

## Background

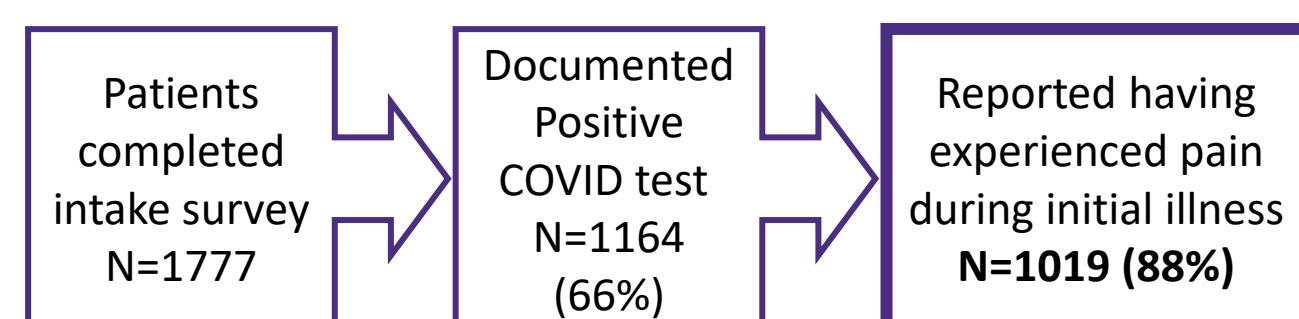
- About 105 million confirmed cases of COVID-19 in the United States with 10-60% of people experiencing prolonged symptoms consistent with post-acute sequelae of COVID-19 (PASC), or “long COVID” impacting quality of life.<sup>1-5</sup>
- Pain occurs in ~50% of patients with PASC.<sup>6</sup>
- Markers of inflammation, can be present in patients for many months after COVID illness.<sup>7</sup>
- Evaluation and management of PASC is not standardized<sup>8</sup> and there is a gap in exploring pain in relation to autoantibodies.
- Characterizing pain as a part of PASC will help clinicians better understand the patient experience and tailor treatment plans.

## Aims

- Determine the prevalence and character of pain reported in patients presenting to the UW Post-COVID Rehabilitation and Recovery Clinic.
- Determine whether the severity of pain, pain self-efficacy, pain catastrophizing, and/or the presence of multiple co-existing pain conditions in patients with PASC correlate with function.
- (a) Explore self-reported pain symptoms in relation to anti-nuclear antibody (ANA) results and (b) determine if the prevalence of positive ANA findings in PASC patients with pain is higher than is generally seen in healthy individuals.
- Examine patient experiences with pain care in the Post-COVID Clinic

## Study Cohort

Patients >18 years old who completed an intake survey between June 2021 and March 2023



## Methods

This study is a cross-sectional mixed-methods study analyzing de-identified data from intake questionnaires, health records, and focus groups of patients seen at the UW Post-COVID Rehabilitation and Recovery Clinic over two years.

### Electronic Medical Records

- ANA lab tests
  - Control: healthy donor sera (N=50 pre-pandemic and 50 from COVID era)
- Epic pain scale
- Function and Quality of Life Outcomes
  - PROMIS-29, PHQ9, GAD7, PTSD

### Intake questionnaire

- Self-reported pain symptoms
- Pain-Related Predictors
  - Concerns About Pain (CAPS) for pain catastrophizing
  - Pain Related Self-Efficacy (PRSE) scale
  - PROMIS-29

### Data analysis

- Descriptive statistics
- Nominal regression analysis on dsDNA titer and pain association
- Hierarchical regression for PROMIS-29 and demographic data

### Qualitative focus groups

- Intentionally recruit 30 participants from diverse locations, payor types, and pandemic timepoints
- Immersion-crystallization process to identify key themes
- Looking at patient-centered outcomes

