Abstracts for Research Presentations and Posters
Introduction and Welcome

I am very pleased to welcome you to this 8th Annual Scientific Meeting (ASM) of the Scottish Pain Research Community (SPaRC)! Those who came to the last seven meetings will remember, I am sure, productive and inspiring days, in which we introduced ourselves to each other, shared our work, and learned about some of the exciting Scottish research that is addressing the problem of pain.

The SPaRC ASM is developing as a welcome fixture on the Scottish Pain calendar, highlighting the wealth of research into pain around Scotland. The abstracts that were submitted for this year’s ASM, again cover the full scientific range, from the laboratory to the community and encompasses important clinical areas such as addiction, cancer, primary care, neuropathic pain and mental health. This year we have seen a significant and welcome increase in the number of research submissions. An important aim of SPaRC is to bring together researchers and clinicians from across the board, so that we can learn from each other, informing our research ideas and outputs, and fostering collaborations.

We also aim to promote the aspirations that:

1. clinical practice in managing chronic pain is informed by current research, and
2. current research in chronic pain is relevant to clinical practice

Over the last few years, we have introduced a new element, to ensure that the clinical relevance of all the presented research was clear, and how the findings can lead to improvements for people who experience chronic pain. Although this can sometimes be very obvious (as in the case of a successful new treatment), it is sometimes less direct (as in research on molecular mechanisms). Feedback indicated that this was a successful initiative, so we have continued with that this year. We have therefore asked today’s presenters to describe, in lay terms, what the scientific problem is that they are addressing, and how the findings might be of benefit to patients. Last year the “Dataltitz” session was introduced, and proved to be very popular, so this year, we have increased the number of selected posters for short oral presentations.

We are particularly pleased to welcome our guest speakers today, who are from diverse backgrounds and areas of expertise. We are honoured to be able to continue our emerging tradition of having internationally renowned keynote speakers: Professor David Williams is a Professor of Anesthesiology, Medicine (Rheumatology), Psychiatry, and Psychology at the University of Michigan where he also serves as the Associate Director of the Chronic Pain and Fatigue Research Center, Co-Director of Research Development within the Michigan Institute for Clinical and Health Research (MICH), and is on the senior faculty of the Neurosciences Program. He is also the President of the American Pain Society. Professor Andrew Todd is a Professor of Neuroscience and an Associate in Life Sciences at the University of Glasgow. His particular focus is the organisation of neuronal circuits in the spinal dorsal horn that underlie the perception of pain and itch.

We are extremely grateful to all of our presenters for their time and expertise in submitting and preparing posters and/or talks. I am looking forward to hearing the results of these and the associated discussions that are stimulated by them, and thank you in advance for your contribution to these discussions. This year we have introduced prizes for both oral and poster presentations, which will be awarded in the final session. Good luck to all participating.

I would like to thank the conference organizing committee: Professor Blair Smith, Professor Sue Fleetwood-Walker, Dr Mick Serpell, Professor Tim Hales, Dr Kathryn Martin, Dr Lars Williams, Dr Lars Williams, Dr Fiona Bull, Dr Paul Cameron, Dr Colin Rae and Professor Gary Macfarlane. It has been a real pleasure and privilege to work with them in preparing for the meeting. Finally, a very big thank you to our conference organizers Cara Richardson and Ruth MacDonald who have together ensured that all runs according to plan.

Lesley Colvin
Chair, Scottish Pain Research Community,
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### Abstract:

Traditionally, pain has been classified as being nociceptive/inflammatory or neuropathic. A third mechanism however may account for nearly half of all chronic pain cases and stems from aberrant perceptual processes within the central nervous system. These conditions manifest in varied body regions and often, more than one diagnosis is applicable. In aggregate, these conditions have been labeled Chronic Overlapping Pain Conditions and research on common etiology is in its infancy. Currently there are efforts to better understand mechanisms, develop new approaches to diagnostics, and to test new interventions and associated modes of treatment delivery for these conditions.
Abstract:
The dorsal horn of the spinal cord is the site of the first synapse in pathways carrying sensory information that is perceived as pain and itch. It therefore provides potential targets for the development of new treatments for these conditions. In addition, changes occurring in the dorsal horn are thought to contribute to the development of neuropathic pain after peripheral nerve injury. However, despite its obvious importance, we still know relatively little about the organisation of neurons within the dorsal horn, or about how these are organised into circuits that process sensory information. The main ascending pathway responsible for pain and itch is the anterolateral tract (ALT), which transmits nociceptive and pruritic information to several brain regions, including the thalamus. However, the cells of origin of the ALT account for only a small minority of the neurons in the dorsal horn, and the vast majority of these are interneurons, which take part in local circuits. These cells can be divided into 2 broad groups: inhibitory interneurons make up around a third of the neurons in laminae I-III, while excitatory interneurons account for the remainder. Cells belonging to each of these broad classes are heterogeneous, but recent studies have shown that several largely non-overlapping populations can be identified within each class, based on the expression of different neurochemical markers (e.g. neuropeptides). Neurochemical classification of dorsal horn interneurons allows selective manipulation of their function by means of molecular genetic approaches. Studies of this type have begun to reveal that different types of interneuron play specific roles in somatosensory processing. Emerging "transcriptomic" information will reveal the expression of proteins among different classes of spinal cord neuron, and taken together with our increased knowledge of the functions of different neuronal populations, should reveal new targets for treating pain and itch.
### Oral Presentations

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**Title**  
Early Life Stress Affects Pain and Morphine Analgesic Tolerance Through a β-arr2 Mediated Process

**Background**  
Exposure to Early Life Stress (ELS) has health implications in later life, including increased risk of pain, substance misuse and cardiovascular diseases. Opioids are the most commonly prescribed drugs in the treatment of pain. However, they also have detrimental effects such as respiratory depression and tolerance. Tolerance is problematic as it increases the dose of opioid required for analgesia. Patients differ in their baseline pain sensitivity and also in their responses to opioids. ELS exposure may affect an individual’s pain sensitivity and their response to the beneficial properties of opioids. The β-arr2 (β-arr2) / Src kinase signalling system has been implicated in pain sensitivity and morphine analgesic tolerance.

**Objective(s) – please include the “problem” being addressed in lay terms:**  
We hypothesise that ELS affects pain sensitivity and opioid analgesia by altering β-arr2 / Src kinase signalling. Our aim is to use a mouse model to establish the effect of ELS on sensitivity to acute nociceptive pain and analgesia in response to repeated daily morphine.

**Methods:**  
Neonatal WT or β-arr2/- mice were either control or underwent exposure to ELS. Once mature, mice were subjected to noxious heat to establish the latency for tail withdrawal before and after daily morphine administration for 10 days. Baseline latencies provide a measure of pain sensitivity.

**Results:**  
Mice exposed to ELS developed tolerance faster than controls. Initially ELS mice had increased baseline tail withdrawal latencies suggesting a reduced sensitivity to pain. ELS mice required a significantly higher dose of morphine to achieve analgesia compared to control mice. Neither control nor ELS β-arr2/- mice, developed tolerance to repeated daily injection of morphine. ELS exposed β-arr2/- did not have altered baseline tail latencies. This suggests that enhanced tolerance development and reduced basal pain sensitivity requires β-arr2 signalling.

**Conclusions:**  
Exposure to ELS reduces sensitivity to acute nociceptive pain and increases the dose needed to achieve analgesia. ELS causes more rapid development of morphine analgesic tolerance. These effects are mediated through β-arr2 mediated signalling.

**Relevance for patient care:**  
If our results using ELS in mice are applicable to patients, we anticipate that exposure to ELS alters patients’ responses to pain and their requirement for opioid analgesia.
Oral Presentations

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Title: The Symptom Burden of Opioid Endocrinopathy in Patients with Chronic Non-Cancer Pain

Background: Opioids are useful in the management of chronic non-cancer pain (CNCP), but responsible for a myriad of side-effects. Recently, attention has shifted to side-effects that are less well recognised, including the suppression of endocrine systems.

Objective(s) – please include the “problem” being addressed in lay terms: The primary objectives were to assess the symptom burden due to opioid endocrinopathy in patients with CNCP, and to examine the relationship between pain, reported symptoms and opioid use. Secondary objectives were to investigate the value of a screening questionnaire in identifying patients that may suffer hormone imbalance.

