



**movement**  
**REFERRALS**

INDEPENDENT VETERINARY SPECIALISTS

# Where the experience matters

Clinical Research Report 2023





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## Introduction to Movement Referrals

Movement Referrals was founded in 2022 and opened its first Specialist Referrals Centre in May 2023. The first centre is located at Preston Brook, Cheshire, a convenient location just off junction 11 of the M56 motorway, making it very accessible from the counties and conurbations of the North of England and North Wales.

Despite its recent inception, Movement Referrals is determined to make an impact in the veterinary sector, not only through veterinary-led services and expertise, but also through contributions to the clinical research literature through responsible innovation and evidence-based veterinary medicine and surgery.

Movement Referrals offers Specialist referrals in canine and feline orthopaedics, neurology and neurosurgery. Our directors are all experienced Specialists with a track record of leadership in their clinical disciplines and a strong sense of what the veterinary sector

should deliver and how it should behave: patients and clients are at the forefront of what we do. We strongly seek to offer value: value being a combination of quality, service and costs.

In this, our first clinical research report, we aim to summarise the contributions we have made to clinical research and quality improvement. We also aim to measure the impact this work has and so you will see various metrics that reflect this.

We are always happy to discuss potential research projects. We have considerable expertise and networks of trusted and valuable contacts, nationally and internationally.



The Directors,  
Movement Referrals.





## Foreword by Professor Anna Meredith FRCVS OBE

I am delighted to introduce the Clinical Research Report 2023 for Movement Referrals, a partner practice of the Harper and Keele Veterinary School. As a veterinary academic, I fully understand the importance of clinical research and its application into clinical practice. These days, UK universities are not only judged on the quantity and quality of their research but also on the impact that this research has on the end users. Partnerships with veterinary practices, such as Movement Referrals, are one way in which universities and other stakeholders can deliver and demonstrate impact.

The directors at Movement Referrals have significant expertise and track records in clinical research and it is wonderful to see that research is a fundamental pillar to the ethos of this new Specialist referral practice. As dedicated professionals, veterinary surgeons and veterinary nurses highly value the environment and culture within which they work. For many, clinical research provides a medium-long term sense of career satisfaction and progress, beyond the immediate reward of day-to-day clinical work. Such a blend of high-level clinical endeavour and a sense of contributing to the progression of veterinary medicine and surgery can be a powerful recruitment and retention tool. In this sense, I congratulate Movement Referrals for their foresight and ambition, and for 'setting off on the right foot' when there must have been many other pulls on their time during the establishment of a new practice.

I hope you enjoy reading about the research performed at Movement Referrals. At Keele, and through the Harper & Keele Vet School, we look forward to developing an impactful working relationship with Movement, helping to build the regional animal health economy and advancing veterinary science.

*Professor Anna Meredith OBE is Executive Dean of the Faculty of Natural Sciences at Keele University. After a long-standing veterinary academic career at the University of Edinburgh's Royal (Dick) School of Veterinary Studies, she was also Head of Melbourne Veterinary School, University of Melbourne from 2018-2022. She is a Professor of Zoological and Conservation Medicine and her interests and expertise lie at the interface between animal, human and ecosystem health (One Health), the conservation of biodiversity, and wildlife population health.*

*Professor Meredith was awarded an OBE in 2019 for services to animal welfare and the veterinary profession.*



## Our major research themes:

### Canine cruciate ligament rupture

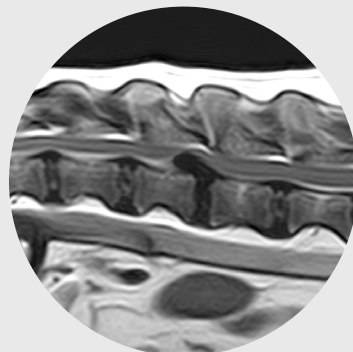


### Design and validation of novel implants using additive manufacturing technology

- Orthopaedics
- Spinal surgery
- Maxillofacial surgery



### Intervertebral disc disease (IVDD)



### Clinical outcomes measures

- Validation
- Automation of collection of client-reported outcomes measures



### Movement disorders and dyskinesia



### Osteoarthritis

- Clinical trials





## Our impact and track record

The directors at Movement Referrals all have a track record of peer-reviewed publications and research impact.