## Results

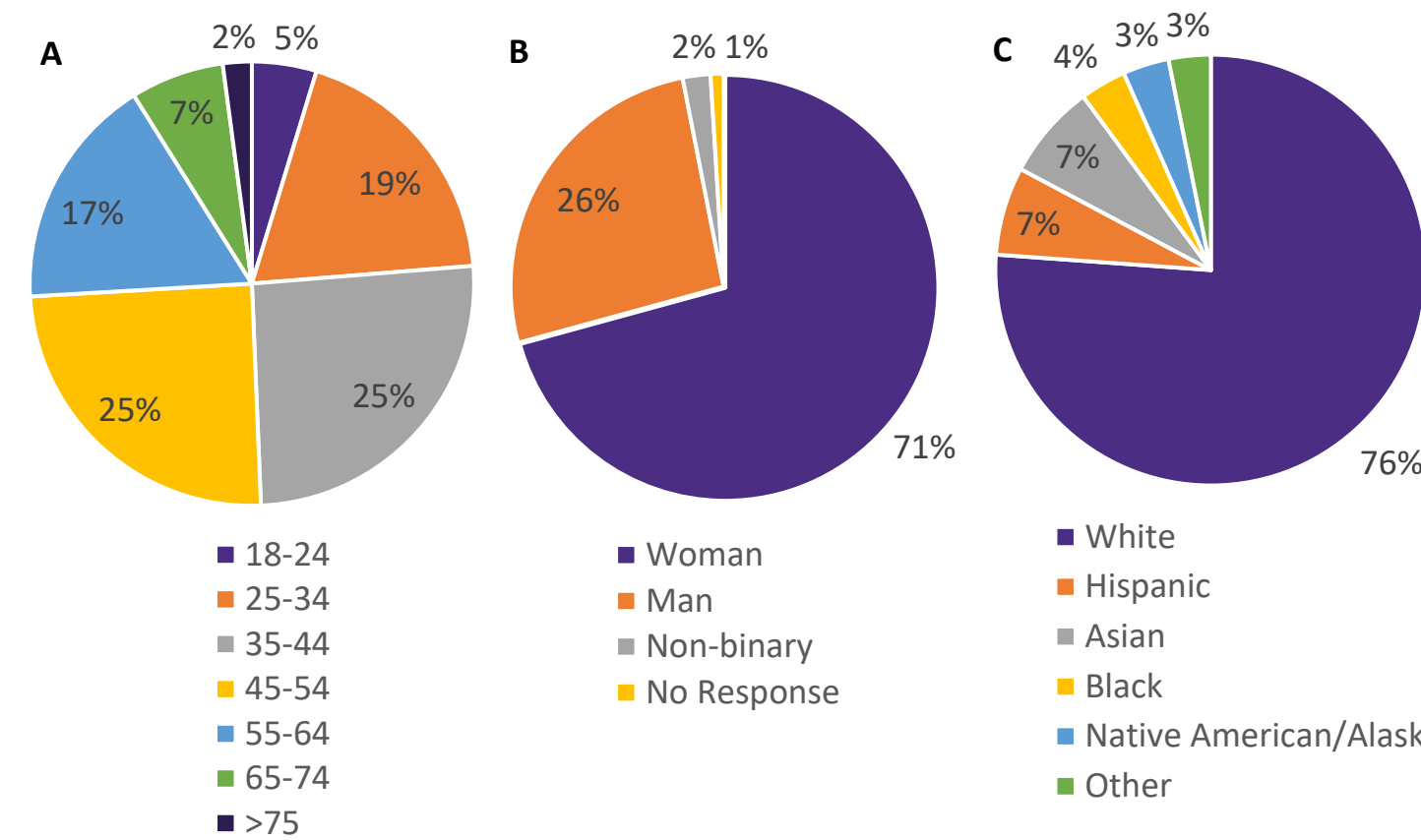


Figure 1. Demographics. Breakdown of (A) age in years (B) identified gender and (C) race in patients with PASC reporting pain on intake survey.\*

- Median age:** 45 years old (range 18 - 93 years)<sup>#</sup>
- Average time COVID+ to referral:** 8 months
- Chronic pain:** 851 (83%) had continued pain symptoms at time of referral to the Post-COVID clinic (>3 months after acute illness)
  - 353 patients reported 3+ pain symptoms
  - Avg pain score: 4.4/10 (n=707)
    - 61% reporting moderate or severe pain
- No PASC pain:** 22% of men and 16% of women