Methods: This was a cross-sectional questionnaire-based study. There is currently no validated questionnaire to assess endocrine status in this patient population. Therefore we constructed a novel questionnaire evaluating symptoms of hypogonadism, hypothyroidism and adrenal insufficiency. This was distributed alongside the Brief Pain Inventory (BPI) to patients attending pain clinics, treated with long-term opioid (n=99) or non-opioid (n=84) analgesia.

Results: Opioid use caused increased symptoms of endocrine dysfunction affecting all axes. Significant differences were observed in several symptoms associated with hypogonadism in males (P=0.001), hypothyroidism (P=0.0005) and adrenal insufficiency (P=0.002) compared to controls. Symptoms of adrenal or gonadal dysfunction in either sex were accompanied by greater average pain and pain interference (P<0.05).

Conclusions: Long-term consumption of opioids causes side-effects that may be attributed to opioid-induced inhibition of endocrine axes. These side-effects are associated with poorer treatment response, and may be managed by reducing or stopping opioids, opioid rotation; or hormone supplementation following endocrine investigation. This should be recognized by all practitioners prescribing opioids for CNCP.

Relevance for patient care: Side-effects of opioids can limit quality-of-life and therapeutic benefits, however they may not be routinely reported by patients. Addressing symptoms may provide much relief.
**Title:**
Does fibromyalgia influence biologic therapy response among patients with axial spondyloarthritis? Results from the BSRBR-AS.

**Background:**
Around 1/5 patients with axial spondyloarthritis (AxSpA) meet research criteria for fibromyalgia (FM). Such patients may be less likely to respond to biologic therapy.

**Objective(s) – please include the “problem” being addressed in lay terms:**
To determine the effect of FM on biologic therapy response, in patients with AxSpA.

**Methods:**
The British Society for Rheumatology Biologics Register in AxSpA (BSRBR-AS) recruits biologics-naïve patients with AxSpA. Data on disease activity (Bath Ankylosing Spondylitis Disease Activity Index (BASDAI)), quality of life (Ankylosing Spondylitis Quality of Life (ASQoL) questionnaire) and the American College of Rheumatology 2011 FM research criteria were collected when commencing biologics, plus 3, 6 and 12-month follow-up. Using the BSRBR-AS June 2017 dataset, multivariable linear regression was used to model the effect of FM on disease activity and quality of life. FM status (yes/no) was considered plus, separately, the components of the FM criteria – Symptom Severity Score (SSS) and Widespread Pain Index (WPI).

**Results:**
Amongst 291 participants who commenced biologic therapy and provided baseline FM data, 139 (48%), 123 (42%) and 74 (25%) provided outcome data at 3, 6 and 12-months. Those with FM had worse BASDAI and ASQoL scores throughout follow-up. At 3-months, no difference in BASDAI and ASQoL improvement was seen with FM status, or WPI, but every 1 unit increase in SSS resulted in a smaller improvement in BASDAI and ASQoL (-0.32 (95% CI: -0.53, -0.12) and -0.74 (-1.22, -0.25) respectively).

**Conclusions:**
AxSpA patients with comorbid FM and treated with biologic therapy show similar absolute improvement in disease activity and quality of life at 3-months, compared to those without FM. However, across all patients there is an inverse association between FM-like symptom burden and treatment response.

**Relevance for patient care:**
In addition to pharmaceuticals targeting inflammation, AxSpA patients with comorbid FM may benefit from specific FM management.
Oral Presentations

Authors’ Names: McQueenie R, Jani B, Hanlon P, Gallacher K, Lee D, Mair FS, Nicholl BI.

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Title: Prevalence of Chronic pain as a comorbidity to physical and mental health long-term conditions: results from UK Biobank

Background: Chronic pain, which impacts considerably on an individual’s quality of life is often considered secondary to other long-term conditions (LTCs). Few studies have examined its prevalence across specific LTCs or whether the number or location of sites of chronic pain are more common in certain LTCs. Understanding the prevalence and extent of chronic pain in LTCs could help to improve clinical guidance.

Objective(s) – please include the “problem” being addressed in lay terms:

To determine the prevalence of chronic pain (presence, extent, and body site) across a range of 43 self-reported LTCs. This was examined in a cross-sectional cohort using self-reported data from UK Biobank cohort of adults (37-73 years old) from the UK general population.

Methods:
We examined 500,444 participants with complete chronic pain and LTCs data (54.4% female; mean age 56.5 (SD 8.1)). Chronic pain:3 months or longer in the back, knee, neck/shoulder, hip, head, abdomen, face or “pain all over the body”. LTCs: self-reported: 43 LTCs recorded.

Results:
Of the 500,444 participants, 327,152 (65.4%) had ≥1LTC. Of these, 158,036 (48.3%) had ≥1 site of chronic pain (compared to 52,722 (30.7%) of those with no LTC); back pain was the most common site in both groups (43.9%, 35.3% respectively). Chronic pain was most prevalent in participants self-reporting migraine (75.3%; with 76.2% reporting head pain), painful conditions (72.4%; with 52.3% reporting back pain) and chronic fatigue syndrome (68.1%; with 38.8% reporting back pain). 23,032 (27.6%) of participants who self-reported having a chronic, long term painful condition had no self-reported sites of chronic pain.

Conclusions:
Chronic pain is highly prevalent people living with LTCs, yet its impact on health-related outcomes is not clear.

Relevance for patient care: The impact of chronic pain on LTC management in primary care has not been fully examined and merits further investigation.
Title: Incidence of iatrogenic opioid dependence or abuse following opioid analgesic treatment: A systematic review and meta-analysis.

Background: Opioid analgesics are shown to be effective in the treatment of acute pain and in managing pain in patients with a terminal diagnosis. Due to concerns about potential dependence and abuse, many physicians are reluctant to prescribe opioid analgesics in the longer term. The literature hypothesises, however, that inadequate analgesic prescribing may lead to ‘pseudoaddiction’ – addiction-like behaviour driven by the need for adequate pain management.

Objective(s) – please include the “problem” being addressed in lay terms: In light of the concerns over the risk of opioid misuse following analgesic prescribing, the primary objective was to undertake a systematic review and meta-analysis to examine the incidence of iatrogenic opioid dependence or abuse following opioid analgesic treatment.

Methods: A search strategy was developed using the PICOS framework. Electronic searches were undertaken using 6 research databases, supplemented by manual literature searches. Pooled incidence estimates were generated using a random effects model (DerSimonian-Laird method), with studies weighted according to the principle of inverse variance.

Results: Twelve articles met inclusion criteria resulting in a total of 310,408 participants. The pooled estimate of incidence of iatrogenic opioid dependence or abuse was shown to be 4.7%. Subgroup analyses showed that there was no gender difference, but that a significantly lower incidence was associated with the use of strong opioids (0.7%) and longer-term prescribing (≥3 months; 2.3%).

Conclusions: Physician concerns over longer-term prescribing of opioid analgesics to patients with non-malignant pain may be over-inflated. Furthermore, these findings suggest the possibility that inadequate prescribing may contribute to increased opioid abuse, possibly via the mechanism of pseudoaddiction.

Relevance for patient care: Patients with non-malignant chronic pain may be being unnecessarily undertreated, based on over-inflated concerns with iatrogenic opioid dependence or abuse.
### Title:
Further characterisation of an incision model of post-operative pain

### Background:
Postoperative pain occurs in around 50% of patients regardless of age (Couceiro et al., 2009). A prominent symptom is hypersensitivity to dynamic mechanical stimuli, for example pain in response to skin stroking. However most pre-clinical pain models only test sensitivity to ‘punctate’ and not ‘dynamic’ mechanical stimuli (Mogil, 2009). In cancer patients treatment often includes surgical intervention followed by adjuvant chemotherapy. Chemotherapy-induced neuropathic pain (CINP) is a significant clinical problem with up to 60% of patients developing pain symptoms (Seretny et al., 2014). Altered intra-epidermal nerve fibre density (IENFD) has been implicated in CINP vulnerability (Kosturakis et al., 2014). However, it is not known whether surgical incision alters IENFD or increases risk of persistent pain.

