choice of definition may identify different people and patterns of pain severity. If remote monitoring of flares is to inform clinical practice and research, it is important to understand the implications of these choices.

Objectives: Investigate the frequency of pain flares from daily pain symptoms under various definitions in a population with chronic pain.

Methods: Participants with chronic (≥ 3 months) musculoskeletal pain in the smartphone study Cloudy with a Chance of Pain² reported daily pain severity and impact of pain on a 5-point scale. Pain flares were defined in five ways:

1. *Worse than average:* pain severity higher than personal median
2. *Above threshold:* pain value 4 or 5
3. *Move to above threshold:* pain value 1 or 2 or 3 yesterday to 4 or 5 today
4. *Absolute change:* 2-point increase in pain since yesterday
5. *Composite:* 2-point increase in pain severity since yesterday and impact 4 or 5

Daily pain-flare rate was calculated by dividing the number of pain flares by the number of days a pain flare would have been possible, hereafter called *at-risk days* (def. 1+2: total days of symptom entry; def 3 to 5: days of data entry for which participant also entered data on preceding day). Monthly pain-flare rates per person were calculated by multiplying the rate by 30.

Results: The study smartphone app was downloaded by 13 256 people. After excluding people that never reported pain severity ($n=2020$), did not complete the baseline questionnaire ($n=947$), stayed in the study for less than 7 days ($n=3418$), and reported non-musculoskeletal chronic pain ($n=728$), 6143 were eligible for analysis.

Abstract OP0071 – Table 1. Participants with pain flares and monthly pain flare rates under 5 definitions

	Participants with ≥ 1 flare (%)	Flares	Monthly pain flare rate
Worse than average	5304 (86.3)	1 09 616	8.0
Above threshold	5627 (91.6)	1 18 596	8.7
Move to above threshold	4246 (69.1)	33 661	3.2
Absolute change	3940 (64.1)	22 173	2.1
Composite	2577 (42.0)	9531	0.9

Table 1 shows that the portion of eligible people with at least one pain flare varies by definition, with 42% reporting at least one pain flare according to the most restrictive classification criterion. Depending on the criterion used, the monthly pain-flare rate per ranges from 0.9 to 8.7.

Under the 'worse than average' and 'above threshold' definition, most participants have more than 10 pain flares per month (figure 1). Under the two most stringent definitions, most participants have between 0 and 3 pain flares per month.

Conclusions: The five plausible definitions for a pain flare are demonstrated to generate quite different flare rates through time. Pain flares in people with chronic musculoskeletal pain, however, remain common even as classification criteria become increasingly strict. As daily data collection of patient-generated data becomes possible, careful thought must be given to flares should best be defined for clinical practice and research.

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OP0072 SLEEP PROBLEMS AND FATIGUE AS A PREDICTOR FOR THE ONSET OF CHRONIC WIDESPREAD PAIN OVER A 5- AND 18-YEAR PERSPECTIVE. A 20-YEAR PROSPECTIVE STUDY

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Background: If localised pain represent one end of a pain spectra, with overall better general health, chronic widespread pain (CWP) and fibromyalgia represent the other end of the spectra with worse general health and more comorbidities with other somatic diseases and mental illness. Sleep problems and fatigue are common among individuals reporting CWP and previous research indicate that sleep problems may be an important predictor for pain prognosis.

Objectives: The aim of this population-based study was to investigate if sleep problems and fatigue predict the onset of CWP 5 and 18 years later.

Methods: In order to get more stable baseline classifications of CWP, a wash-out period was used, including only individuals who had not reported CWP (according to ^{ACR 1990} criteria for fibromyalgia) at baseline (-98) and three years prior baseline (-95). In all, data from 1249 individuals entered the analyses for the 5 year follow-up (-03) and 791 entered for the 18 year follow-up (-16). Four parameters related to sleep (difficulties initiating sleep, maintaining sleep, early morning awakening and non-restorative sleep), and one parameter related to fatigue (SF-36 vitality scale) were investigated as predictors for CWP. Binary logistic regression analysis were used for analyses.

Results: All investigated parameters predicted the onset of CWP five years later (problems with initiating sleep (OR 1.91; 1.16–3.14), maintaining sleep (OR 1.85; 1.14–3.01), early awakening (OR 2.0; 1.37–3.75), non-restorative sleep (OR 2.27; 1.37–3.75) and fatigue (OR 3.70; 1.76–7.84)) in a model adjusted for age, gender, socio-economy and mental health. All parameters except problems with early awakening predicted the onset of CWP also 18 years later. In all, 785 individuals did not report any of the sleeping problems at baseline (fatigue not included), 268 reported one of the problems, 167 two, 128 three and 117 subjects reported to have all four sleep problems. Reporting all four sleep problems was significantly associated with CWP at follow-up at both time points when adjusting for age, gender, socio economy and mental health (OR 4.00; 2.03–7.91 and OR 3.95; 1.90–8.20); adjusting for age, gender, socio economy and number of pain regions (OR 2.94; 1.48–5.82 and OR 2.65; 1.24–5.64) and in a model adjusting for age, gender, socio economy and pain severity (OR 2.97; 1.53–5.76; and OR 3.02; 1.47–6.21) for the 5 year and 18 year follow-up respectively, compared to not reporting any of the sleep problems at baseline.

