2$-test; p=0.74); in all case these occurred at around 2 months following the end of antibiotic treatment.

Conclusions: We found no statistically significant difference in the rates of clinical or microbiological remission between patients randomized to only four, compared with six, weeks of systemic antibiotic therapy after removal of an infected osteoarticular implant.

Clinical Trial Registration Number: ClinicalTrials.gov (NCT0362209)

Poster 016

Title	**Incidence of adverse effects in patients receiving Linezolid treatment under the Bone Infection Unit at ROHFT**
Authors	Gulshada Begum, Daniel Hearsey
Address	*The Royal Orthopaedic Hospital, Birmingham*

Abstract

The aim of this study was to assess the safety and tolerability of linezolid in patients who were treated under the Bone Infection Team at The Royal Orthopaedic Hospital NHS Foundation Trust (ROHFT). The main indication for linezolid therapy was prosthetic joint infections but also included spinal patients.

A retrospective review was conducted to identify patients prescribed Linezolid treatment which was initiated by the BIU service based at the ROHFT. The indication, duration, dose and concomitant antibiotic treatments were included within the data collection. The incidence of side effects were reported to the Bone Infection Unit team and input to the BIU database, alongside the biochemistry and full blood counts.

A total of 15 patients received linezolid but only 12 met the inclusion criteria. All patients took oral linezolid at a dose of 600mg BD. The initial prescribing of Linezolid was between 18-84 days, however due to treatment discontinuation, the median duration was 25 days (1-46 days). Drug-related side effects included thrombocytopenia, sore throat, pruritus, vomiting and hallucinations where adverse effects resolved when treatment was stopped. In one case, a patient experienced bleeding gums following initiation of linezolid, however resolved within a few days. Linezolid was continued in another patient despite cataracts developing during treatment.

Linezolid was well tolerated in our small cohort of patients and adverse effects were similar with the known safety profile established by the manufacturers guidance.

Poster 017

Title	**Management of peri-prosthetic joint infection after total hip arthroplasty with femoral bone deficit using a long stemmed cemented custom made articulating spacer (CUMARS)**
Authors	Jonathan Quayle, Ahmed Barakat, Aaina Mittal, James Gibbs, Mark Edmondson, Philip Stott
Address	*Brighton and Sussex University Hospital, Brighton*

Abstract

Introduction: Peri-prosthetic joint infection (PJI) is a devastating complication after total hip arthroplasty (THA). The use of custom-made articulating spacers (CUMARS) has been described for use in the first of two stage treatment. We report our experience managing PJI utilising this technique with Exeter long stems where proximal femoral bone defects prevent use of standard stems.

Methods: Patients undergoing 1st stage revision for THA PJI using the Exeter Long Stem (>200mm), standard all-polyethylene acetabulum and antibiotic loaded cement between 2011-2018 were identified. Medical records were assessed for demographics, initial microbiological and operative treatment, complications, eradication of infection and subsequent operations. There were no post-operative restrictions. 2nd stage revision was undertaken in the presence of pain or subsidence.

Results: 21 patients underwent 1st stage revision with an Exeter Long Stem. Average follow up was 3.8 years (range 1.2 – 7.2). Infection was eradicated in 16 (76%) patients. 5 patients had chronic infection - 1 patient died and 4 are on long term antibiotics. Complications occurred in 29% (2 dislocations, 2 distal femoral fractures, 1 PE, 1 cortex perforation). 4 patients required repeat 1st stage. 2nd stage revision was performed in 13 patients (62%).

Conclusion: The management of THA PJI with compromised femoral bone stock is challenging. The use of Exeter long stem implants allows mobility, local antibiotic delivery and maintenance of length to assist 2nd stage revision. It also achieves eradication of infection in a high proportion of patients and may negate need for 2nd stage revision in some patients.

Poster 018

Title	**Bitten by a bug**
Authors	Saba Qaiser, Eleni Mavrogiorgou
Address	*East and North Hertfordshire NHS Trust, Stevenage*

Abstract

Background: *Streptobacillus moniliformis* is pleomorphic, gram-negative,bacterium, part of the normal respiratory flora of rodents, transmission can occur through broken skin, or bites.