### Objective(s) – please include the “problem” being addressed in lay terms:
To assess whether surgical incision results in ‘dynamic’ touch-evoked pain or altered IENFD in a preclinical post-operative pain model

### Methods:
The animal work was approved by the UK Home Office and carried out in accordance with Animals (Scientific Procedures) Act 1986, following applicable aspects of the ARRIVE Guidelines. Hindpaw plantar incision was performed under isoflurane anaesthesia in male Sprague-Dawley rats (Brennan et al., 1996). Dynamic touch-evoked pain sensitivity was measured by brushing a paintbrush along the plantar surface of the hindpaw and scoring the behavioural response (Duan et al., 2014). Punctate mechanical and thermal sensitivity were also measured. 3mm biopsies were collected on post-surgical day 10 from both the incision site on the incised hindpaw, and the untreated contralateral hindpaw. Tissue was sectioned and immunostained for nerve fibres (PGP9.5) and basement membrane (Collagen IV) and IENFD quantified.

### Results:
Dynamic mechanical sensitivity was significantly increased up to 3 days post-surgery (n=11, p<0.0001, two-way RM ANOVA). Punctate mechanical and thermal hypersensitivity were also evident. IENFD is significantly reduced following surgical incision, ten days after surgery (n=6, p=0.001, two-tailed, unpaired t-test) when tissue has healed and pain hypersensitivity largely resolved.

### Conclusions:
Dynamic alldynia has been demonstrated for the first time in an incision model of postoperative pain. IENFD is altered following surgical incision, in a pre-clinical model of post-operative pain.

### Relevance for patient care:
Demonstration of dynamic alldynia in this preclinical model will facilitate study of underlying mechanisms and treatment of this debilitating symptom. The observation that incision leads to altered IENFD, that is a potential risk factor for CINP, may provide insight into why some but not all patients develop CINP.
## Authors' Names: LaKrista Morton, Marijn de Bruin, Gary J Macfarlane

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## Title:  
Patterns of perceptions about back pain and their relationships with illness behaviours: a cross-sectional analysis.

## Background:  
Individuals may manage their back pain in a way that makes sense within the context of a set of perceptions that they hold about it. However, few studies have aimed to understand the relationships between illness perceptions and illness behaviours – despite interventions being carried out, like media campaigns, which have aimed to influence illness behaviours by changing perceptions of back pain.

## Objective(s) – please include the “problem” being addressed in lay terms:  
To explore:  
1) Whether different groups of individuals can be identified with specific illness perceptions;  
2) Relationships between these identified groups and different illness behaviours.

## Methods:  
A cluster analysis was conducted of illness perceptions within a sample of adults experiencing back pain (n=1343). Univariate logistic regression was used to investigate relationships between identified clusters and different illness behaviours. This was followed by a multivariate analysis which investigated these relationships adjusting for reported symptom characteristics to see whether relationships attenuated.

## Results:  
We identified four distinct clusters of individuals based on their illness perceptions. Relative to Cluster 1, other clusters had higher likelihoods of contacting a GP (Cluster 4 OR 2.70, 95% CI: 1.63-4.47), a physical therapist (Cluster 2 OR 1.95, 95% CI: 1.16-3.28) and using medication (Cluster 4 OR 1.58, 95% CI: 1.05-2.38). They were also associated with a lower likelihood of reporting self-care of pain (Cluster 2 OR 0.61, 95% CI: 0.42-0.88; Cluster 4 OR 0.49, 95% CI: 0.33-0.74).

## Conclusions:  
These findings highlight that the interpretation of back pain, rather than the presence of pain itself, is an important determinant of illness behaviour. A cluster analysis provided a meaningful classification of individuals based on their illness perceptions, as these clusters were related to different illness behaviours independently of symptom characteristics.

## Relevance for patient care:  
Targeting specific patterns of illness perceptions may lead to changes in how individuals manage their back pain.
Authors’ Names: Cara Richardson, Katherine Berlouis, Blair H. Smith, Alex Baldacchino, Pauline Adair, Steve Gilbert, Rebecca Lawrence and Lesley Colvin

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Title: A systematic review of interventions to reduce use of prescribed opioids in patients with chronic non-malignant pain

Background:
Chronic non-malignant pain is a significant public health issue, affecting up to 46% of the population. Strong opioid use for chronic pain has increased dramatically, despite lack of evidence of long term efficacy and safety. Effective strategies to support patients in reducing or stopping opioids are urgently needed.

Objective(s) – please include the “problem” being addressed in lay terms:
The aim of this review was to assess the recent evidence for effective opioid reduction interventions in patients with chronic pain.

Methods:
Seven databases were searched EMBASE, MEDLINE, Cochrane Central Register of Controlled Trials (CENTRAL), PubMed Central, Web of Science, CINAHL and PsycNET from 4th April 2013 to 20th of July 2017. Eligible studies were prospective randomised controlled trials or systematic reviews of interventions to reduce or discontinue opioids for chronic pain, compared to standard care, placebo, or active control.

Results:
A total of 2,254 studies were retrieved, of which two met inclusion/ exclusion criteria, one of which was a systematic review. Studies provided information on 205 participants and demonstrated initial moderate quality evidence for the use of MORE (Mindfulness Oriented Recovery Enhancement). The studies were limited by small sample size and issues surrounding blinding.

Conclusions:
Despite the need for effective opioid reduction strategies, there is very limited good quality evidence. A limited number of moderate quality small studies were identified, with some evidence for the use of psychologically based techniques, such as mindfulness.

Relevance for patient care:
Chronic opioid use, especially at higher doses, may be associated with harms such as increased risk of overdose, misuse and dependence. There is a need for further exploration of strategies to reduce opioid use in chronic pain patients.
## Authors’ Names:  Dr Gillian Anderson (ST5 Psychiatry), Veronica Davey (Specialist Nurse, Lothian Chronic Pain Service), Dr Rebecca Lawrence (Consultant Psychiatrist), Professor Lesley Colvin (Consultant/Hon Professor in Anaesthesia and Pain Medicine)

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### Title: Evaluating outcomes of chronic pain patients with problematic prescription opioid use, admitted to an in-patient detox facility for conversion to sub-lingual buprenorphine.

### Background:  
Chronic pain patients may develop problems with opioid use, often being prescribed high doses, despite limited analgesic benefit and adverse effects. There is limited evidence for strategies to reduce intake, but long acting opioids have a good evidence base for stabilisation in substance misuse.

### Objective(s) – please include the “problem” being addressed in lay terms:  
The aim of this service evaluation was to assess outcomes from a novel approach we are using in NHS Lothian, with in-patient conversion of prescription opioids to buprenorphine.

### Methods:  
Patients were identified using previous referrals to the inpatient addictions unit, and pain clinic data obtained via the electronic records system. We collected basic demographic data; information on chronic pain; psychiatric co-morbidity; substance misuse; medication on admission; success of conversion; and subsequent changes in opioid medication.

### Results:  
15/20 patients consented to use of data. 11/15 (73%) were female; mean duration of admission was 5.6 (2-17) days. 2 (13%) had specific opioid related side effects; 14 (93%) had a co-morbid psychiatric diagnosis; 1 patient (7%) had a history of alcohol dependence. The most common chronic pain diagnosis was cancer-treatment related pain (4 patients, 27%). All 15 were successfully converted to buprenorphine. 10 (67%) discharged on buprenorphine remained on this at outpatient review, 3 (20%) remained on other opioids, and 1 (7%) was not prescribed opioid analgesia. We were unable to obtain current data on 1 patient who had moved away. Pre- and post-admission BPI scores were available for 12 patients. 10 patients either had same or improved total BPI after conversion, with 2 patients having worse scores.

### Conclusions:  
In-patient conversion from high dose opioids to buprenorphine was successful in this patient group, with the majority remaining on buprenorphine post discharge. Further work is required.

### Relevance for patient care:  
Use of sublingual buprenorphine with inpatient conversion may offer a novel strategy for chronic pain patients with opioid problems.
**Oral Presentations**

**Authors' Names:** Abirami Veluchamy, Harry L. Hébert, Weihua Meng, David L.H. Bennett, Colin NA Palmer, Blair H. Smith  
**Lead Author:** Abirami Veluchamy  
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**Title:** A genome-wide association study identifies a novel neuropathic pain susceptibility locus.

**Background:**  
Neuropathic pain (NP) is an increasingly common chronic pain state, affecting approximately 7-10% of the general population and up to 26.4% of individuals with diabetes. Emerging evidence suggests that genetic factors could partially explain individual susceptibility to NP and the estimated heritability in twins is 37%.

**Objective(s)**  
To perform a genome-wide association study (GWAS) to identify novel genetic variants associated with NP risk.