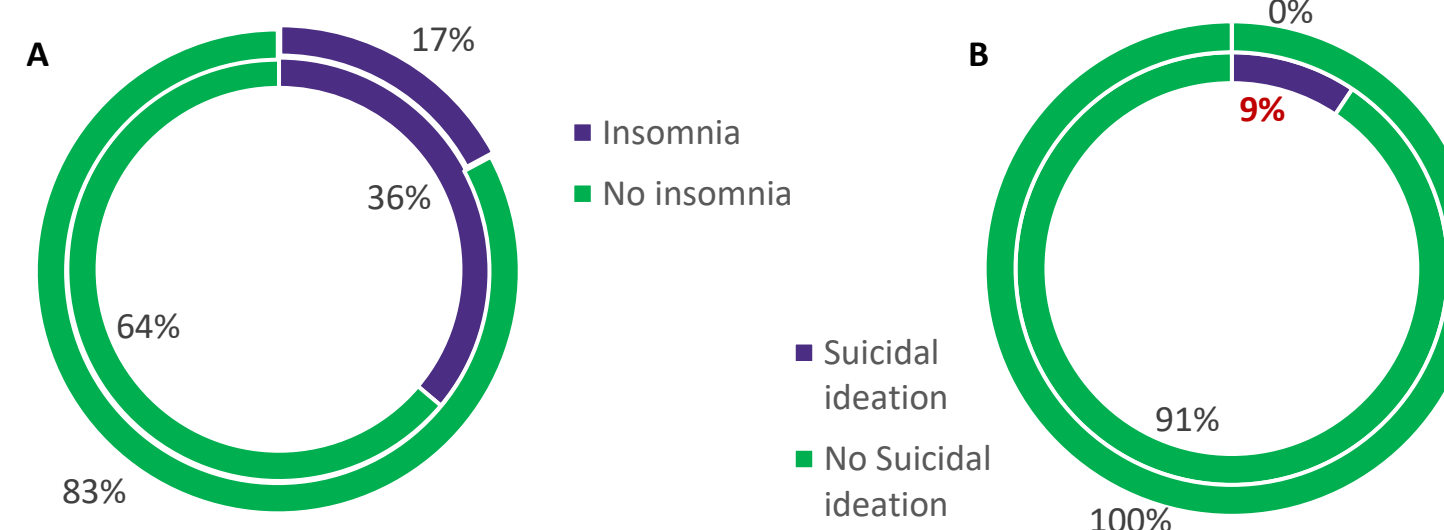


Figure 2. Insomnia (A) and suicidal ideation (B) measured by PHQ-9 in patients with PASC reporting pain vs no pain (n=237).<sup>§</sup> The inner circle represents participants with continued pain symptoms (n=202) and the outer circle representing participants without continued pain symptoms (n=35) and the proportion of their responses.

Table 1. PHQ-9, GAD-7, and PTSD Scores in Patients with PASC Reporting Pain vs No Pain

PRO <sup>&amp;</sup>	No Pain	Pain
<b>PHQ-9*</b> (p<0.001; 95% CI [-6.2,-2.1])	7.3 n=35	11.4 N=202
<b>GAD-7*</b> (p=0.02; 95% CI [-4.6, -0.4])	5.1 n=34	7.6 n=201
<b>PTSD*</b> (p=0.02; 95% CI [-2.0,-0.2])	2.3 n=17	3.4 n=123

