Impact of Fibrodysplasia Ossificans Progressiva on Living Adaptations and Employment: Burden of Illness Survey Results from the United States and Canada

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Background

- Fibrodysplasia ossificans progressiva (FOP; OMIM #135100) is an ultra-rare, genetic disorder characterized by progressive heterotopic ossification within soft and connective tissues causing severe, irreversible disability.[1,2]
- Disability in FOP is cumulative, with most people with the disease requiring a wheelchair by the time they are between 20 and 30 years old.[3]
- Loss of joint mobility and function has been shown to create a substantial need for living adaptations and changes to career plans for individuals with FOP and their family members.[4]
- However, this impact has not been quantified for specific geographic regions.

Objective

To determine the impact of loss of joint mobility and function on use of living adaptations and employment for individuals with FOP and their family members in the United States (U.S.) and Canada.

Methods

- An international, cross-sectional burden of illness survey (NCT04665323) was co-created with advisors from the FOP community.
- The survey was available online between January 18 and April 30, 2021 across 15 countries and in 11 languages.
- Participants were recruited through the International FOP Association (IFOPA) and other national/regional FOP organizations.
- Individuals with FOP of any age, as well as their immediate family members (parents/legal guardians and siblings aged ≥18 years) were eligible to participate:
  - For individuals aged <13 years, the survey was completed by proxy;
  - Family members who identified as the primary caregiver for the person with FOP answered additional survey questions.
- Customized questionnaires were used to assess patients' use of living adaptations and consultation of medical specialists.
- Patients and family members (aged ≥18 years) answered questions related to the impact of FOP on their careers.
- The impact of FOP on physical functioning was assessed using the Patient Reported Mobility Assessment (PRMA), which scores range of motion across 12 joints and 3 body regions as 0 (not limited at all), 1 (moderately limited), or 2 (extremely limited [cannot move at all]):
  - PRMA total scores range from 0–30; PRMA levels are derived from total scores, and a higher total score/level represents more severe limitations in mobility and function.
- Descriptive analyses were performed for each population overall and by degree of joint impairment of the patient.
- Linear regression analyses were used to evaluate the relationship between patients' PRMA total score and total number of living adaptations used.

Results

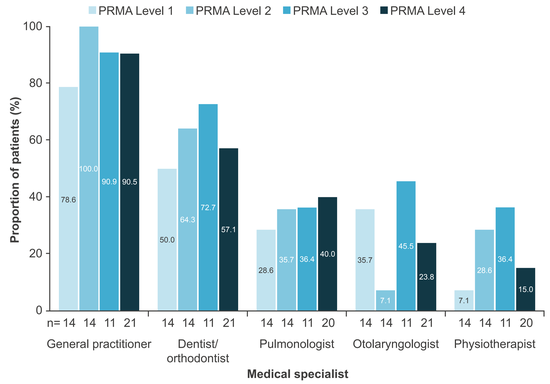
- 67 individuals with FOP and 107 family members responded to the survey from the U.S. and Canada:
  - 59 individuals with FOP and 96 family members responded from the U.S., and 8 individuals with FOP and 11 family members responded from Canada;
  - Participant demographics and patient clinical characteristics are presented in **Table 1**.
- Use of aids, assistive devices, and adaptations (AADAs) and medical therapies/doctors varied by the patient's PRMA level (**Figure 1A**) and age (**Figure 1B**):
  - Patients with greater mobility restrictions tended to use more AADAs and medical therapies/doctors (**Figure 1A**), but no clear trend was identified by patients' age (**Figure 1B**).
- There was a significant positive association between degree of joint impairment (PRMA total score) and the number of AADAs and medical therapies/doctors used by patients for all areas assessed (p<0.0001), apart from school/sport (p=0.0638).
- The most common medical specialists consulted by patients with FOP in the 12 months prior to survey completion were general practitioners (89.1%, n=57), dentists/orthodontists (56.3%, n=36), pulmonologists (33.3%, n=21), otolaryngologists (26.6%, n=17), and physiotherapists (22.2%, n=14):
  - Types of specialist consulted varied by the patient's PRMA level (**Figure 2**).
- 85.7% of patients (≥18 years; n=42), 29.2% of family members (n=106), and 44.4% of primary caregivers (n=63) reported that FOP had impacted their career decisions:
  - Of patients aged ≥18 years (n=42), only 14.3% and 16.7% were working in a full-time or part-time job, respectively, in the 12 months prior to completing the survey (2021 employment rate in the U.S. and Canada for those of working age: 69.4% and 73.5%, respectively);[5]
  - The mean (standard deviation) number of hours per day primary caregivers spent helping to look after their family member with FOP was 9.9 (8.7 [n=61]).

Table 1. Participant demographics and patient clinical characteristics (U.S. and Canada)

		Patient/proxy (n=67)	Family member[a] (n=107)	Family member sub-populations		
				Primary caregiver (n=64)	Non-primary caregiver (n=18)	Sibling (n=25)
Age, years, mean (SD)		25.9 (15.7)	49.2 (13.5)	52.0 (12.1)	56.7 (7.1)	36.6 (12.5)
Age ≥13 years, n (%)[b]		50 (74.6)	107 (100.0)	64 (100.0)	18 (100.0)	25 (100.0)
Gender, n (%)[c]	**Male**	14 (28.0)	39 (36.4)	9 (14.1)	16 (88.9)	14 (56.0)
	Female	35 (70.0)	68 (63.6)	55 (85.9)	2 (11.1)	11 (44.0)
	Non-binary	1 (2.0)	0	0	0	0
Country of living, n (%)	**Canada**	8 (11.9)	11 (10.3)	5 (7.8)	2 (11.1)	4 (16.0)
	U.S.	59 (88.1)	96 (89.7)	59 (92.2)	16 (88.9)	21 (84.0)
FOP diagnosis confirmed by genotyping, n (%)		48 (82.8)	N/A			
PRMA total score, n (%)[d]	**Level 1**	14 (22.6)	N/A			
	Level 2	15 (24.2)				
	Level 3	11 (17.7)				
	Level 4	22 (35.5)				