Conclusions: Both sleeping problems and fatigue predicts the onset of CWP 5- and 18 years later. The results highlight the importance of the assessment of sleep quality in the clinic.

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OP0073 CENTRAL SENSITISATION PREDICTS FATIGUE INDEPENDENTLY OF MUSCULOSKELETAL PAIN

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Background: Fatigue is a common musculoskeletal (MSK) pain comorbidity that is associated with increased healthcare use and poor quality of life. Central sensitisation (CS), the amplification of sensory input across multiple systems, has been associated with MSK pain. It has been hypothesised that similar mechanisms may explain the co-occurrence of fatigue, but data are conflicting.

Objectives: To test the hypothesis that CS was associated with the presence of fatigue, and to establish whether the relationship was independent of the relationship between MSK pain and fatigue.

Methods: 2455 participants in a prospective cohort study completed a baseline questionnaire collecting data on fatigue (Chalder Fatigue Scale, score 0–33 (CFQ); pain (body map, score range 0–44); demographics (date of birth, sex); Rapid Assessment of Physical Activity (RAPA); analgesic use; and mental health (Hospital Anxiety and Depression (HAD) scale). During a clinic visit a random sample of participants ($n=290$, 11.8%) had a wind-up ratio test (the perceived intensity of a single 256mN pinprick/intensity of a series of 10 pinpricks) at the thenar eminence of the right hand (WUR-H) and dorsum of the left foot (WUR-F) to assess CS, and bioelectric impedance (Tanita BC-418 Segmental Body

Composition Analyzer) to determine proportion body fat. All participants were followed up 12 months later, at which time they completed the CFQ. Linear regression, with inverse probability sampling weights, tested the relationship between WUR at baseline and CFQ at 12 months, adjusted for baseline CFQ, demographics, lifestyle factors, HAD and in a final model baseline MSK pain. Results are expressed as beta coefficients with p values.

Results: The median (IQR) WUR-H and WUR-F were similar (2.4 (1.5, 3.8) and 2.5 (1.6, 4.0) respectively), did not differ by sex but were significantly lower in older people. After adjusting for age and sex, WUR-H ($\beta=0.17$, $p=0.00$) and WUR-F (0.18, 0.00) predicted CFQ at follow-up. In a fully adjusted model, WUR-H (Model 1: 0.13, 0.00) and WUR-F (Model 2: 0.13, 0.00) predicted CFQ at follow-up, independently of baseline MSK pain. Independent predictors of CFQ were age, MSK pain, depression, anxiety, physical activity and body fat (table 1).

Abstract OP0073 – Table 1

Baseline predictors of fatigue at 12 months

	Model 1 – Hand (β , p-value)	Model 2 – Foot (β , p-value)
Wind-up ratio	0.13–0.00	0.13–0.00
Age	0.03–0.00	0.04–0.00
Gender	–0.41, 0.05	–0.46, 0.05
HAD Depression	0.18–0.00	0.18–0.00
HAD Anxiety	0.30–0.00	0.30–0.00
RAPA	–0.25, 0.00	–0.19, 0.00
% body fat	0.03–0.004	0.04–0.002
Analgesic use	0.03–0.34	0.05–0.12
MSK pain	0.11–0.00	0.10–0.00

Conclusions: Fatigue is predicted by CS, independently of the presence of MSK pain. For those seeking to treat fatigue, the potential benefit of interventions which reduce sensitisation should be investigated.

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OP0074

ASSOCIATION BETWEEN BRAIN-DERIVED NEUROTROPHIC FACTOR GENE POLYMORPHISMS AND FIBROMYALGIA IN A KOREAN POPULATION: A MULTI-CENTRE STUDY

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Objectives: Several lines of evidence suggest that brain-derived neurotrophic factor (BDNF) is involved in the pathophysiology of fibromyalgia (FM) and studies have found that FM patients have altered serum and plasma BDNF levels. However, it is not known whether polymorphisms of the *BDNF* gene are associated with FM. In this study, we explored the association between polymorphisms of the *BDNF* gene with FM susceptibility and the severity of symptoms.

Methods: The study enrolled 409 patients with FM and 423 controls from 10 medical centres that participated in the Korean nationwide FM survey study. Alleles at 10 positions in the *BDNF* gene were genotyped: rs2883187 (C>T), rs7103873 (G>C), rs7103411(C>T), rs10835210 (C>A), rs11030104 (A>G), rs12273539 (C>T), rs11030102(C>G), rs11030101 (A>T), rs6265 (G>A), and rs7124442 (C>T).