**Methods:**  
We conducted a GWAS of NP on 2050 cases and 3495 controls of European ancestry from the GoDARTS comprises of individuals with and without diabetes. Association analyses were performed using logistic regression adjusted for age and gender. Cases were defined as subjects having a prescription record of at least one of the following medications: pregabalin, gabapentin, duloxetine, capsaicin and lidocaine plasters. Controls were defined as subjects not having a prescription record of any of these drugs or of tramadol, amitriptyline or nortriptyline. Subjects with epilepsy and/or on any anti-epileptic medication concomitantly with pregabalin or gabapentin alone were excluded from analysis.

**Results:**  
We found a genome-wide significant single nucleotide polymorphism (SNP) associated with NP at 6p22.3 mapping to PRL, prolactin (OR=1.54; 95% CI, 1.32-1.78; P=2.5×10^-8). This non-coding variant is associated with the expression of PRL in brain-hippocampus. PRL has been previously reported to play a role in post-operative pain responses. We identified a suggestive signal at 9q34.3 (OR=1.65; 95% CI, 1.37-2.00; P=3.3×10^-7) near CACNA1B, voltage-dependent calcium channels. We also replicated a previously reported SNP at 22q12.3 near CACNG2 associated with NP.

**Conclusions:**  
This study presents a novel genetic variant and a biologically relevant suggestive SNP associated with NP that warrants further studies, and replicates a previously identified association.

**Relevance for patient care:**  
Our findings provide insights into the genetic mechanisms underpinning NP and may elucidate biomarkers for clinical prognosis and drug targeting.
## Title:
Assessment of outcomes following interventional procedures for pain management - 5 years of outcomes in Glasgow

## Background:
We introduced a patient questionnaire to assess outcomes after interventional procedures for pain management in our pain service in 2011, presenting an audit of the first year of outcomes in 2013. We now revisit this audit with five years of outcome data.

## Objective(s) – please include the “problem” being addressed in lay terms:
An analysis of all post-procedure questionnaires completed in the 5 years from August 2011.

## Methods:
The original outcomes questionnaire was developed by a multi-disciplinary team, then validated and further modified after a pilot study. Every patient attending for an interventional procedure for pain management in Greater Glasgow and Clyde is given the questionnaire immediately after their procedure, and asked to return it after 8 weeks. Questions include duration and degree of pain relief, changes in analgesic use, quality of life, and side effects. Data is stored and analysed in an Access database.

## Results:
For the period 1/08/11-31/07/16, a total of 3092 questionnaires were returned, an estimated return rate of 45%. The most commonly performed procedures were sacro-iliac joint injection, lumbar facet joint injection, and caudal epidural. Overall, 61% of patients reported more than 30% pain relief and 49% of patients had a reduction in pain lasting longer than 5 weeks. If a positive response is defined as >30% relief for >4 weeks, 45% were responders. 35% of responders reduced their analgesic intake, 50% reported improved sleep, 55% reported improved mobility and 74% reported an improvement in their quality of life. 24% of patients complained of minor, transient side effects.

## Conclusions:
Interventional procedures provided most of our patients with a period of pain reduction, sometimes leading to improvement in sleep, quality of life and mobility and medication reduction. Future work will concentrate on improving the questionnaire return rate.

## Relevance for patient care:
Our growing database of operator and procedure-specific outcomes allows us to provide accurate information to patients and audit our own practice as part of clinical governance.
**Title:**  
Psychological predictors of outcome from interventional analgesic procedures in chronic low back pain: a feasibility study

**Background:**  
The evidence base to support injections and radiofrequency procedures for treatment of chronic low back pain (CLBP) is weak, and response to these procedures is variable. Research suggests that emotions and beliefs can influence the outcome of spinal surgery and dorsal column stimulator implantation, but the role of psychological factors as predictors of outcome from injections for CLBP is unknown.

**Objective(s) – please include the “problem” being addressed in lay terms:**  
Do psychological variables predict outcome from CLBP injections?

**Methods:**  
Patients attending the South Glasgow pain service for any injection (steroid or radiofrequency) for CLBP between July 2016 and April 2017 were invited to participate. 86 patients completed a questionnaire pre-procedure (time 1), 65 at 6 weeks post-procedure (time 2), and 48 at 10 weeks post-procedure (time 3).

Outcome measures were: pain (NRS) and disability (Roland and Morris SIP). Predictor variables were: psychological distress (HADS); pain-related fear (TSK); pain catastrophising (PCS); and adult attachment style (ECRM). Statistical analyses were performed using R.

**Results:**  
Pain decreased significantly between time 1 and 2 and time 1 and 3. Disability decreased significantly between time 1 and 2, but not significantly between time 1 and 3.

Mixed linear modelling showed that anxiety, depression, and pain catastrophising were positively related to pain and disability, but they were not predictive of changes in these over time. Pain related fear and anxious attachment were positively related to disability but not pain, and neither was predictive of changes in these over time.

**Conclusions:**  
Steroid and radiofrequency injections for low back pain led to improvements in pain and disability. Many of the psychological predictors were related to pain and disability in expected ways. However, we found no evidence that emotional problems, beliefs, or attachment style predicted the degree of improvement in pain and disability following injections.

**Relevance for patient care:**  
Psychological variables appear not to predict outcome following injections for CLBP.
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**Title:**
Cooled radiofrequency denervation for sacroiliac joint pain: a case series of 100 procedures over a four year period.

**Background:**
The sacroiliac joint is a complex wedge-shaped shaped synovial joint. It is generally accepted to account for 15-30% of low back pain. Pain that fails to respond to conservative treatment can be targeted by radiofrequency denervation of the lateral branches of the L5, S1, S2, and S3 dorsal rami.

**Objective(s) – please include the “problem” being addressed in lay terms:**
We sought to audit our local outcomes from sacroiliac joint radiofrequency denervation over our initial four year experience.

**Methods:**
A single clinician performed 100 sacroiliac denervation procedures on 61 patients. All patients had low back pain localised to the sacro-iliac region, and reported at least 60% temporary relief of this pain following at least two prior sacroiliac joint steroid injections. The effect on pain intensity, mobility, medication use and sleep were recorded, alongside negative outcomes such as complications or side-effects, in accordance with the IMMPACT recommendations.

**Results:**
From the 100 procedures performed, sixty-two patients reported greater than 60% pain relief, 17 reported 30-60% relief, four reported less than 30% relief. In terms of mobility, 55 reported it had improved. Fifty-one percent reported much improved quality of life. Seven patients experienced complications which comprised mild post-procedural pain (six patients) and one case of “moderate pain” secondary to neuritis. In terms of duration of pain relief, the average duration for all-comers including those with no relief was 7.4 months (range 1-24 months, median 6). Considering only those who had a significant response to the procedure, the average duration of relief was 8.9 months (range 3-24 months, median 8).

**Conclusions:**
Our experience suggests that a significant proportion of patients with low back pain of sacroiliac aetiology will benefit from radiofrequency denervation of the sacroiliac joint. The incidence of complications in our investigation was low.

**Relevance for patient care:**
Sacro-iliac joint denervation using cooled radiofrequency ablation can be used successfully for patients with refractory pain as part of an MDT delivered package of care.
**Authors’ Names:** Weihua Meng, Mark Adams, Andrew McIntosh, Blair Smith

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**Title:** a genome-wide association study suggests genetic variants for abdominal pain indicating Mediterranean fever

**Background:**  
Abdominal pain is a major symptom of Mediterranean fever and it occurs in over 95% of all patients.  
In the UK Biobank pain questionnaire, participants were asked ‘in the last month have you experienced abdominal pain that interfered with your usual activities?’

**Objective(s) – please include the “problem” being addressed in lay terms:**  
To identify genetic variants that associated with abdominal pain using a genome-wide association study

**Methods:**  
A standard genome-wide association study was applied adjusting with age, sex, BMI and population principal components. For genetic information, the UK Biobank released the genetic information of 150,000 participants on September 2016. For phenotypes, the ‘abdominal pain’ cases in this study were those who answered ‘Yes’ to the specific pain question. The controls in this study were those who selected the ‘No’ to the question. A P value of less than $5 \times 10^{-8}$ was considered to be significant.

**Results:**  
After quality control filtration such as removing non-British samples, we have a total GWAS sample size of 47087. The top 2 SNPs were located in the upstream of the MEFV gene in the chromosome 16, which is a causative gene for Mediterranean fever. Rs192539666 with a $P$ value of $2.50 \times 10^{-10}$, an odds ratio of 7.8 was the strongest hit. The minor allele frequency of this SNP is 0.0004.

**Conclusions:**  
This GWAS has suggested new SNPs which might be responsible for abdominal pain indicating Mediterranean fever.