Symptoms are non-specific and include fever, chills, rash and polyarthritis. If untreated, it may result in invasive infection.

Materials/methods: We report a case of a 66 year old female, presenting to the Accident and Emergency Department with pyrexia and swollen right thumb and right knee joint. She had a right total knee replacement one year ago. Her symptoms started 2 weeks prior to presentation when she sustained a mouse bite. She was penicillin allergic and commenced on meropenem. Empirical vancomycin and doxycycline were added to cover rodent's mouth flora.

She developed poly-arthralgia and back pain and was found to have a soft systolic murmur. She had washouts of the thumb and knee and a first stage revision of the right knee joint.

Results: Tissue samples taken from the knee and thumb were sent for culture and sensitivity testing. Microscopy revealed very thin gram negative bacilli. Culture was positive and it was identified as *Streptobacillus moniliformis* by MALDI-TOF, also verified by 16s ribosomal PCR. Unfortunately, the isolate failed to grow on subculture and antimicrobial susceptibilities were not available. Echocardiogram and spinal MRI were negative. The patient has made a good recovery on iv ceftriaxone.

Conclusion: *S. moniliformis* carries significant risk of invasive infection but it is under recognized due to its fastidious nature.

This report highlights the importance of good history taking and keeping low threshold to suspect unusual bacterial infection.

Poster 019

Title **A review of antibiotics used in culture negative prosthetic joint infections**

Authors Mariam Lami, Jose Lomas

Address *Bone Infection Unit, Oxford University Hospitals NHS Foundation Trust*

Abstract

Introduction: Culture negative prosthetic joint infections (CNPJIs) have been reported in up to 42% of cases. Broad-spectrum antibiotics are recommended following intra-operatively sampling. However, there is no clear guidance on antibiotic choice in culture-negative cases. Our aim was to explore antibiotic use in CNPJIs at our institution and whether outcomes where affected.

Method: Patients with CNPJIs were identified retrospectively between 2012 and 2015. Infections were categorised according symptom presentation and age of implant in early-acute, late-acute and chronic. Data was collected using the Electronic Patient Records (EPR) system.

Results: 38 patients with CNPJIs were identified. Histology was suggestive of infection in 63.2% of the cases. Sixty-eight percent of the cases had a previous positive microbiology and 52% of patients were off antimicrobials two-weeks prior debridement. Chronic infections represented 81% of the sample and the knee was the more common joint involved. Forty-two percent of patients received > 6 weeks antibiotics and 34.2% received oral treatment exclusively. The commonest oral combination used was ciprofloxacin and rifampicin whilst the most repeated IV antimicrobial was teicoplanin. Outcomes measured: 29% of patients had a recurrence and side-effects were present in 34.2% of cases forcing a switch to a different antimicrobial in 80% of the occasions.

Conclusions: Prognosis of CNPJIs is not different from positive-culture cases, described in literature. Antimicrobial plans, based on previous microbiology where possible and supported on an optimal surgical debridement are key to reduce failure. However, a careful selection and monitoring of the antibiotic regimens is recommended, given side effects.

Poster 020

Title **Outcome of culture negative chronic osteomyelitis**

Authors Mariam Lami, Jose Lomas, Jamie Ferguson

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Abstract

Introduction: The success of osteomyelitis (OM) treatment relies on an extensive surgical debridement and adequate antibiotic therapy. Antimicrobial therapy is based on the susceptibility pattern of those organisms isolated at intra-operative sampling. There is no clear guidance on antibiotic choice for culture-negative OM (CNOM). Our aim was to explore antibiotic use in CNOM at our institution and whether outcomes where affected.

Method: Patients with CNOM were identified retrospectively between 2012 and 2015. Data was collected using the Electronic Patient Records (EPR) system.

Results: 36 patients with CNOMs were identified. Histology was suggestive of infection in 83.3% of the cases. Fifty-two percent of them had a previous positive microbiology and 75% of patients were off antimicrobials two-weeks prior debridement. The tibia was the most common bone involved. Fifty-five percent of patients had a complete debridement although 66% percent of patients received > 12 weeks antibiotics. Amongst all patients, 52.8% received oral treatment exclusively. The commonest oral combination used was ciprofloxacin-rifampicin whilst the most repeated IV antimicrobial was teicoplanin. Of the 36 patients, 3 recurrences were identified (8.3%), side effects being present in 33.3% of cases, forcing a switch to a different antimicrobial in 75% of the occasions.