Results: The allele and genotype frequencies of *BDNF* rs11030104 differed significantly between the FM patients and controls ($p=0.031$). The GG genotype of rs11030104 had a protective role against FM ($p=0.016$) and the G allele of rs11030104 was negatively associated with the presence of FM compared with the A allele ($p=0.013$). In comparison, although the allele and genotype frequencies of *BDNF* rs12273539 did not differ between the FM patients and controls, the TT genotype of *BDNF* rs12273539 was associated with susceptibility to FM ($p=0.038$). Haplotype analyses suggested that some *BDNF* haplotypes have a protective role against FM. Finally, we found that that some genotypes and haplotypes of the *BDNF* gene contribute to the specific symptoms of FM.

Conclusions: This study is the first to evaluate the associations of *BDNF* gene polymorphisms with FM. Our results suggest that some *BDNF* single-nucleotide polymorphisms and haplotypes are associated with susceptibility to, and contribute to the symptoms of, FM.

Disclosure of Interest: None declared

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OP0075

ULTRASOUND-DETECTED SHOULDER PATHOLOGIES CLUSTER INTO GROUPS WITH DIFFERENT CLINICAL ASSOCIATIONS: DATA FROM A PROSPECTIVE STUDY OF 500 COMMUNITY REFERRALS FOR SHOULDER PAIN

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Background: Shoulder pain is common and its management remains challenging, often resulting in poor outcomes: 50% of people continue to have shoulder pain at 18 months. This may be in part due to inaccurate clinical diagnosis. Ultrasound offers accurate detection of pathology and its use is increasing. However, the relationship between ultrasound findings and clinical phenotype is unclear.

Objectives: A prospective study was undertaken to explore latent class groupings and explore the association between patient reported outcome measures and the different groups.

Methods: 500 primary care patients attending for shoulder ultrasound were prospectively recruited. Radiologists and sonographers underwent training to ensure standardised reporting. Baseline data was collected via self-reported questionnaires. Outcome measures collected included pain, function, quality of life, treatments received, activity, self-efficacy and levels of acceptable symptom states. These measures underwent Rasch analysis. Latent class analysis was undertaken to identify groups.

Results: Mean age was 53.6% and 52% were female. Latent class analysis confirmed the existence of 4 groups: limited bursitis; extensive inflammation; RC tears; limited pathology. The oldest age group were those with RC tears, and the youngest was those with limited bursitis. The rotator cuff tear group had the highest levels of pain and disability, and the lowest levels of acceptable symptom states. Those with limited pathology had the highest levels of acceptable symptom states. The extensive inflammation group had the lowest activity scores.

Summary statistics for classes obtained prior to covariate adjustment (complete data only)

	Bursitis (limited inflammation)	Bursitis (extensive inflammation)	RC tear	Limited pathology
% of sample	49	18	15	18
Age, years: mean (95% CI)	47.4 (45.3–49.6)	64.4 (61.1–67.7)	66.1 (63.4–68.9)	49.1 (46.3–51.9)
Female:%	53	58	41	52
Duration of symptoms, months: median (IQR)	6 (3–14)	7 (4–23)	5 (3–12)	6 (4–15)
RC tear (y/n):%	4	44	>99	2
Full thickness RC tear:%	<1	20	92	<1
Bursitis:%	>99	88	34	6
Impingement:%	70	58	94	2
Calcific tendinitis:%	10	6	2	12
ACJ degeneration:%	34	83	63	33
Glenohumeral OA:%	1	2	15	2
Adhesive capsulitis:%	3	5	6	25
Biceps tenosynovitis:%	<1	17	10	<1
Rotator cuff tendinopathy:%	22	81	12	14
EQ5D-5L VAS: median (IQR)	75 (61–85)	66 (49–80)	80 (70–90)	75 (60–85)
Brophy activity score: mean (95% CI)	7.2 (6.9–7.5)	5.5 (4.9–6.0)	7.1 (6.6–7.7)	6.7 (6.2–7.2)
Total SPADI: mean (95% CI)	49.9 (48.6–51.1)	51.8 (48.6–55.1)	56.2 (54.0–58.4)	50.2 (47.7–52.6)
P-SEQ: mean (95% CI)	34.7 (33.3–36.1)	32.2 (29.3–35.1)	33.2 (30.6–35.7)	34.3 (31.8–36.8)
PASS:%	17	30	11	34

VAS=visual analogue scale; SPADI=shoulder pain and disability index; P-SEQ=patient self-efficacy questionnaire; HADS=hospital and depression scale; PASS=patient acceptable symptom state

Conclusions: This study confirms that ultrasound pathologies cluster into groups. These groups appear to differ in symptom associations at baseline; expanding the LCA to include covariates will allow us to formally explore these associations. A longitudinal study will provide understanding of the relevance of these groups to long-term patient outcomes.

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