**Relevance for patient care:**  
As 20% of the Mediterranean fever patients cannot be explained by existing mutation check within the MEFV gene. These two genetic variants outside the gene can provide extra genetic evidence to explain or diagnosis this disorder.
**Title:** Community-based Pain Education Sessions: An evaluation.

**Background:**
The sessions were devised by Glasgow Pain Management Team, jointly delivered by NHS GG&C and Pain Concern. The sessions included an introduction to pain neurophysiology education (PNE) and advice on self-management. Both forms of education found support in the SIGN guidelines for the management of chronic pain.

**Objective(s) – please include the “problem” being addressed in lay terms:**
To provide a detailed evaluation of the sessions from the patient attendees’ perspective, including identifying strengths and improvements that could be made to future sessions.

**Methods:**
One hundred and ninety eight patient attendees completed a questionnaire allowing quantitative and qualitative data to be collected. Quantitative data captured patient attendees’ ratings of different aspects of the sessions. Qualitative data captured the reasons why they would recommend the sessions to others. The quantitative data was analysed producing descriptive, summary statistics and qualitative data was analysed using a thematic analysis.

**Results:**
The quantitative results show that the helpfulness and explanations given by staff were the most highly rated aspects of the sessions. Waiting room and group room comfort were the most poorly rated. Thematic analysis results outlined one overarching theme: changes in thinking, behaviour, and attitude towards pain management. This was underpinned by three subordinate themes: thoughts less focused on a medical management of pain, feeling more hopeful about the future, and greater peer support.

**Conclusions:**
The pain education sessions were consistently highly rated by patient attendees and the positive impact of the sessions was evident. The vast majority of attendees said they would recommend the sessions to others. There were specific concerns about some of the sites where classes were delivered and changes have been made to the form to allow us to more clearly identify these problem areas.

**Relevance for patient care:**
The sessions provide an introductory source of PNE to individuals within the community and support patients to actively play a role in the management of chronic pain, with the aim of sustaining effective day-to-day management.
Title: Pilot evaluation of the utility of a novel tool to enhance communication in chronic pain consultations – The Navigator Tool Intervention.

Background: Self-management has been highlighted as one of five recommended treatment strategies for living with long-term pain (SIGN 136). Pain Concern previously evidenced multiple barriers to supported self-management for those experiencing chronic pain (Gordon et al. 2016). Using the House of Care model, both HCPs and patients must be engaged and prepared to successfully support a holistic care approach. Poor communication, between patients and healthcare professionals (HCPs), can leave patients feeling misinformed or uninformed in regards to self-management.

Objective(s) – please include the “problem” being addressed in lay terms: The Navigator Tool Intervention (NTI) aims to address the limiting effect of communication on self-management. It offers a framework to structure communication for both HCPs and chronic pain patients. The study aimed to achieve this by (1) piloting the NTI and assessing its efficacy in improving communication regarding self-management (2) develop a suitable method of evaluating the NTI to inform a future longitudinal study with a larger sample size.

Methods: Randomized controlled trial at 5 Scottish primary care sites (5 HCPs, 38 patients). HCPs attended one half-day training on supported self-management. Intervention patients received the Navigator Tool and were instructed to see their HCP 2-3 times over 3 months. Control patients were not sent the tool and were told to engage with HCP as normal.

Quantitative analysis of feedback questionnaires completed by all patients regarding: satisfaction with the consultations and HCP communication, change in self-efficacy, perceived participation in decision-making.

Thematic analysis of interviews with randomly sampled patients and HCPs, discussing their experiences of the NTI.

Results: Preliminary results from data collected January-February 2018, final results will be presented at a future conference.

Conclusions: N/A

Relevance for patient care: Poor communication is an addressable contributing factor to improving supported self-management.
**Title:**
Do pain interventions improve work outcomes for people with back pain? A review of reviews.

**Background:**
Back pain (BP), a common condition among the working population, is one of the largest causes of work-related absence in the UK. People with BP have identified the ability to return to work as an important priority. While exercise and multidisciplinary rehabilitation (MDR) have been previously shown to improve both pain and function in people with BP, it is unclear whether these interventions improve work outcomes.

**Objective(s) – please include the “problem” being addressed in lay terms:**
To review the evidence on the effect of exercise and MDR on work outcomes among persons with BP.

**Methods:**
Medline, EMBASE and Cochrane databases were searched in April 2017. Reviews and/or meta-analyses that assessed exercise or MDR and reported work-related outcomes were identified and their results were synthesised.

**Results:**
From 2046 identified reviews, 13 were included. Seven reviews (including 2 meta-analyses) considered exercise interventions. Each review included relatively few trials (median=5), with considerable clinical heterogeneity. The largest (a Cochrane review) included 25 trials, nine reported as low quality. Pooled data on chronic BP (5 trials, n=1093) showed intense physical conditioning reduced absenteeism at 12 months compared to usual care (standardised mean difference:-0.23; 95% CI:-0.42, -0.03). Six reviews considered MDR (including 4 meta-analyses). However, of the four meta-analyses, only two pooled results on work. Again, each review included few trials (median=4). The largest meta-analysis examined chronic BP and included 14 trials. Pooled data (8 trials) showed MDR reduced long-term absenteeism compared to physiotherapy (OR=1.87; 1.39, 2.53). Five out of six reviews concluded that MDR effectively reduced absenteeism, but all highlighted that MDR content varied between trials.

**Conclusions:**
There is promising evidence that exercise and MDR reduce work absenteeism as well as improve pain and function.

**Relevance for patient care:**
Work is an important patient outcome. Future trials should include assessment of work outcomes as a central component of standard pain trials.
Menthol reduces phototoxicity pain in a mouse model of photodynamic therapy

Background:
Phototoxicity-induced pain is a major clinical problem triggered by light acting on photosensitising drugs or endogenous porphyrins, notably protoporphyrin IX (PpIX), an intermediary in heme biosynthesis. PpIX accumulates in individuals with erythropoietic protoporphyria and is elevated during photodynamic therapy subsequent to application of 5-aminolevulinic acid (ALA). Pain occurs during irradiation of PpIX and responds poorly to conventional analgesics.

Objective(s) – please include the “problem” being addressed in lay terms:
Our objective was to develop a model of PpIX phototoxicity pain and investigate the potential of menthol as an analgesic.

Methods:
We developed a behavioural assay for PDT pain in mice. Electrophysiological recording from culture primary afferent dorsal root ganglion neurons was used to establish the effect of phototoxicity on action potentials.

Results:
Application of ALA to the tails of C57 black and SWISS white mice caused PpIX accumulation and nociception during irradiation (630 nm at 3.7 J/cm2). Despite similar PpIX accumulation, C57 mice exhibited less pain behavior compared with SWISS mice because of light absorption by pigmentation.
Irradiation of ALA-treated dorsal root ganglion neurons caused phototoxicity-evoked action potentials (APs) in both mouse strains. The antioxidant L-tryptophan increased the light dose required to elicit such APs. By contrast, the addition of keratinocytes to neuronal cultures decreased the threshold for APs, suggesting a requirement for proliferating cells. Inhibition of fatty acid amide hydrolase, selective antagonism of TRPV1 or the application of lidocaine or its quaternary derivative QX-314, reduced AP frequency, whereas antagonism of TRPA1 had no effect.

Conclusions:
These results suggest that products of singlet oxygen–mediated lipid peroxidation trigger nociceptor activation via TRPV1. Menthol inhibited phototoxicity-evoked APs and reduced pain behavior when applied topically to mice.

Relevance for patient care:
These findings suggest that menthol might provide pain relief in patients experiencing PpIX–phototoxicity pain caused by photodynamic therapy (PDT) or erythropoietic protoporphyria. We will begin a small clinical trial of menthol as an analgesic during PDT.
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**Title:** Differences between two neurochemically well defined excitatory interneuron populations in the mouse superficial dorsal horn

**Background:** The superficial dorsal horn where nociceptive afferents make central terminals also consists of heterogeneous populations of spinal interneurons. Lately we begin to uncover separable populations, in particular by looking at neurochemical substances expressed by interneurons as molecular identifiers.

**Objective(s) – please include the “problem” being addressed in lay terms:** As for a case of excitatory interneurons, we demonstrated that four non-overlapping populations were identified by expression of neurotensin, neurokinin B, gastrin releasing peptide (GRP) and substance P (SP). However, we still have little to know about their roles in sensory processing and connectivity within the dorsal horn. Here, we focus to study two populations marked by GRP and SP by using the spinal cord obtained from transgenic (GRP-eGFP and Tac1-cre) mice.