Conclusions: Inspite of culture-negativity there was a low rate of clinical failure, comparable to culture-positivity case series. Longer duration of antibiotics may be partially explained by the uncertainty in etiological diagnosis. This data is reassuring and may help to reduce duration of treatment, which will impact directly on drug related adverse effects.

Poster 021

Title	**Ability of antibiotic loaded Genex to eradicate established biofilms in an *in vitro* model**
Authors	Craig Delury[1], Sean Aiken[1], Leanne Cornes[1], Hannah Thomas[2], Cate Winstanley[2], Samantha J. Westgate[2]
Addresses	*[1]Biocomposites Ltd, Keele, Staffordshire. [2]Perfectus Biomed Limited, Cheshire*

Abstract

Aims: Successful treatment of periprosthetic joint infection requires surgical intervention, alongside antimicrobial therapy, targeting surface-adhering microorganisms. This has limited efficacy against implant-associated infection, whereby strategies such as releasing antibiotics at the site of infection are a promising option for biofilm prevention and eradication.

Genex is a β-tricalcium phosphate/calcium sulfate bi-phasic bone void filler (B-BVF); in this study mixed with either vancomycin and gentamicin (VG) or vancomycin and tobramycin (VT). This investigation assesses the ability of antibiotic B-BVF to eradicate pre-established biofilms in vitro.

Method: Single-species biofilms of *Staphylococcus aureus* (NCTC 8325) and *Pseudomonas aeruginosa* (NCIMB 10434) were established on polycarbonate coupons within CDC biofilm reactors. Coupons were transferred to challenge plates and suspended between pre-prepared antibiotic B-BVF beads at concentrations of 500mg vancomycin and 185mg gentamicin or tobramycin per 5cc. After 24 hours incubation at 37+/- 2°C, the coupons were removed, washed and sonicated to recover remaining microorganisms. Viable colonies were counted, and data was analysed by Students T-test.

Results: Negative controls retained 5.08 +/- 0.09, and 6.94 +/- 0.11 $Log_{10}CFUmL^{-1}$ colonies of *S. aureus* and *P. aeruginosa* respectively. No viable colonies were recovered from positive controls or B-BVF VT/VG samples within the detection limits. This equated to an average log reduction of >5.94 Log10CFUmL-1 in P. aeruginosa and >4.08 $Log_{10}CFUmL^{-1}$ in *S. aureus* ($p < 0.001$).

Conclusion: Exposure of *in vitro* biofilms to antibiotic loaded B-BVF resulted in eradication of *S. aureus* and *P. aeruginosa* biofilms, indicating a potential role for antibiotic B-BVF in infection management. Further assessment is required to confirm clinical performance.

Poster 022

Title	**Proposal and validation of a novel, descriptive classification system for hip pathology in HIV-infected patients**
Authors	Jurek Pietrzak, Nkhodiseni Sikhauli, Wofhatwa Solomon Ndou, Dick van der Jagt, Lipalo Mokete
Address	*University of the Witwatersrand, Johannesburg, South Africa*

Abstract

Introduction: Improved life expectancy in patients with HIV results in an increased possibility of developing chronic degenerative and HIV-associated joint disease.

Objectives: The aim was to propose and validate a descriptive hip-specific radiological classification system for HIV patients for THA.

Materials and Methods: We reviewed hip radiographs of 75 HIV-infected patients and 119 hips with hip pathology at a sub-Saharan academic hospital. Type 1 was if avascular necrosis of the femoral head was evident; Type 2 if the pathology was unrelated to HIV and Type 3 if a neck of femur (NOF) fracture was present. Type 1 hips were subclassified according to the subsequent position of the centre of rotation (COR) of the necrotic femoral head. Subsequently, Type 1A had normally contained femoral heads, Type 1B had proximal erosion of the acetabulum, Type 1C had proximo-lateral migration of the COR and Type 1D had medial migration of the COR and acetabuli protrusio. Inter- and intra-observer reliability was evaluated by 6 reviewers.