### Between us we have:

#### Publications

207

Total

From 1993 to 2024

#### Citing Articles

2,977

Analyze

Total

2,877

Analyze

Without self-citations

#### Times Cited

4,064

Total

3,839

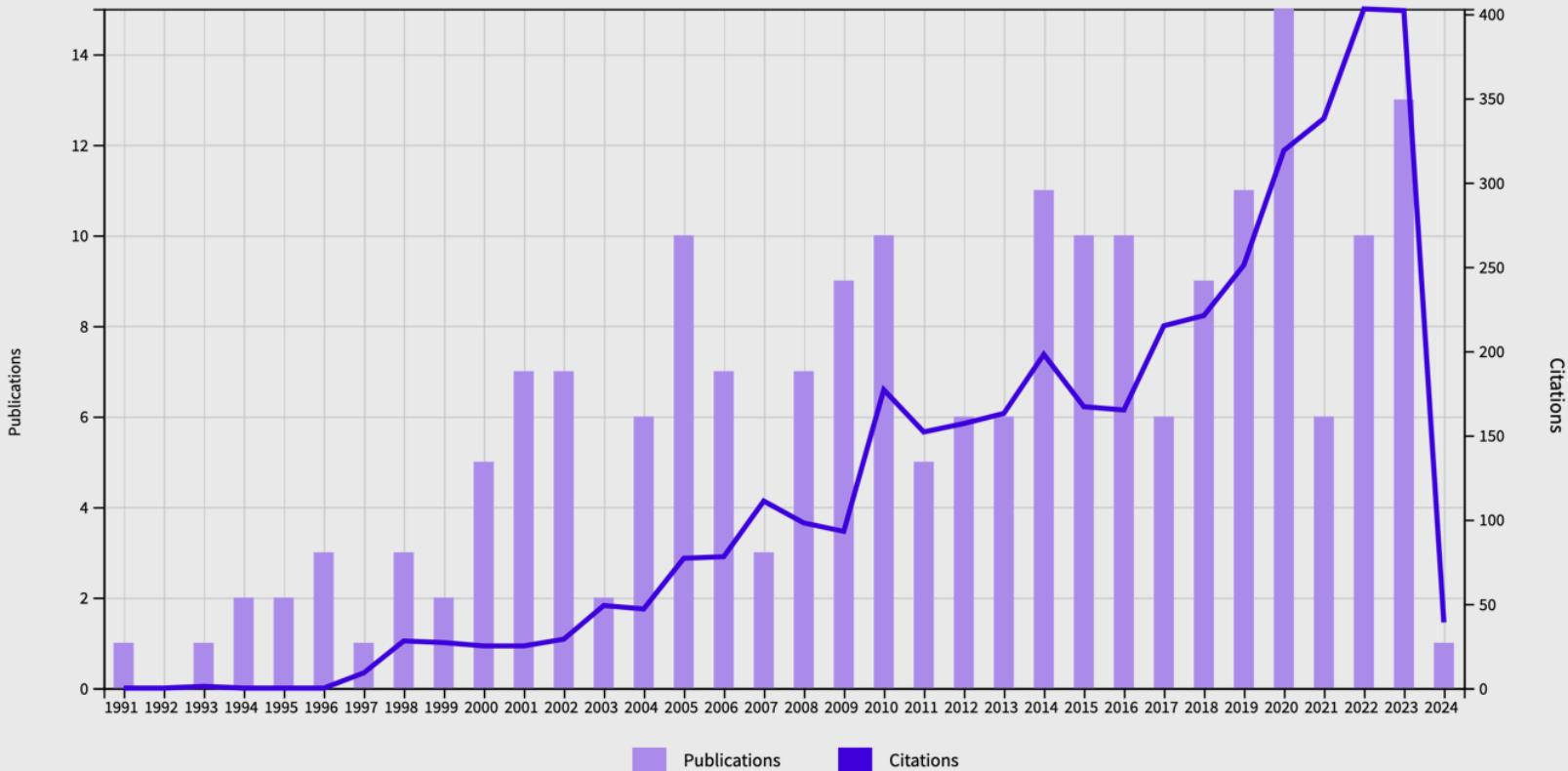
Without self-citations

9.63

Average per item



Our impact and track record



Graph showing peer-reviewed publications and citations of these papers for all four Movement Referrals Directors  
(\*Data for 2024 are to end of February 2024 only)

# The Directors







## Mr Ben Walton

BVSc DSAS(Orth) MRCVS



### Major Interests and Expertise

- **Humeral Intracondylar Fissures and Humeral Condylar Fractures in Dogs**
- **Novel orthopaedic implant design and development**
- **Canine Elbow Dysplasia**
- **Patient-specific, 3D-printed surgical guides and implants**
- **Spinal Stabilisation**
- **Gait Analysis**
- **Clinical metrology (measurement) of osteoarthritis**

### Career Summary

Ben has over 20 years of experience in small animal orthopaedics and spinal surgery. After eight years in mixed and first-opinion, small animal practice, Ben returned to the University of Liverpool in 2010 in a clinical research post, running a clinical trial comparing treatments for canine osteoarthritis, and researching and refining measurement tools for this condition. He is also Research and Development Director for Fusion Implants, an advanced veterinary devices company based in Liverpool, specialising in additive manufacturing, anatomic implants, and patient-specific surgical guides.

### Awards and Achievements

- BSAVA Simon Award (2024) for “Outstanding Contribution to Small Animal Surgery”
- Brian Pound Award for Clinical Excellence, CVS UK LTD, 2018
- RCVS Specialist in Small Animal Surgery (Orthopaedics), 2015
- 15 peer-reviewed papers
- BVOA Co-chair for Education, 2020-2023
- Co-supervisor of four PhDs on novel surgical solutions in veterinary orthopaedics
- Co-developer of eight novel surgical implants

### Research Activity in 2023

“No research without action, no action without research.”

*Kurt Lewin, German Psychologist.*

Research has limited value if its findings are not applied to real-life situations, and novel treatments should only be applied in a controlled and measured way.