**Methods:** To assess physiological properties of GRP and SP interneurons, whole-cell patch-clamp recording was performed on slice spinal cord preparations. Anatomy of these interneurons was investigated with a tracing technique such as microinjection of cholera toxin B subunit (CTb) or fluorescent viral vector (AAV.flex.eGFP) to the spinal cord.

**Results:** GRP and SP expressing interneurons did show a unique difference in electrophysiology. A predominant pattern to fire action potentials was so-called ‘transient’ in GRP whereas ‘delayed’ in SP interneurons. Anatomically, axons of GRP interneurons did not extend rostrocaudally beyond a few spinal segments. On the other hand, SP interneuron axons appeared to do so and also innervate the lateral spinal nucleus (LSN), which suggests a role in propriospinal information processing.

**Conclusions:** GRP and SP interneurons possess distinct properties in cellular physiology and anatomy, which likely supports that these two populations would play differential roles over nociception.

**Relevance for patient care:** To understand defined spinal interneurons amongst the heterogeneous mix not only deserves a scientific merit but also contributes to clinical understanding about sensory-related pathology like neuropathic pain, allodynia and hyperalgesia.
Title: A modified model of endometriosis for studying pain and lesion progression

Background: Endometriosis affects 127 million reproductive age women worldwide and is characterised by chronic inflammation and pelvic pain. It is defined by the presence of ectopic endometrial-like tissue (lesions) commonly in the pelvic cavity. Current treatments are limited to surgical excision of lesions or suppression of ovarian function. To address the unmet clinical need for new treatments for endometriosis appropriate preclinical platforms are required. Endometriosis is thought to develop due to ‘retrograde menstruation’. Our group has developed a mouse model using ‘menses’ endometrial tissue injected into the pelvic cavity of ovariectomised recipient mice. Lesions form which phenocopy those observed in patients.

Objective(s) – please include the “problem” being addressed in lay terms: Our objective was to refine our model to allow longitudinal imaging of lesions and to correlate disease severity with pain.

Methods: We used a minimally invasive model where endometrial tissue was injected into intact mice. This allows us to examine pain specific to the disease that is not confounded by surgery or hormonal manipulation. We conducted bioluminescent imaging to establish lesion size and location in vivo. Pain response was measured using von Frey filaments applied to the abdomen and hind-paw.

Results: Our data indicate that mice with lesions have a lower withdrawal threshold when filaments are applied to the abdomen and hind-paw compared to controls. Lesion location appears to influences secondary hyperalgesia, where lesions induced hyperalgesia in the ipsilateral hind-paw, and not the contralateral hind-paw.

Conclusions: This model will contribute to a better understanding of pain outcomes in endometriosis based on the ongoing pathology of the lesions.

Relevance for patient care: We hope our model will provide an optimised preclinical platform to understand the mechanisms of pain signalling in endometriosis, and to test new therapies for the treatment of endometriosis.
**Authors’ Names:** Allen C Dickie¹, Marami Mustapa¹, Noboru Iwagaki¹, Kelly M Smith², Robert J Callister², Brett A Graham², Andrew J Todd¹ and David I Hughes¹

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**Title:**
Calretinin-expressing dorsal horn inhibitory interneurons presynaptically inhibit nociceptive C fibres

**Background:**
Inhibitory interneurons in the spinal dorsal horn play a crucial role in controlling the transmission of somatosensory information from the periphery to the brain. Spinal inhibition is diminished in some chronic pain states, and inhibitory interneurons therefore represent a target for analgesic development. The circuitry through which inhibitory interneurons modulate the transmission of sensory information is poorly understood, in part due to the difficulty in identifying distinct interneuron populations. In the superficial dorsal horn, calretinin (CR) is primarily expressed in excitatory interneurons, however we have recently identified a population of inhibitory CR interneurons. Preliminary data suggest that these inhibitory CR neurons are likely to contribute to presynaptic inhibition of C fibres.

**Objective(s) – please include the “problem” being addressed in lay terms:**
The aim of this study was to characterise CR-expressing inhibitory interneurons, and to assess their role in inhibiting C fibre input to the spinal cord.

**Methods:**
Patch-clamp electrophysiology and immunocytochemistry was used to characterise CR inhibitory interneurons.

**Results:**
Electrophysiological recordings showed that CR neurons predominantly receive monosynaptic C fibre input, which includes TRPV1-lacking input that is indicative of non-peptidergic (MrgD+) C fibre input. Anatomical analysis found that CR neurons have islet cell morphology and that their dendritic spines and axonal boutons frequently contacted MrgD+ boutons, indicating they receive input from and provide inhibitory input to C nociceptors. We also found that CR neurons do not belong to other previously described inhibitory interneuron groups.

**Conclusions:**
We have identified a previously unrecognised group of calretinin-expressing inhibitory interneurons in the dorsal horn. Our findings suggest that these cells are a major source of presynaptic inhibition for non-peptidergic C nociceptors.

**Relevance for patient care:**
Spinal inhibition is reduced in some chronic pain conditions, therefore dorsal horn inhibitory interneurons represent a potential target for the alleviation of pain. In identifying a previously undescribed population of inhibitory interneurons we have increased our understanding of spinal circuitry, which could inform analgesic development.
Authors’ Names: Fiona Bull, Daniel Baptista-Hon, Claire Sneddon, Lisa Wright, Wendy Walwyn, Tim G. Hales.

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Title: Src Kinase Inhibition Reduces Morphine Tolerance without Affecting Reinforcement

Background:
Continuous opioid administration produces tolerance characterised by reduced analgesic potency. Pain management is also affected by the hedonic effects of opioids, the cause of their misuse. The protein β-arrestin2 regulates these effects and participates in opioid tolerance.

Objective(s) – please include the “problem” being addressed in lay terms:
Opioid drugs are used to treat severe pain. Many patients receive prolonged opioid administration. However analgesic tolerance develops rapidly, leading to the requirement for dose escalation for adequate pain control and increasing side effects as a result of this.

Methods:
We investigated the role of Src kinase in morphine analgesic tolerance, locomotor stimulation, and reinforcement in wild-type (C57), μ+/−, μ−/−, and β-arrestin2−/− mice.

Results:
Wild-type mice treated with morphine exhibited tolerance, analgesia declined by day 10 to a median of 62% maximum possible effect (interquartile range, 29 to 92%). Tolerance did not occur in mice receiving dasatinib. Tolerance was enhanced in μ+/− mice (34% maximum possible effect; interquartile range, 5 to 52% on day 5). Dasatinib attenuated tolerance (100% maximum possible effect; interquartile range, 68 to 100%), as did PP2 (91% maximum possible effect; interquartile range, 78 to 100%). Inhibition of c-Src affected neither reinforcement nor morphine-evoked locomotor stimulation. Dasatinib attenuated tolerance and reversed established tolerance in μ+/− mice.

Conclusions:
Inhibition of c-Src promotes sustained opioid mediated analgesia. This occurs without altered psychomotor or reinforcing effects of morphine. This suggests that inhibitors of c-Src reduce opioid tolerance without increasing reward. The c-Src inhibitors administered alone had no effect.

Relevance for patient care:
The restoration of analgesia through inhibition of c-Src, without affecting the hedonic effect of morphine, makes c-Src inhibitors promising candidates as adjuncts to opioid analgesics.
**Authors’ Names:** Pamela Andrews  

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**Title:**  
Fibromyalgia: The Diagnostic Journey  

**Background:**  
Fibromyalgia (FM) is an extremely debilitating condition, with an estimated worldwide prevalence of 1.8%. The diagnosis of FM is often complex and lengthy, leading to frustration in not only the patient but also the healthcare practitioner(s) involved in the patients’ health care. Lengthy diagnosis times can impact patient satisfaction and illness behaviour.  

**Objective(s) – please include the “problem” being addressed in lay terms:**  
To examine the journey of individuals from presenting with their first symptom to a diagnosis of FM.  

**Methods:**  
Participants were recruited via social media to participate in an anonymous web-based survey. The survey consisted of a series of validated and self-developed questionnaires and was available online between February 2016 and August 2016. Data were collected and managed using REDCap, and was approved by Glasgow Caledonian University Ethics Committee.  