Results: 79 hips (67%) were Type 1 (with evidence of AVN). The majority, 33 patients (44.6%), were Type 1A (well contained) while 12 (16.2%) showed proximal migration and superior acetabular erosion (Type 1B) and 19 (25.7%) had acetabuli protrusio (Type 1D). There were 33 (27.7%) who were Type 2 with 21 with Tonnis 2 OA. There was both excellent inter- and intra-observer reliability (kappa-value 0.95).

Conclusion: We propose and validate a descriptive classification system for HIV-associated hip pathology in patients awaiting THA. AVN is present in the majority of cases.

Poster 023

Title **Review of the microbiology of osteomyelitis associated with war injuries in the Middle East and North Africa**

Authors Ghassan AbuSittah, Abdul Rahman Bizri, Paul Beaineh, Rawad Chalhoub, Fadi Ghieh

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Abstract

Background: The aim of this systematic review is to collect published data about the microbiology of osteomyelitis in war related injuries.

Methods: A thorough literature search was done using 6 search engines for pertinent articles: Cochrane Library, EMBASE, Global Health Library, Scopus, Medline and PubMed. Articles with a minimum of 5 cases of osteomyelitis from war wounds, citation of microbial etiology, and mention of the timing of cultures obtained in relation to injury were included.

Results: 10 studies that met the eligibility criteria were included, involving 1786 patients and a total of 2535 cultures. Gram negative bacteria were isolated from 1266 cultures and Gram positive bacteria were identified from 1171 cultures. Data obtained were further divided into acute and chronic osteomyelitis. *Staphylococcus* species were the most identified bacteria in both acute and chronic osteomyelitis. Most studies reviewed revealed dominance of gram-negative organisms in early stages of infection. In acute osteomyelitis, *Acinetobacter* and *Pseudomonas* were the two most isolated organisms. In chronic osteomyelitis, *Staphylococci*, *Acinetobacter*, *Pseudomonas*, were the most frequently isolated.

Conclusion: The bacterial isolates involved in war-related osteomyelitis are mainly gram-negative organisms in early stages and gram-positives in the chronic phase. Multi-drug resistant bacteria played an important role. Antibiotic coverage should be tailored accordingly, with broader coverage reserved for critically ill patients. Understanding the microbial biology of acute and chronic osteomyelitis may improve our choice of empiric antibiotic therapy. There is dire need for further and larger studies about osteomyelitis from the region.

Poster 024

Title **Associations between osteomyelitis and squamous cell carcinoma**

Authors Glen Barlow[1], Martin McNally[2]

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Abstract

Malignant transformation is a rare complication of chronic osteomyelitis, with squamous cell carcinoma (SCC) arising from the wall of a sinus tract. This often occurs many years after the onset of infection. The case presented here is an example of a different association between SCC and osteomyelitis – one in which SCC can present similarly to osteomyelitis.

A 60-year-old male was referred to the BIU with suspected osteomyelitis of the left elbow. He had a history of MS, T2DM, and had been a heavy smoker. Five months previously he had surgery to treat a suspected pressure sore on his elbow, which required a PIA flap. The flap deteriorated and dehisced over the course of a few months. His inflammatory markers were raised, and an MRI was performed at the referring hospital. The report stated that there was destruction of the proximal ulna, with diffuse oedema - 'most likely to reflect osteomyelitis'.

In clinic he was found to have lost two stone in weight. The wound had multiple discharging sinuses and was heavily indurated. An X-ray showed rapidly advancing bone destruction. A soft tissue biopsy later showed SCC. Shortly afterwards, he became septic and an emergency amputation was performed. Extensive invasion was seen, and the patient died six weeks later.

This case highlights the fact that SCC can present similarly to osteomyelitis if there is bone invasion. In such cases, imaging may not distinguish between osteomyelitis and neoplasm. Therefore, it is important to consider the clinical signs that suggest invasive SCC.