As Research and Development Director at Fusion Implants, Ben works with a team of scientists and engineers developing novel implants and surgical systems. The team there has supported four PhD and dozens of Masters projects. Fusion also collaborate with surgeons from across the world to ensure a broad base of clinical input.



## Mr Ben Walton

**BVSc DSAS(Orth) MRCVS**

In 2023, Victor Lopez finished his PhD with Fusion Implants investigating the design and application of patient-specific, porous (to allow bone in-growth), 3D-printed spinal spacers to replace intervertebral discs in dogs with “wobblers” syndrome – a degenerative condition in the neck. The results of the first clinical cohort to receive this treatment were published in June, with 8/9 dogs having a sustained clinical improvement (Driver et al. 2023). Alice Brettle and Itayetzi Rodarte also finished their PhDs, investigating, respectively, a novel treatment for unloading the painful part of the joint in dogs with elbow dysplasia, and breed-stratified total hip replacement systems for dogs. Data from their research will be published in 2024 and beyond.

Also, in 2023, the long-term results for the humeral intracondylar repair system (HIRS) were published (Hood, Walton, Innes. 2023). Ben Walton and John Innes developed the HIRS to overcome the many challenges faced in managing fissures and fractures that occur in some dogs’ elbows. They published the first clinical results in 2020 (Walton et al 2020.), demonstrating a 6% major complication rate – considered very low for this procedure. We wanted to know, however, how these patients did in the longer term: in 36/37 cases, owners reported that dogs had regained full function of the operated limb.

## Peer-reviewed Publications in 2023

Hood RS, Walton MB, Innes JF (2023). “Long term outcomes of the Humeral Intracondylar Repair System for management of canine humeral intracondylar fissures and humeral condylar fractures.” *Frontiers in Veterinary Science*

Proteasa A; Walton MB; Carrera I; Garosi LS; Alcoverro E; Heyes M; Tauro A (2023). “Spinal decompression and stabilisation in a cat with lumbar vertebral pathological fracture and subluxation, following discospondylitis and spinal epidural empyema.” *JFMS Open Reports*

Driver CJ, Lopez V, Walton MB, Jones D, Fentem R, Tomlinson A, Rose J (2023). “Instrumented cervical fusion using patient specific end-plate conforming interbody devices with a micro-porous structure in nine dogs with disk-associated cervical spondylomyelopathy.” *Frontiers in Veterinary Science*

## Other References

Walton MB, Crystal E, Morrison S, Onyett J, McClement J, Allan R, Straw M; Innes JF (2020). “A humeral intracondylar repair system for the management of humeral intracondylar fissure and humeral condylar fracture.” *Journal of Small Animal Practice*



## Mr Mark Morton

BVSc DSAS(Orth) MRCVS



### Major Interests and Expertise

- **Cranial Cruciate Ligament Rupture (treatment and audit of outcomes)**
- **Common Calcaneal Tendon (Achilles Tendon) Injuries**
- **Total Hip Replacement**
- **Quality Improvement (QI) and Clinical Audit**
- **Efficiency**

### Career Summary

Mark Morton has 17 years experience in small animal orthopaedic surgery training and working at some of the largest referral clinics in the UK. Mark has developed a surgical technique for treating Common Calcaneal Tendon Injuries in dogs. This technique is now used world-wide. We and others have adapted these principles and they are now used to treat other tendon injuries. Mark, in partnership with RCVS Knowledge, is founder of the RCVS Knowledge Canine Cruciate Registry (CCR). This is the first automated registry for veterinary patients. Mark is responsible for clinical oversight of the CCR. He is Chair of the CCR Steering and Advisory Boards and holds responsibility for the annual CCR benchmarking report. International regard for the CCR has led to many of Mark's speaking invitations.

### Awards and Achievements

- Founder and Clinical Lead of RCVS Knowledge Canine Cruciate Registry 2018- current
- Quality Improvement Lead, CVS Referrals, 2020-2023
- Brian Pound Award for Clinical Excellence, CVS (UK) Ltd, 2019
- British Veterinary Orthopaedic Association Co-chair for Education, 2020-2023
- Developer of novel surgical techniques for managing ligament and tendon injuries.

### Research Activity in 2023

"Without data you're just another person with an opinion"

*W. Edwards Deming*

Canine cruciate ligament rupture is one of the most common causes of lameness in canine patients with a prevalence in the UK of 0.52% (Taylor-Brown et al). Controversy surrounds its treatment. Whether to operate or not, and if so what procedure to perform. Whilst there is increasing evidence around the benefits of surgery and particularly Tibial Plateau Levelling Osteotomy (TPLO) a lot of this data comes from small studies based in single centres.

The RCVS Knowledge Canine Cruciate Registry, launched in 2021, gathers real-world data from across the UK to help guide decision making around treating this issue. To date over 300 veterinary surgeons registered, over 1200 dogs enrolled and more than 1000 surgical procedures logged. We use the Liverpool Osteoarthritis in



## Mr Mark Morton

**BVSc DSAS(Orth) MRCVS**

Dogs Questionnaire (LOAD) and the Canine Orthopedic Index (COI) to track dogs progress after surgery for the rest of their lives. There is significant interest in expanding the registry internationally and we continue to explore this.