**Results:**  
1296 individuals from 26 countries agreed to participate. 94.5% were female, with a mean age of 45.1±11.4, with 51.1% being unemployed. 82% presented to their GP, with pain in multiple locations (75%), fatigue (63%) and difficulty sleeping (44%) being the most common initial symptoms. Individuals experienced a total of 5.4±4.4 symptoms and pain in 11.0±5.3 locations. Following presentation, the most common outcomes were “wait and see” (41.2%) and being sent for tests (36.1%), and 27.2% received an alternative diagnosis. A diagnosis was most often done by rheumatology (67.5%). 60% were diagnosed within 4 years, presenting to approximately 4.9±5.9 different practitioners with on average 24.8±43.3 visits before receiving a diagnosis.  

**Conclusions:**  
This study highlights the extremely complex, lengthy process individuals go through before reaching a diagnosis of FM.  

**Relevance for patient care:**  
It is important as clinicians to better understand the complexities surrounding the presentation of FM, improved diagnostic pathways may allow quicker diagnosis, which may reduce the burden on the health care system and improve patient satisfaction.
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### Title:  
Prevalence of neuropathic pain and associated factors in a Scottish diabetic cohort. A DOLORisk Study.

### Background:  
Neuropathic (nerve) pain (NP) arises through disease or direct damage to the somatosensory system and is associated with reduced quality of life, reduced employability and increased financial burden on healthcare resources. Not everyone with a relevant disease or lesion develops NP and those that do have varying degrees of severity.

### Objective(s) – please include the “problem” being addressed in lay terms:  
To identify (non-genetic) factors associated with chronic NP and determine its prevalence in the diabetic cohort GoDARTS.

### Methods:  
Participants of GoDARTS (n=5,242) were posted a self-complete questionnaire on pain duration, location and severity, as well as health related quality of life (HRQoL), psychological and personality traits and smoking and alcohol history. Questionnaire data were linked to pre-existing demographic and biomedical data by electronic record linkage. Participants with possible chronic NP (PCNP; pain duration ≥3months, DN4 ≥3) were compared to those with chronic nociceptive pain (duration ≥3months, DN4 <3) and those with no pain. Variables were analysed using binomial regression with backward stepwise elimination. Significance was set at $P = 0.05$.

### Results:  
A total of 1,915 (36.5%) returned a completed questionnaire and PCNP prevalence was 25.1% (482/1915). Factors significantly associated with PCNP versus chronic nociceptive pain were pain catastrophizing (OR=1.04), and Creatinine (OR = 1.00). Factors significantly associated with CPNP versus no pain were pain catastrophizing (OR=1.06), HRQoL (<0.001), being open to new experiences (OR=1.24), age (OR= 0.95), female gender (OR=2.04).

### Conclusions:  
This study demonstrates that clinical, psychological and demographic factors are associated with PCNP. The estimated prevalence of 25.1% is broadly in line with previous studies in diabetic populations.

### Relevance for patient care:  
This study provides clues as to the biological pathways involved in NP, which can potentially be targeted by therapies to treat the disorder. The association of specific factors will also help identify patients at increased risk of developing NP, so that it can be more effectively managed by healthcare providers.
**Title:** Assessment of Pain in the Critical Care Survivor

**Background:**
Pain poses a unique challenge to the critical care team, and often remains unresolved. This has deleterious physiological and psychological effects on the patient.

**Objective(s) – please include the “problem” being addressed in lay terms:**
This study aims to assess thoroughly the characteristics of pain in recently discharged critical care survivors; and identify the prevalence, intensity and determinants of this pain.

**Methods:**
66 patients were approached to complete a mixed methods questionnaire upon ICU discharge. Information was collected on pain location, severity and psychological impact. These were then analysed with the patients’ demographic and clinical information.

**Results:**
88% of patients reported having pain, with 56% being classified as moderate-to-severe. Pain was most commonly reported in the lower back (47%), and patients with sepsis or cardiovascular failure reported the highest pain severities. Risk factors predisposing to severe pain included presence of neuropathic symptoms and pre-existing chronic pain. 9% of patients were found with symptoms of PTSD, and this was associated with more severe pain.

**Conclusions:**
Pain remains a severe and persistent problem in survivors of critical illness, especially in septic and cardiovascular patients. Further studies are needed to investigate therapeutic interventions that can address this long-term problem.

**Relevance for patient care:**
This study highlighted that critically ill patients’ self-report frequent experiences of severe persistent pain. Additionally it showed subgroups of patients particularly at risk of experiencing severe pain. This is relevant as improving pain management in these patients will reduce the physiological and psychological burden associated with severe pain.
**Datablitz Presentations**

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**Title:**  
An Evaluation of the Impact of Primary Care Musculoskeletal (MSK) Physiotherapy Transformation Projects across Scotland.

**Background:**  
In 2017 the Scottish Government, through the Scottish School of Primary Care, requested an evaluation of primary care transformation of MSK physiotherapy delivery across Scotland; determining new models of service delivery.

**Objective(s) – please include the “problem” being addressed in lay terms:**  
Phase 1 involves the evaluation of new models of MSK physiotherapy delivery in primary care within all Scottish Health Boards, narrowing to a smaller number of case studies in Phase 2 for in-depth evaluation. This evaluates tests of change in order to advise on future implementability, sustainability and spread.

**Methods:**  
Phase 1: new models of MSK primary care will be identified, characterised and anticipated outcomes documented through interviews with key stakeholders in each health board and documentary analysis. Phase 2: Explores barriers/facilitators to implementation, examining impact, learning, spread and sustainability of a selected number of tests of change through semi-structured interviews and analysis of documentary evidence, alongside other appropriate methods.

**Results:**  
Phase 1 has identified two main tests of change rolled out across Scottish health boards: Advanced Physiotherapy Practitioners within GP surgeries (within 12/14 Health boards) and the use of NHS24 MATS (within 10/14 health boards). These tests of change have been implemented differently dependent on context and funding; the subject of in-depth evaluation in phase 2.

**Conclusions:**  
We will provide an overview of the new models of care being deployed Scotland-wide, identifying key implementation barriers and facilitators. These results are relevant to those involved in designing, implementing or evaluating new models of MSK physiotherapy delivery.

**Relevance for patient care:**  
Changes in MSK physiotherapy service delivery is expected to ensure patients see the correct health professional at the correct time, potentially impacting positively on GP workload and the 4 week waiting target set by Scottish Government. Evaluating the implementation of changes can help to establish good practice for future models of MSK physiotherapy delivery in primary care.
### Datablitz Presentations

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### Title:
Language of Pain: Merging multiple voices for improved chronic pain management

### Background:
Despite scientific medical evidence showing effective chronic pain management strategies, prevalence of chronic pain has remained relatively static through the years. Experiencing chronic pain can influence a human being in a wide variety of ways affecting mood, ability to interact and cope. Identification of the causes of pain, mechanisms that address the problem and the impact of the pain are important factors in problem solving towards self-management and efficient interaction with health professionals. Consequently, management of chronic pain is an interdisciplinary task that takes into account many stakeholders, including the chronic pain sufferer.

### Objective(s) – please include the “problem” being addressed in lay terms:
The objective of this study is to explore chronic pain management from the interdisciplinary group of healthcare providers. Our aim is to identify communities of practice in the wider team and try to identify efficient management strategies.

### Methods:
This study adopted a design research approach that engaged patients with chronic pain and a range of health professionals: GPs, physical therapists, pharmacist’s, psychologists, pain specialists, community nurses as well as policy makers to explore the current practice for management of chronic pain in the region of Grampian. Health professionals were engaged in semi-structured interviews to explore current practice and experiences of management of chronic pain. People living with chronic pain were engaged in four focus group interviews to gather lived experience and scenarios of future healthcare.

### Results:
Primary results show limited evidence of stringent standardized management and highlight that clinical patient pathways are difficult to identify. The study opens up many further research topics that may shed light on how to enable a larger pain management team to join forces.

### Conclusions:
The output from the interviews are realised in a series of visualisations that represent the perspectives of those involved and highlight the perceived current landscape of chronic pain management in Grampian.

### Relevance for patient care:
This study aims to reduce barriers and realise opportunities for improved chronic pain management as identified by those experiencing chronic pain and those delivering chronic pain management care.
**Title:** "Well I wasn’t kind to myself before, I was tough on myself” Compassion Focused Therapy in a Pain Management Programme: Patient & Clinician Experiences

**Background:**
Living with persistent pain is associated with loss of identity, increased isolation and judgement from others. The emotional and cognitive effects can include shame and self-criticism, which can impact ability to self-manage and adjust to living with pain. Compassion Focused Therapy (CFT) has been developed to address shame and self-criticism. Emerging evidence suggests CFT is linked to reductions in pain catastrophising, improvements in psychological wellbeing, lower pain interference and engagement in self-management.