Poster 025

Title **Microdialysis as a method for assessment of antimicrobial bone concentrations in orthopaedically relevant settings – improving prevention and treatment of orthopaedic infections**

Authors Josefine Slater[1], Mats Bue[2,1], Pelle Hanberg[2,1], Maja Thomassen[1], Mikkel Tøttrup[1], Nis P. Jørgensen[3], Kristina M. Öbrink-Hansen[3], Mathias Bendtsen[1], Andrea René Jørgensen[1], Maiken Stilling[1], Kjeld Søballe[1]

Addresses *[1]Department of Orthopaedic Surgery, Aarhus University Hospital, Denmark. [2]Department of Orthopaedic Surgery, Horsens Regional Hospital, Denmark. [3]Department of Infectious Diseases, Aarhus University Hospital, Denmark*

Abstract

Aim: Adequate antimicrobial dosing is essential for prevention and treatment of orthopaedic infections. Therapeutic concentrations must be achieved at the target site, i.e. the site of infection or where prevention is needed. Making valid measurements of antimicrobials in bone tissue is, however, a difficult task. Our research group has applied microdialysis for sampling of antimicrobial concentrations in bone and soft tissue. The overall aim of this work is to investigate the target site pharmacokinetics of antimicrobials following common routes of antimicrobial administration in different orthopaedically relevant settings.

Method: Microdialysis is a minimal invasive catheter-based pharmacokinetic tool that allows for dynamic sampling of the extracellular, unbound and active fraction of antimicrobials from the interstitial space of tissues, including bone, joints, intervertebral discs and soft tissues.

Results: We have successfully applied microdialysis for assessment of antimicrobial bone and soft tissue concentrations in clinical and porcine studies. In both healthy and infected bone tissue an incomplete and heterogeneous distribution has been demonstrated for a diverse combination of drugs and tissues under different conditions.

Conclusions: We believe that microdialysis is a feasible and reproducible technique for dynamic and quantitative measurements of antimicrobial concentrations in bone and surrounding soft tissues. Our findings suggest that the choice of antimicrobial treatment regimens should not only be based on the characteristics of the infectious bacteria and plasma concentrations, but also on the specific tissue pharmacokinetics of the drug. Future studies investigating additional drugs, routes of administration and other orthopaedically relevant settings are warranted.

Poster 026

Title **Outcomes of mycetoma management in Oxford – a case series**

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Abstract

Mycetoma is a chronic soft tissue infection included in the World Health Organisation list of neglected tropical diseases. It is caused by fungi or filamentous bacteria and most often affects the feet after traumatic inoculation. It is most common in tropical and sub-tropical regions and typically affects young males with frequent soil exposure but its prevalence is unknown. Complications include bone involvement, superadded bacterial infection, deformity and loss of function.

Classically, patients present with soft tissue swelling and discharging sinuses with visible grains, or colonies, of the causative pathogen. Diagnosis involves clinical suspicion, supportive imaging and biopsy. Treatment depends upon the suspected causative agent but can involve at least a year of anti-fungal therapy or anti-bacterial agents. Surgical debridement can be used as an adjunct to medical therapy to reduce infection burden. Advanced cases are managed with amputation.

There is no published randomized controlled trial to determine the most effective treatment strategy for mycetoma, although a double blind randomized clinical trial is now underway in Sudan. Treatment strategies are based upon case studies and series. The most recent meta-analysis of treatment outcomes published in 2018 included only 47 patients in its analysis (1) demonstrating the paucity of data currently available.

This case series examines medical and surgical management strategies and clinical outcomes of 3 cases of mycetoma of the foot managed in Oxford between 2008-2018.

(1) Salim AO et al. Treatment of Madura foot: a systematic review. JBI Database System Rev Implement Rep. 2018 Jul;16(7):1519-1536

Poster 027

Title **Spontaneous bilateral sternoclavicular joint septic arthritis and lumbar discitis: an unusual case in a healthy adult**

Authors Georgios Mamarelis[1], Mohammad Zain Sohail[1], Athanasios Mamarelis[2], Hassan Fawi[1], Jehangir Mahaluxmivala[1]

Addresses *[1]Princess Alexandra Hospital, Harlow. [2]Queen's Medical Centre, Nottingham*

Abstract

Septic arthritis of the sternoclavicular (SC) joint is a rare condition. Typically, it presents in patients with risk of infection and is usually unilateral. In this report, we describe a case of spontaneous bilateral sternoclavicular joint infection of an otherwise healthy adult.