The registry accounts for a significant amount of Marks 'research' time. He regularly leads training sessions for members of the registry and present both nationally and internationally on this initiative. In 2023, data from the CCR was used in a peer-reviewed publication for the first time; combining owner assessment of function and data around the use of two CROMs to estimate 'minimal clinically-important differences' (MCID) for the first time in canine patients. (Innes, Morton et al. 2023).

Later in 2023 Mark worked with RCVS Knowledge to publish the first benchmarking report, with over 300,000 data points collected from across the UK.

The CCR revolutionises how we capture real-world data to bring benefit to all dogs suffering with canine cruciate ligament rupture. As RCVS Knowledge's Clinical Lead for Registries, Mark is exploring how we might develop similar initiatives for other conditions.

## Publications in 2023

### *Peer-reviewed research outputs*

Innes, JF, Morton MA, Lascelles BDX (2023). "Minimal clinically-important differences for the 'Liverpool Osteoarthritis in Dogs' (LOAD) and the 'Canine Orthopedic Index' (COI) client-reported outcomes measures." Plos One 18(2).

### *National Reports*

[RCVS Knowledge Canine Cruciate Registry 1st Annual Report](#)

## References

Taylor-Brown, Frances E et al. (2015) Epidemiology of Cranial Cruciate Ligament Disease Diagnosis in Dogs Attending Primary-Care Veterinary Practices in England. [Veterinary Surgery](#)



## Mr Mark Lowrie

MA VetMB MVM DipECVN  
MRCVS



### Major Interests and Expertise

- **Movement Disorders**
- **Intervertebral Disc Disease**
- **Feline neurology**
- **Inflammatory central nervous system disease**
- **Epilepsy**
- **Myasthenia gravis**

### Career Summary

Mark Lowrie has a track record of establishing and enhancing specialised training programs across various multi-disciplinary referral centres in the UK. With over two decades of clinical experience, Mark is a global authority in the field of movement disorders in dogs and cats. His research on meningoencephalitis, a prevalent and debilitating brain condition in dogs, has led to the development of treatment strategies that have significantly reduced early mortality rates by more than 50%. Mark's expertise extends beyond clinical practice; he serves as a veterinary consultant to the International Society of Feline Medicine (ISFM) and plays a pivotal role as an assessor for the Kennel Club IVDD scheme in Dachshunds.

### Awards and Achievements

- Over 80 peer-reviewed papers
- Over 1500 citations, H index: 24, i10-index: 33
- 10 textbook chapters

- Petplan 'Vet of the Year', 2022
- CVS Group plc Colleague Awards 2022 Winner for "Outstanding contribution to clinical care improvement"
- Nottingham Vet School Veterinary Student Awards 2018 Winner for "Favourite Associate Staff Member"
- CVS Group plc Colleague Awards 2020 Highly Commended for "Best Clinical/Practice Director"
- Widely read, most downloaded 'Classic' Journal of Feline Medicine and Surgery article award in 2015, 2016 and 2021
- Winner of Best Poster Prize at 7th APP Congress, Barcelona, 2009
- Winner of Marbocyl Achievement Award at University of Glasgow, 2008
- Distinction, Level 5 Operations / Departmental Manager, City and Guilds, 2020

### Research Activity in 2023

In 2019, Pete the Cocker Spaniel gained widespread attention due to his unusual collapsing disorder that was captured in a video that went viral (jvim15660-sup-0006-VideoS4.mp4). Recognising this as a serious condition, we collected data from dogs suffering similar signs noting it was specific to spaniels located within the United Kingdom and three phenotypes were evident with collapse, a difficulty climbing stairs, and running like 'a dog in a computer game'. This data formed the basis of our investigation into the genetic origins of this geographically isolated condition (Stee et al. 2021). This led to us identifying a genetic test that is available for diagnosing this condition. By screening for the gene, breeders can avoid producing offspring with the disorder, ultimately reducing its prevalence in the spaniel population. This collaborative effort between researchers, veterinarians, and breeders highlights the importance of interdisciplinary approaches in tackling complex genetic conditions



## Mr Mark Lowrie

MA VetMB MVM DipECVN  
MRCVS

in animals. Through collaboration and clinical testing, we now hope to have closure. At Movement Referrals we are very aware of the number of dogs that suffer intervertebral disc disease (IVDD). In 2023, Mark Lowrie continued his support of the Kennel Club IVDD screening scheme in Dachshunds. The scheme uses radiographs of the spine to assess for disc calcifications in Dachshunds aged two to four years. In doing this, potential breeders are given a score and this can be used as guidance on mitigating the risk of producing puppies affected by IVDD. Mark is a member of the team of scrutineers responsible for evaluating these radiographs. Their efforts have resulted in the screening of over 300 Dachshunds and the publication of an open registry containing these scores. This registry enables breeders and owners to make well-informed decisions regarding Dachshund breeding practices.