**Objective(s) – please include the “problem” being addressed in lay terms:**
To find out what patients thought of the CFT component of the Pain Management Programme (PMP) to enable further development. To find out about clinicians’ experiences of integrating CFT into a multidisciplinary PMP.

**Methods:**
12 participants from three Pain Management Programmes and four psychologists and four physiotherapists were invited to participate in semi-structured interviews. Framework analysis was used to analyse transcripts from 20 interviews.

**Results:**
Themes identified:
- Understanding the problem – starting point
- Drawing and reflecting on links
- All in the same boat
- The take away
- CFT suitability to Pain Management
- Clinicians’ views of how CFT is being received by patients

**Conclusions:**
Although novel for participants, self-compassion was identified as an important factor in adjustment to living with persistent pain.
All clinicians felt that CFT is helpful to people with persistent pain and fits well within a PMP. In the clinicians’ experiences, patients presenting with high levels of shame and self-criticism had greater difficulty engaging with the concept of compassion.

**Relevance for patient care:**
This research will contribute to the development of using CFT in a PMP and increase clinicians’ knowledge of enabling changes to ‘view of self’, feelings of shame and self-criticism as part of learning to live with pain.
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**Title:**  
GP direct access to Pain Rehabilitation Services: outcomes from a pilot scheme

**Background:**  
Many specialist chronic pain services including NHS Lanarkshire operate with consultants as the front line service, providing assessment and managing onward referral to pain rehabilitation from this point. However, there is an increasing shift in the emphasis of long term condition management for chronic pain, including both medicines management and pain rehabilitation (SIGN 2013; Realising Realistic Medicine CMO Scotland, 2017). Therefore, it may be more appropriate to explore primary care routes for these services for a proportion of patients referred to the chronic pain service.

A GP with an interest in chronic pain (KD) managed referrals from one practice for pain rehabilitation, and referred into chronic pain physiotherapy as an initial point of access to rehabilitation services, including to 1:1 chronic pain physiotherapy, self-management course, pain management programme, psychology.

**Objective(s) – please include the “problem” being addressed in lay terms:**  
To find out if GP direct referrals be appropriate for specialist pain rehabilitation. To monitor if these patients will require further consultant level care in addition to this pathway.

**Methods:**  
After an initial meeting with the staff involved, GP referrals (from KD) were accepted to the chronic pain physiotherapy list for one year. Data was collected on: attendance, flow through the service, and a check on the hospital system was performed 2 months after completion of the pilot to review further attendance/referrals for pain services.

**Results:**  
11 were referred, 9 attended. After assessment, patients were either taken on for individual input and/or referred to psychology, the pain management programme and the self-management course by the physiotherapist. No patients had been referred to, or attended with the consultant level service following the GP referral to pain rehabilitation.

**Conclusions:**  
There is potential to develop links between appropriately trained GPs and pain rehabilitation services for a more streamlined approach to research based, chronic pain care.

**Relevance for patient care:**  
This model has potential to deliver care in a timely manner with the emphasis on research based options. This could help consultants to prioritise their time to those who may be more likely to respond to interventions and lead to cost savings associated with this appointment for this group of patients.
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Title: Using FLO to Engage Patients on Tayside Pain Management Programme

Background: Tayside Pain Management Programme (PMP) is an 11 week programme based on an Acceptance and Commitment Therapy (ACT) approach. An early audit revealed issues with both patient drop-out rates and ongoing engagement with programme tasks. FLO is a home and mobile monitoring solution that uses a simple text messaging system to support people managing their own health conditions. Patients require a mobile phone which receives text messages.

Objective(s) – please include the “problem” being addressed in lay terms: This is a pilot project to assess the use of FLO as a tool to improve engagement with our PMP. We aim to investigate both patients’ and clinicians’ experience of using FLO in an ACT based PMP.

Methods: FLO was piloted with one group of our PMP. Two messages were sent each week to promote engagement and to encourage homework completion. Some messages required a response.

Additional messages were sent as reminder of cancelled sessions due to public holidays or change of venue. All messages signed by FLO to give a more human element. Patient experience was measured using a patient evaluation questionnaire and clinician experience was explored.

Results: Initial response was very positive with 100% sign up. Early feedback from the first half of the course demonstrated satisfaction with the number of text messages received. Clinicians found FLO user friendly and that it allowed more efficient use of time. Full results available in February.

Conclusions: A successful pilot of FLO in the PMP setting has been well received. It is hoped that the increased professional support throughout the programme will encourage patients to take more responsibility for the self management of their chronic pain condition. Further results will be described once our trial has concluded.

Relevance for patient care: Offer improved support to patients undertaking the PMP through increased contact with them.
Poster Presentations

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Title:
Data and Measurement for Chronic Pain Services. A Project to Inform National Service Improvement.

Background:
In Scotland, and across the world, chronic pain is the greatest cause of disability [1]. The prevalence of chronic pain depends on the precision of definition and identification. Improving outcomes for chronic pain patients is a priority area for the Scottish Government, and NHS Scotland, and there has been substantial investment in service improvement [2].

Objective(s) – please include the “problem” being addressed in lay terms:
This project was set up in answer to the lack of standardised routine data reporting across Chronic Pain Services in Scotland.

Methods:
Routine clinical data from NHS Tayside, Lothian and Fife was assessed (between 2014 and 2016). Feasibility and psychometrics of outcome measures was evaluated. A clinician questionnaire was administered to assess use of I.T. systems and any issues. From these findings, Quality Performance Indicators (QPIs) and a Core Dataset for Chronic Pain were developed.

Results:
The timing of data collection varied across health. Data across all three health boards are used in planning individual care. 50% of sampled clinicians indicated there a lack of clarity in regards to the usefulness of the collected data. The speed of I.T. Systems was rated by clinicians as the most poorly rated feature of their clinical databases, with ‘lack of time’ rated the most significant barrier to data entry.

Conclusions:
There is currently a large quantity of data being collected, with no unified approach in subsequent use. From the results, this project has made initial recommendations for a sustainable and standardised approach to Pain Services across Scotland, with a view to extending to Primary Care and other related services.

Relevance for patient care:
This research aims to provide a clearer picture of chronic pain in Scotland, developing and implementing a unified approach to data collection in NHS Pain Services.

References
**Poster Presentations**

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**Title:**
Do pharmacological interventions improve work-related outcomes in people with knee pain? A systematic review.

**Background:**
Knee pain (KP) is common amongst working age people, and work-related factors, such as kneeling, have been shown in its aetiology. Patients identify being able to remain in their work as a key outcome of management of KP.

**Objective(s) – please include the “problem” being addressed in lay terms:**
To determine which pharmacological interventions for KP deliver the best work-related outcomes.

**Methods:**
We conducted a systematic literature review. The databases EMBASE, Medline and AMED were searched until October 2017 to identify randomised controlled trials (RCTs) that assessed the effectiveness of pharmacological interventions for KP in relation to work outcomes. Reference lists of relevant publications and clinical trial registry were also searched. Two reviewers independently selected eligible trials and assessed the risk of bias in the included RCTs.

**Results:**
From 644 identified records, 5 RCTs (3 were from clinicaltrial.gov) with 1,879 participants were eligible. Interventions included hyaluronic acid injections, serotonin-norepinephrine reuptake inhibitors (SSRIs), and opioids. Work was the primary outcome in only one study and there was little overlap in the specific work outcomes assessed. Trials had moderate to high risk of bias. Two of the three unpublished trials which investigated SSRIs found significant effects of duloxetine in decreasing work-related pain interference versus placebo at week 13 and 8, respectively (mean difference=-0.87, p=0.001; -0.85, p<0.001, respectively). One trial of hyaluronic acid injections found them to be more effective in improving activity compared to saline (VAS score improved from 59 to 22 at 12-week, p<0.0001). And one trial on opioids also concluded that tapentadol seemed to be more effective in improving at-work productivity compared to placebo.

**Conclusions:** Although an important patient outcome, this review demonstrated there is almost no evidence available on which pharmacological interventions for KP deliver the best work outcomes.

**Relevance for patient care:**
This review highlights that future trials of KP must include assessment of work as a key outcome.