Case Presentation: A 67-year-old man presented in our hospital complaining of 2-week history of neck and chest pain which was radiating to his shoulders bilaterally. Clinical examination revealed erythema and swelling of the sternoclavicular area. Inflammatory markers were raised. Image investigation with CT and MRI was undertaken and verified the presence of bilateral sternoclavicular joint infection. The patient received prolonged course of intravenous antibiotics since his admission. The patient was discharged in a good condition and followed up in clinic. Conclusion: High index of clinical suspicion of SC joint infection is important for early diagnosis to avoid further complications.

Poster 028

Title **Propidium monoazide-quantitative polymerase chain reaction for diagnosis of periprosthetic joint infection**

Authors Mohamed Askar, Brigitte Scammell, Waheed Ashraf, Roger Bayston

Address *University of Nottingham*

Abstract

Background: Microbiological diagnosis of periprosthetic joint infection (PJI) is made difficult due to the high rate of false negative culture results particularly when patients have been on long term antibiotics. Molecular techniques, though having higher sensitivity, have proved to have a lower specificity partly due to detection of residual DNA from dead bacteria. Propidium monoazide (PMA), a DNA binding reagent, prevents DNA from dead bacteria from being amplified during the polymerase chain reaction (PCR). We have tested the performance of real-time PCR on clinical samples with and without prior treatment with PMA in the diagnosis of PJI and compared it to conventional microbiological culture.

Methods: 208 periprosthetic tissues and explanted prostheses were collected from 62 episodes from 60 patients undergoing revision arthroplasties for either PJI or non-infective causes. Tissue homogenates and prostheses sonicates were used for culture, PCR, and PMA-PCR. The PCR assay included genus-specific primers for staphylococci and enterococci and species-specific primers for *Cutibacterium (Propionibacterium) acnes*.

Results: 15 of the 62 episodes satisfied the Musculoskeletal Infection Society (MSIS) criteria for PJI and 46 did not. The sensitivity of culture, PCR, and PMA-PCR were 50%, 71%, and 79% respectively. Specificities were 98%, 72%, and 89% respectively.

Conclusion: PMA-PCR enhanced both the specificity and the sensitivity of PCR. It could have the potential to be used as a detector of residual bacterial viability to confirm eradication of infection prior to reimplantation in the two-stage revision for PJI or in post-septic arthritis patients before considering arthroplasty.

Poster 029

Title	**Periprosthetic joint infection in a District General Hospital: a quality improvement study**
Authors	Abbas See, Sam Channon, Veronica Garcia-Arias
Address	*Wexham Park Hospital, Slough*

Abstract

Introduction: Periprosthetic joint infections (PJIs) are a significant problem despite advancements in perioperative care and operative technique. It carries significant morbidity, is challenging to treat and requires a multidisciplinary approach. Hence, we present a joint study between the orthopaedic and microbiology departments in a district general hospital focusing on possible areas of improvement in the treatment of PJIs.

Methods: All known cases of PJI in Wexham Park Hospital between 2016 to 2018 were identified. Data was collected from several electronic databases. Data recorded included type of implant affected; age of affected implant; and pathogenic organisms. A retrospective case note analysis was performed to obtain perioperative details.

Results: 33 cases of PJI were identified. The mean age was 73.5 years (range 48 to 94). The majority of cases affected the lower limb (93.9%) with 54.5% of cases affecting the knee. 69.7% of cases affected a primary joint replacement and 68% of infections had a late onset.

42% of cases were treated with debridement, aspiration and implant retention while the remainder were treated with either one or two staged revisions. All patients received long-term antibiotics. 69.7% of cases had four or more intraoperative samples taken.

Microbiologically, 87.9% of cases had positive microbiology detected from their intraoperative samples. Of those, the majority were monomicrobial (54.5%).

Conclusion: PJIs remain a difficult condition to treat with several different treatment options. Further collaborative research is required to formulate conclusive guidelines in order to optimise treatment and improve patient outcomes.

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In 2009, the British Infection Society merged with the Association of Medical Microbiologists to form the British Infection Association. With over 1400 members, the BIA promotes the science and practice of medicine in relation to infection, and provides support for all infection specialists and trainees, whether in clinical practice, laboratory medicine, public health, research or education. The Association is committed to working collaboratively with other professional bodies and external agencies to produce standards and evidence-based guidance to improve patient care.