\*significant Welch's t-test p-value

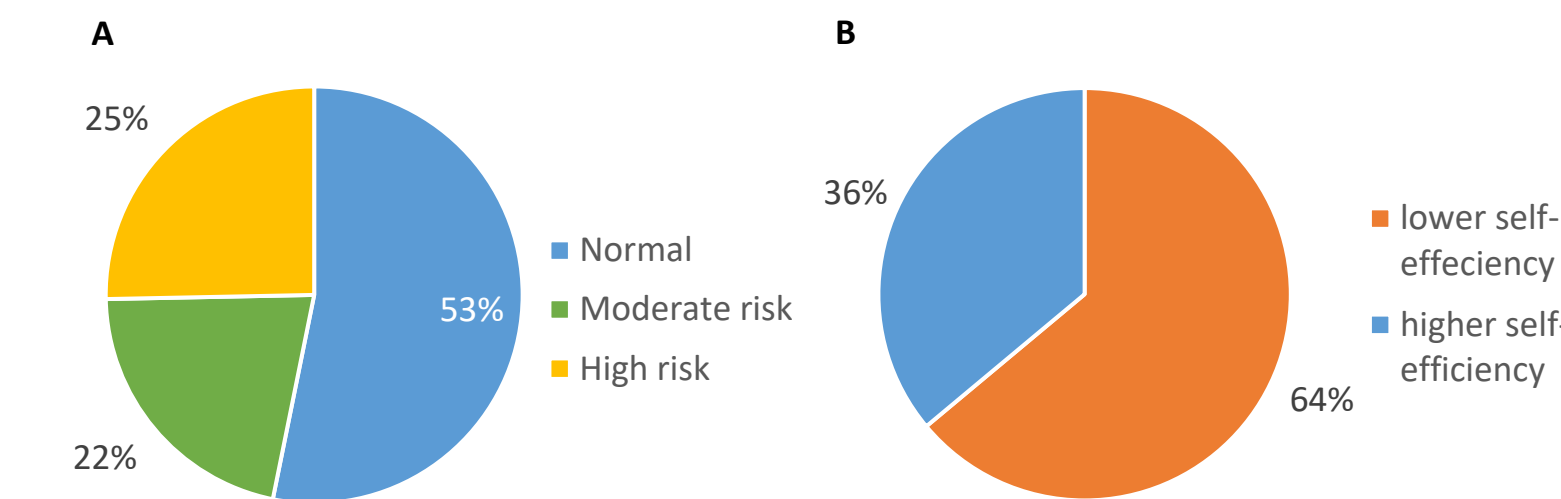


Figure 3. Pain Related Predictors. (A) Concerns About Pain Scale (n=707) using the Pain Catastrophizing Scale (PCS) cut offs. 75% of patients with PASC report moderate or high risk of developing prolonged pain and disability. (B) Pain Related Self-Efficacy Scale (n=707) indicating patients' belief in their ability to accomplish important tasks despite their pain.