### Publications in 2023

#### *Peer-reviewed research outputs*

Van Poucke M, Stee K, Lowrie M, Peelman L (2023). "The c.126C>A(p. (Cys42Ter)) SLC7A10 nonsense variant is a candidate causative variant for paradoxical pseudomyotonia in English Cocker and Springer Spaniels." *Animal Genetics* 54(4):483-490.

Lowrie M (2023). "In search of the best analysis regarding treatment for meningoencephalitis of unknown origin in dogs." *Frontiers in Veterinary Science* doi: 10.3389/fvets.2022.1062114.

Christen M, Gutierrez-Quintana R, James M, Faller KME, Lowrie M, Rusbridge C, Bossens K, Mellersh C, Pettitt L, Heinonen T, Lohi H, Jagannathan V, Leeb T (2023). "A TNR Frameshift Variant in Weimaraner Dogs with an Exercise-Induced Paroxysmal Movement Disorder." *Movement Disorders* 38(6): 1094-1099.

Mignan T, White R, Stee K, Bonanno G, Targett M, Lowrie M (2023). "Immune remission from generalized myasthenia gravis in a dog with a thymoma and cholangiocellular carcinoma." *Frontiers in Veterinary Science* doi: 10.3389/fvets.2023.1124702.

Thatcher H, Targett M, Alcoverro E, Stee K, Schofield I, Lowrie M, Gomes SA (2023). "Incidence and clinical characterisation of thoracolumbar intervertebral disc extrusions in Basset Hounds compared with Dachshunds." *Veterinary Record* 194(1): e3212.

Formoso S, Khan S, Lowrie M, Hughes J, Freeman P (2023). "Interobserver agreement of computed tomography in detecting calcified intervertebral discs in comparison with radiography in a population of 13 healthy British Dachshund dogs." *Veterinary Record Open* 10(1): e59.

Bentley RT, Fan TM, Lowrie M (2023). "Editorial: Chemotherapy and other pharmacotherapies for canine neurological disorders." *Frontiers in Veterinary Science* doi: 10.3389/fvets.2023.1323496.

#### *Book chapters*

Lowrie M (2024) Movement Disorders – tremors, paroxysmal dyskinesia and its mimics' in 'BSAVA Manual of Canine and Feline Neurology'; Beltran E, Platt S and Olby N (Eds), 5th Edition, British Small Animal Veterinary Association.

#### *Reviews*

Stee K, Van Poucke M, Lowrie M, Van Ham L, Peelman L, Olby N, Bhatti SFM (2023). "Phenotypic and genetic aspects of hereditary ataxia in dogs." *Journal Veterinary Internal Medicine* 37(4): 1306-1322.

### Reference

Stee K, Van Poucke M, Peelman L, Lowrie M (2020). "Paradoxical pseudomyotonia in English Springer and Cocker Spaniels." *Journal Veterinary Internal Medicine* 34(1): 253-257.

## Professor John Innes

BVSc PhD CertVR  
DSAS(orth) FRCVS



### Major Interests and Expertise

- **Clinical outcomes measures**
- **Osteoarthritis**
- **Total hip replacement**
- **Arthroscopy**
- **Humeral intracondylar fissure (HIF)**
- **Extracellular matrix biology**

### Career Summary

John Innes has over 30 years experience in small animal orthopaedics and spinal surgery. He has a PhD in canine osteoarthritis from University of Bristol and he was Professor of Small Animal Surgery at University of Liverpool (2001-2013) and Visiting Professor at University of Sydney in 2010. During his 22-year period in academia, he led clinical and laboratory research in to clinical outcomes measures, gait analysis, and extracellular matrix biology.

### Awards and Achievements

- Over 100 peer-reviewed papers
- 15 textbook chapters
- BSAVA Blaine Award (2023) for 'Outstanding contribution to Veterinary Science'
- Chair, RCVS Fellowship Board (2019-2022)
- Fellowship of Royal College of Veterinary Surgeons for 'meritorious contributions to knowledge' (2016)
- President, European Society for Veterinary Orthopaedics (2014-2016)

- BSAVA Simon Award (2005) for 'Outstanding contribution to Small Animal Surgery'
- British Veterinary Orthopaedics Association 'Leslie Vaughan' Prize (1997)
- H index: 30

### Research Activity in 2023

*'One cannot improve what one does not measure'. Measuring clinical outcomes is a prerequisite to quality improvement, and also important to identify problems and set expectations.*

Client-reported outcomes measures (CROMs) are increasingly important in veterinary medicine and surgery but such measures need to be carefully developed and validated. John Innes was one of the earliest proponents of CROMs and developed the 'Liverpool Osteoarthritis in Dogs' (LOAD) tool for outcomes assessment in canine musculoskeletal disorders. LOAD has been through validation processes and these have been previously published; LOAD is now recommended by the World Small Animal Veterinary Association for the assessment of chronic musculoskeletal pain in dogs (Monteiro, Lascelles et al. 2022).