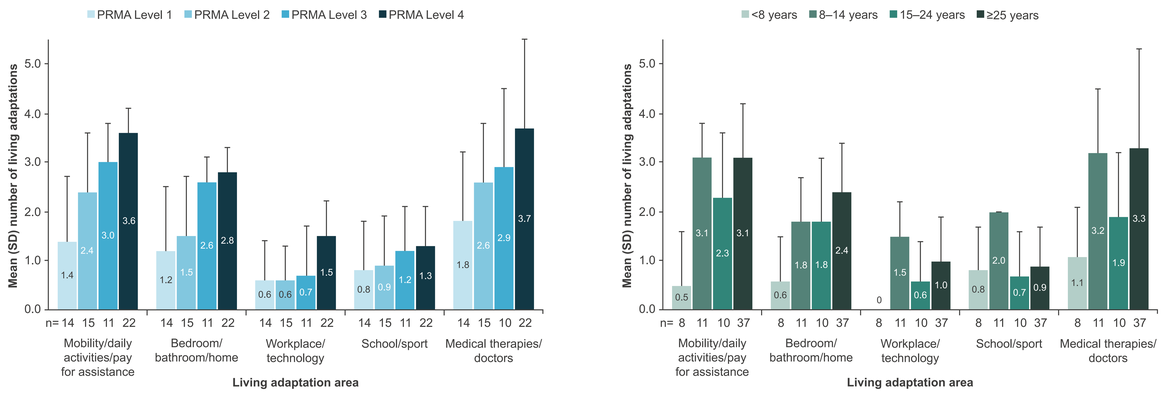
[a]The family member population included primary caregiver, non-primary caregiver, and sibling sub-populations. [b]The survey was completed by proxy for patients aged <13 years. [c]Patient's gender was not collected in questionnaires completed by proxies. [d]Patient population with recorded PRMA total score, n=62. Missing data may result in n values for a category not totalling to the n value of the given population. PRMA levels are derived from PRMA total scores: total score 0–6, Level 1; total score 7–12, Level 2; total score 13–18, Level 3; total score ≥19, Level 4. A higher total score/PRMA level represents more severe limitations in mobility.

Figure 2. Medical specialists most commonly consulted by patients within the past 12 months



Patient population, n=67. Missing data may result in n values for a category not totalling to the n value of the given population. Participants answered a series of questions designed to assess the frequency of medical specialist consultation ('in the last 12 months'). The 12-month recall period coincided with the global COVID-19 pandemic; therefore, data reported here may differ from pre-pandemic patterns. PRMA levels are derived from PRMA total scores: total score 0–6, Level 1; total score 7–12, Level 2; total score 13–18, Level 3; total score ≥19, Level 4. A higher total score/PRMA level represents more severe limitations in mobility. All remaining medical specialists were consulted by <22% of patients.

Figure 1. Utilization of living adaptations by patients



Patient population, n=67. Missing data may result in n values for a category not totalling to the n value of the given population. Living adaptation utilization measured frequency of use of AADAs and medical therapies/doctors. Living adaptation categories: Mobility/daily activities/pay for assistance (4 items): mobility aids/devices, paid/unpaid assistants, personal care tools, eating tools; Bedroom/bathroom/home (3 items): bathroom aids/devices, bedroom aids/devices, home adaptations; Workplace/technology (2 items): workplace adaptations, technology adaptations; School/sport (2 items): sport adaptations, school adaptations; Medical therapies/doctors (7 items): medical therapies, doctor/nurse consultation for FOP flare-ups, respiratory/lung infections, heart failure symptoms, chronic lung disease, health services for pressure ulcers, falls. PRMA levels are derived from PRMA total scores: total score 0–6, Level 1; total score 7–12, Level 2; total score 13–18, Level 3; total score ≥19, Level 4. A higher total score/PRMA level represents more severe limitations in mobility.

CONCLUSIONS

- For patients from the U.S. and Canada, loss of joint mobility and function leads to increased use of living adaptations, suggesting a greater economic impact with disease and disability progression for patients with FOP.
- In addition, loss of joint mobility and function can lead to changes to career plans for patients with FOP and their family members in the U.S. and Canada.
- These findings increase our understanding of factors that may have negative financial implications for people with FOP and their family members in the U.S. and Canada, which may allow for targeted support and care for the FOP community in this region.

Abbreviations AADAs: aids, assistive devices, and adaptations; FOP: fibrodysplasia ossificans progressiva; IFOPA: International FOP Association; N/A: not applicable; PRMA: Patient-Reported Mobility Assessment; SD: standard deviation; U.K.: United Kingdom; U.S.: United States; U.S.A.: United States of America.

References 1. OMIM #135100 FOP. Volume 2022; **2.** Kaplan FS et al. J Bone Joint Surg Am 1993;75:220–30; **3.** Connor JM & Evans DA. J Bone Joint Surg Br 1982;64:76-83; **4.** Al Mukaddam M et al. Expert Rev Pharmacoecon Outcomes Res 2022;1199–1213; **5.** OECD 2023. Employment rate.

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