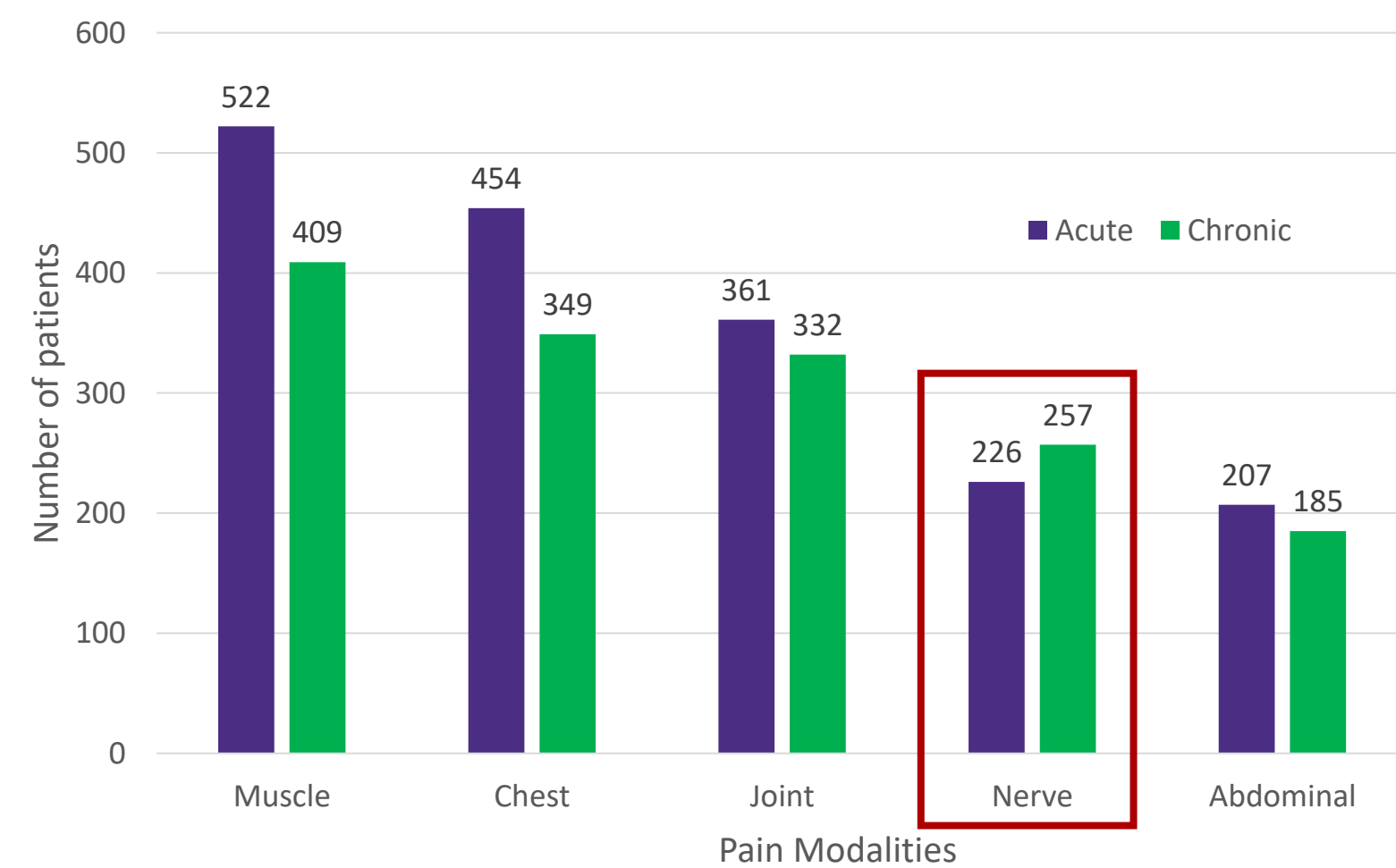


Figure 4. Pain modalities. Type of pain reported during acute COVID illness and at the time of referral to the Post-COVID Rehabilitation and Recovery Clinic (N=1019). Includes patients reporting multiple pain modalities. Not shown: Headache, acute (n=916) and chronic (n=590). Red box represents increased reports of nerve pain from acute illness to intake survey.