In 2023, we provided the veterinary community with further data around the use of two CROMs, namely LOAD and the Canine Orthopedic Index (COI). We focussed on estimates for the 'minimal clinically-important differences' (MCID) for these tools in two clinical contexts: dogs with cranial cruciate ligament rupture (Innes, Morton et al. 2023), and dogs with osteoarthritis (Alves and Innes 2023). MCID is an important metric for several reasons. Firstly, it allows clinicians to understand whether a change in the score on these CROMs is clinically meaningful rather than just expected variance or



## Professor John Innes

**BVSc PhD CertVR  
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‘noise’. Secondly, for researchers and regulators, it provides a means to set thresholds for defining ‘success’ in clinical trials and assists in sample size estimates for appropriately powered clinical trials.

We are already seeing interest in the veterinary community from these publications with some researchers already using these data to design and initiate clinical trials. Indeed, we ourselves are currently using these metrics in a clinical trial comparing two treatments for canine osteoarthritis.

### Publications in 2023

#### *Peer-reviewed research outputs*

Allaith S, LJ Tucker, JF Innes, G Arthurs, A Vezzoni, S Morrison, J Onyett, CK Stork, P Witte, H Denny, R Pettitt, AP Moores, T Maddox and EJ Comerford (2023). “Outcomes and complications reported from a multiuser canine hip replacement registry over a 10-year period.” *Veterinary Surgery* 52(2): 196-208.

Alves, JC and JF Innes (2023). “Minimal clinically-important differences for the “Liverpool Osteoarthritis in Dogs” (LOAD) and the “Canine Orthopedic Index” (COI) in dogs with osteoarthritis.” *Plos One* 18(9).

Innes, JF, MA Morton and BDX Lascelles (2023). “Minimal clinically-important differences for the ‘Liverpool Osteoarthritis in Dogs’ (LOAD) and the ‘Canine Orthopedic Index’ (COI) client-reported outcomes measures.” *Plos One* 18(2).

Cachon T, O Frykman, JF Innes, BDX Lascelles, M Okumura, P Sousa, F Staffieri, PV Steagall and B Van Ryssen (2023). “COAST Development Group’s international consensus guidelines for the treatment of canine osteoarthritis.” *Frontiers in Veterinary Science* 10.

#### *Book chapters*

Innes JF (2023) ‘Practical tool: Assessment of Chronic Pain in Dogs and Cats’ in ‘Canine and Feline Clinical Nutrition’; Lenox C, Corbee RJ and Sparkes A (Eds), 2nd Edition, Embark Consulting Group LLC, Massachusetts

#### *Review articles*

Innes JF (2023) ‘How Client-Reported Outcome Measures Can Improve Veterinary Care’ *Today’s Veterinary Practice*, March/April 2023

Innes JF (2023) ‘X-ray tips for canine joint disease’ *Veterinary Times*, October 2023

### References

Monteiro, BP, BDX Lascelles, J Murrell, S Robertson, PVM Steagall and B Wright (2022). “2022 WSAVA guidelines for the recognition, assessment and treatment of pain.” *Journal of Small Animal Practice*

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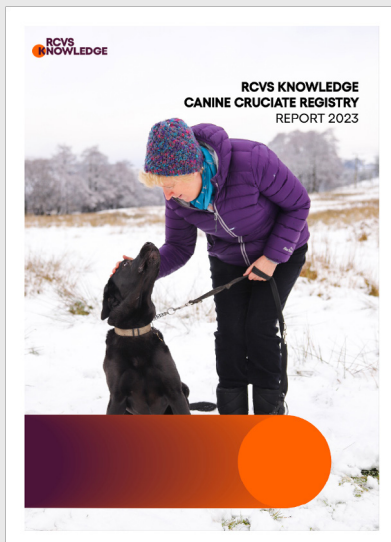


## In depth: the RCVS Knowledge Canine Cruciate Registry

### Mark Morton

BVSc DSAS(orth) MRCVS  
Director, Movement  
Referrals  
Clinical Lead, RCVS  
Knowledge Canine  
Cruciate Registry

The RCVS Knowledge Canine Cruciate Registry (CCR) launched in July 2021, with the aim of improving canine cruciate patient outcomes and minimising complications, by supporting clinicians to evaluate which surgical techniques and implants are most effective and advance their quality of care. The CCR is open to any veterinary surgeon in the UK performing any cruciate surgery technique. Outcomes are owner assessed using the Liverpool Osteoarthritis in Dogs (LOAD) questionnaire and the Canine Orthopaedic Index (COI). The CCR is endorsed by the British Veterinary Orthopaedic Association (BVOA). Surgeons can use the registry to monitor their own patients and can use the inbuilt reporting tools for personal clinical audit. Cases from across the registry are analysed centrally and the information presented here was published in the inaugural report which included data that had been collated from the first two years to July 2023.