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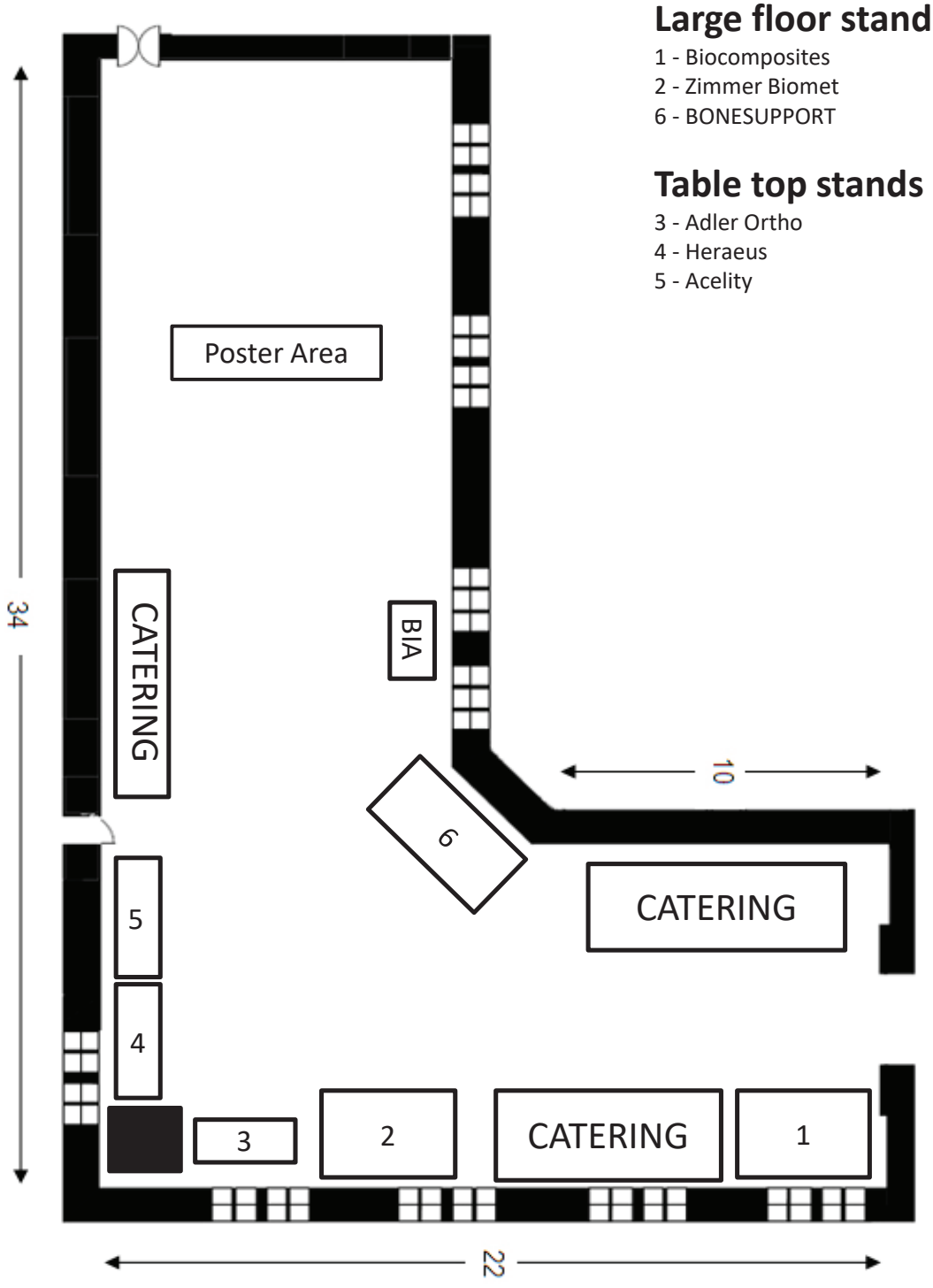
EXHIBITION HALL

EXAMINATION Schools



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NOTES

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SOCIAL PROGRAMME MAPS

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