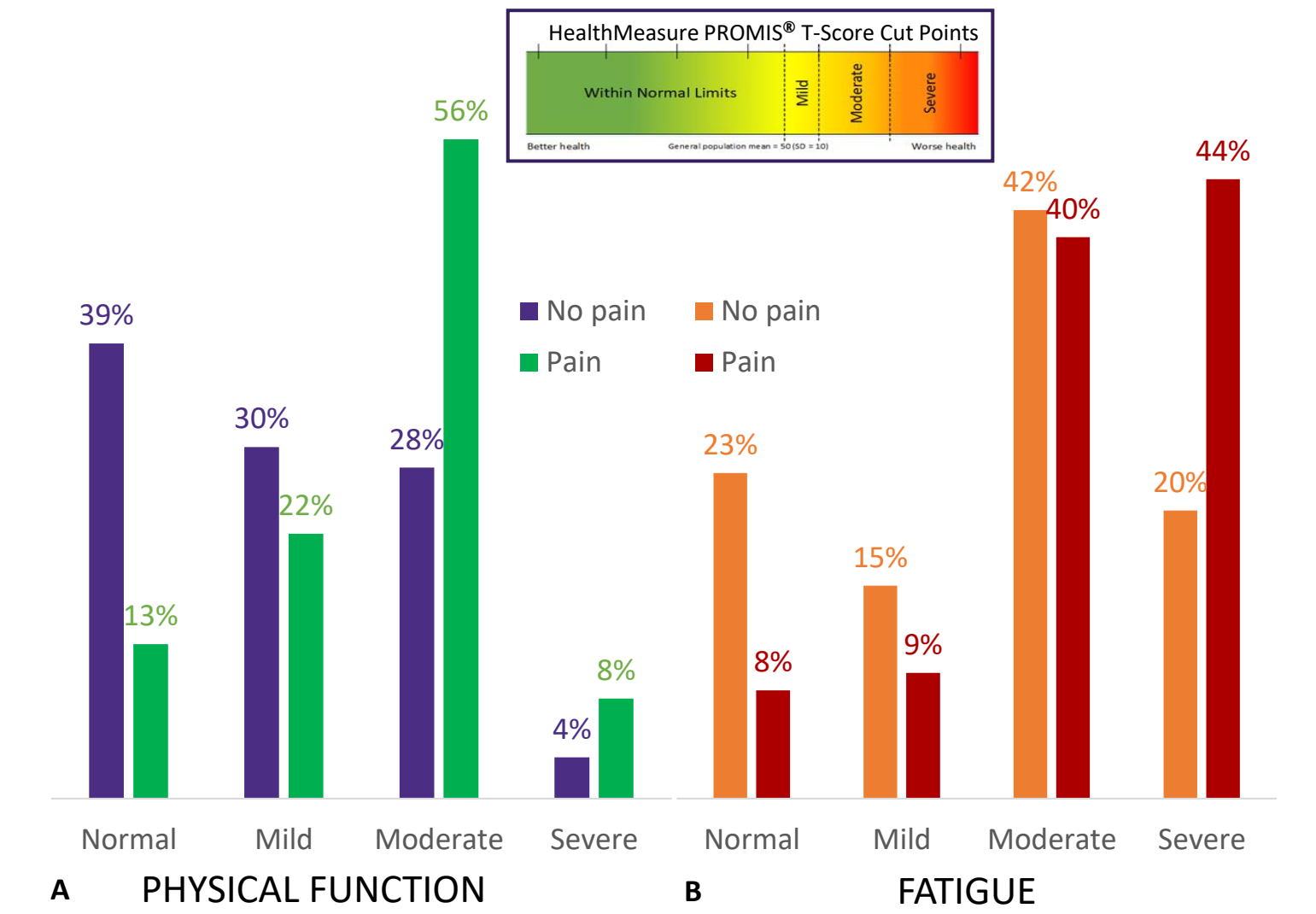


Figure 5. Impact of PASC pain on (A) physical function (n=679) (B) and fatigue (n=675) as measured by PROMIS-29.<sup>®</sup> T-scores indicate measured health with "Normal" representing "better health" and "Severe" representing "worse health" according to the HealthMeasure key shown. Other domains collected: pain, depression, social, anxiety, and sleep (not shown). Overall, 80% and 59% of patients report moderate or severe health in fatigue and physical function domains, respectively.

ID	Pre-COVID		Post-COVID
	ANA	Titer	Titer
1	Negative	N/A	Homogenous 1:160
2	Positive	Homogenous 1:80	DFS 1:160
3	Positive	Homogenous 1:160	Homogenous 1:160

Figure 6. ANA test results ordered within UW for patients with PASC related pain (A) ANA test results following a positive COVID test and (B) ANA test results in patients with a positive result post COVID and titers prior to their COVID-19 illness. Data does not include ANA tests ordered outside of UW. DFS: dense fine speckled.

- DFS pattern seen in 56% (17) of ANA positive tests
- Longitudinal labs for 6 patients post COVID (not included in Figure 6B), 4 with DFS patterns

## Discussion & Next Steps

- Summary:** Persistent pain >3 months after COVID infection is more common in women and is associated with increased depression, suicidal ideation, PTSD, insomnia and fatigue as well as decreased physical function in patients with PASC seen at the UW Post-COVID Rehabilitation and Recovery Clinic.
- Limitation:** Missing intake<sup>#</sup>, EMR PRO<sup>&</sup>, pain scores<sup>#&</sup> and lab data.
- To-Dos:** (1) perform more robust statistical analysis of PROs, (2) Pull ANA lab data from outside of UW and analyze controls, and (3) complete aim 4.
- Future Goal:** Apply for external funding for acupuncture and MBSR clinical trial/RCT.

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