**Since launch**  
**928 patients**  
**have been**  
**enrolled on**  
**the CCR.**  
**994 pathways**  
**and 735 surgical**  
**procedures have**  
**been logged.**



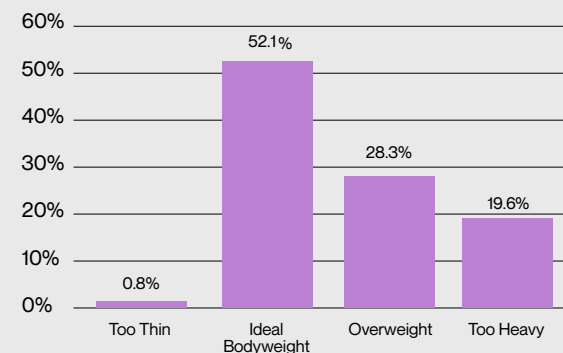
## Key extracts from the RCVS Knowledge Canine Cruciate Registry Annual Report 2023

### Background variables

The age of patients was calculated based on their age at the time of the procedure (or at the time of registration if no procedure was performed). Age ranged from 9 months to 15 years. The average age of patients was 7.2 years (median=7 years and 3 months). Age was recorded in 98.8% of pathways (n=982). The age recorded in 3 cases was outside of the biologically possible range so were excluded from this analysis.

85 different breeds were reported (n=994). The 5 most common were Labrador Retriever (9.3% n=88), English Springer Spaniel (5.0% n=47), Golden Retriever (4.8% n=45), Cocker Spaniel (4.1% n=39) and Staffordshire Bull Terrier (4.1% n=39). 5.1% of patients were Crossbreeds (n=48) though this figure does not include Crossbreeds that are non-kennel club registerable e.g. Cockerpoo, as these are recorded separately. The breed was unknown or not recorded in 10.7% of patients (n=101).

Body Condition Score was recorded by the veterinary surgeon following initial patient assessment of 50.2% patient pathways (n = 499) using the Royal Canin 9 point scale 3. 0.8% of patients were classified as 'Too Thin', 52.1% were of 'Ideal Bodyweight', whereas 28.3% were 'Overweight', and 19.6% of patients were 'Too Heavy'.





In depth:  
the RCVS  
Knowledge  
Canine Cruciate  
Registry

**Mark Morton**  
BVSc DSAS(orth) MRCVS  
Director, Movement  
Referrals  
Clinical Lead, RCVS  
Knowledge Canine  
Cruciate Registry

RCVS Knowledge  
Canine Cruciate Registry  
1st Annual Report.  
**The full report can be  
downloaded here**

Surgical procedures

735 surgical procedures were recorded. This represents 73.9% of patient pathways. The majority of procedures were osteotomies (Table 1). 1.3% (n=13) pathways had previously had surgery on the contralateral limb which were recorded in the CCR.

	Number (n)	%
CBLO	3	0.4%
CCWO	208	28.3%
Extracapsular	29	3.9%
TPLO	435	59.2%
TTA/MMP	60	8.2%
Total	735	

Table 1: Surgical procedures performed in 735 reports from the CCR

An intra-articular assessment was performed in 92.0% of procedures (n=676). This was performed via an arthrotomy in 98.0% of patients (n=662) and arthroscopically in the remainder. The degree of cranial cruciate ligament tear was recorded in 96.3% of these (n=651) with 78.3% being complete tears and 21.7% partial tears.

The status of the medial meniscus was recorded in 97.9% of pathways (n=662). A medial meniscal tear was identified in 36.2% of these patients. The tear was classified in 33.8% (n=224) of these cases with a 'bucket handle' tear being most common. A meniscal tear was recorded in 42.4% (n=216) of patients with a complete tear of the cranial cruciate ligament vs 17.0% of patients with a partial tear. A partial meniscectomy was performed in 89.0% of pathways where a medial meniscal tear was reported (n= 218). A meniscal release was reported in 1.6% of patients (n=4). Data in the

remainder was not reported or not classified consistently. A meniscal procedure was reported in 1.7% (n=7) of medial menisci that were classified as normal, including meniscal release in 3.

Outcomes

Primarily, outcomes are assessed using Client Reported Outcome Measures (CROMs). Owners are asked to complete both a baseline 'Liverpool Osteoarthritis in Dogs' (LOAD) and a 'Canine Orthopedic Index' (COI). Follow up questionnaires are sent after the procedure at 6 weeks, 12 weeks, 6 months, 1 year and then at yearly intervals. Both LOAD and COI scores are calculated on a numeric basis with a lower score being representative of better mobility. The maximum LOAD and COI scores are 52 and 64 respectively. In both CROMs, a clinical improvement is represented by a lower score when compared to the previous assessment point. Outcomes assessed by LOAD are displayed in Figure 2. There was an improvement in outcome scores following surgery with all procedures, though variation in the amount and rate of improvement.

Mean LOAD Score by Procedure

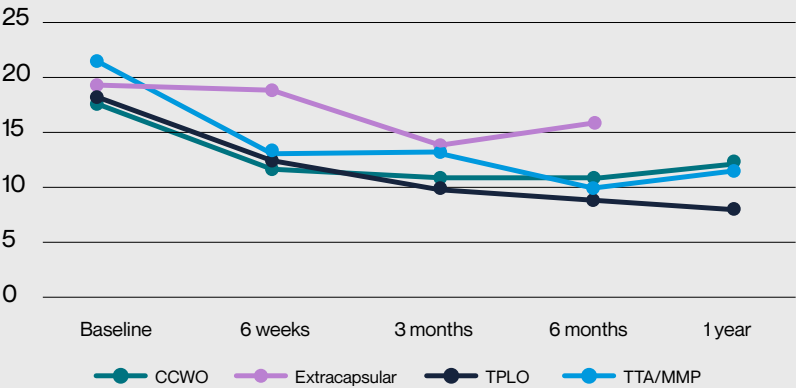


Figure 2: LOAD scores reported before and after surgery for dogs reported in the CCR

# Our Research Partners



## Our research partners

### Fusion Implants

Fusion Implants is committed to research, development and the advancement of veterinary orthopaedics. The Fusion Implants Team comprises mechanical and biomedical engineers, product designers, scientists and Specialist orthopaedic veterinary surgeons who have worked successfully on a number of innovative veterinary implant products since the company formed in 2013. Dr Dan Jones is managing director, and he also supervises PhD and Master students from the University of Liverpool.

The dynamic team has the right blend of expertise, experience and determination to constantly strive towards bringing the latest technology advancements and applying it to innovations within the veterinary sector.

**Registered address:** Fusion Implants,  
Liverpool Science Park, 131 Mount Pleasant,  
Liverpool, L3 5TF

**Tel.** +44 151 230 2121  
**Web.** [www.fusionimplants.com](http://www.fusionimplants.com)  
**Email.** [info@fusionimplants.com](mailto:info@fusionimplants.com)

Company number 08437560

**Fusion  
Implants**  
Advanced Veterinary Devices



### Veterinary Tissue Bank Ltd., Brynkinalt Business Centre, Chirk, Wrexham, UK

Veterinary Tissue Bank (VTB) is Europe's only veterinary tissue bank dedicated to helping companion animals in need of life changing surgeries. Its aim is to help pets who are afflicted with debilitating injuries by providing tissue transplants such as bone, cartilage, and tendons to improve their quality of life. Similar to human tissue donation, pet owners can donate tissues from their beloved pets.

VTB's work relies on the support of the pet owners who make the selfless decision to donate and the veterinary professionals to facilitate the donation process.

Movement Referrals and VTB work together on solutions for clinical orthopaedic and spinal problems. For example, the Humeral Condylar Repair System, in collaboration with Fusion Implants, uses VTB's canine demineralised bone matrix nanopaste to deliver bone graft to the humeral condyle to stimulate healing.

**Registered address:** Veterinary Tissue Bank Ltd,  
No. 1 The Long Barn, Brynkinalt Business Centre, Chirk,  
Wrexham, LL14 5NS, United Kingdom

**Tel.** +44 (0)1691 778769  
**Web.** [www.vtbank.org](http://www.vtbank.org)  
**Email.** [info@vtbank.org](mailto:info@vtbank.org)

Company number 06795761



## Professor Duncan Lascelles,

**Director of the Comparative Pain Research and Education Centre (CPREC), North Carolina State University, Raleigh, NC, USA**



Professor Duncan Lascelles is director of the Comparative Pain Research and Education Centre (CPREC). His research programme (Translational Research in Pain [TRiP]) is dedicated to answering critical questions about pain control and pain mechanisms through high quality, innovative research. His career has been focused on developing algometry methods (methods to measure pain) in spontaneous disease animal models (pets with naturally occurring disease), and probing tissues from well-phenotyped animals with spontaneous disease to understand the neurobiology, with a strong translational focus. The aim of his research is to improve pain control in companion animals, and facilitate analgesic development in human medicine. He has authored over 230 peer reviewed research papers and reviews (total citations >16,000; H index 70), and 240 research abstracts, as well as over 30 book chapters. He is an advocate for greater involvement of private practice in high quality clinical research, and delighted to partner in collaboration with Movement Referrals.

## Dr Brian Beale



Brian Beale is a equity shareholder and non-executive director of Movement Referrals. He attended the University of Florida College of Veterinary Medicine and also completed a 3 year residency in small animal surgery and joined the faculty there as an assistant professor from 1990–1992. Brian became board-certified by the American College of Veterinary Surgeons in 1991 and joined Gulf Coast Veterinary Specialists in 1992.

Brian has a special interest in arthroscopy, minimally-invasive surgery, fracture repair, joint replacement, treatment of arthritis, and pain management. He has many publications, including textbooks, textbook chapters and scientific articles. He is a past-president of the Veterinary Orthopedic Society, past-president of the Gulf Coast Veterinary Foundation and active in the American College of Veterinary Surgeons. He has been a board member for American Humane since 2017. Brian was awarded the Specialty Veterinarian of the Year Award by the Texas Veterinary Medical Association in 2010. Brian currently is the CEO of Beale's Best and Beale Veterinary Specialists in Victoria, Texas.

## RCVS Knowledge

RCVS Knowledge is an independent charity sitting at the heart of the UK veterinary professions with a mission to advance the quality of care for the benefit of animals, the public and society. To meet its goals, it supports and collaborates with veterinary teams on the ground and in practice, influences policy and engages with educators and other organisations. It translates and disseminates the latest research from across the globe, fosters approaches to shared learning with training and tools, and logs and tracks the evolving professions, underpinned by the veterinary archive.

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England & Wales No. 598443





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**movement**  
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