RESEARCH ARTICLE

# Recruitment strategies and geographic representativeness for patient survey studies in rare diseases: Experience from the living with myeloproliferative neoplasms patient survey

**Jingbo Yu📅\*, Dilan Paranagama, Shreekant Parasuraman**

Incyte Corporation, Wilmington, DE, United States of America

\* jyu@incyte.com

## Abstract

### Background

Recruitment of individuals with rare diseases for studies of real-world patient-reported outcomes is limited by small base populations. Myeloproliferative neoplasms (MPNs) are a group of rare, chronic, hematologic malignancies. In this study, recruitment strategies and geographic representativeness from the Living with MPNs survey are reported.

### Methods

The Living with MPNs online cross-sectional survey was conducted between April and November 2016. Individuals 18 to 70 years of age living in the United States and diagnosed with an MPN were eligible to participate. Recruitment approaches included direct contact via emails and postcards; posts on MPN-focused social media and patient advocacy websites; postcard mailings to doctors' offices; and advertisements on medical websites, Google, and Facebook. Geographic representativeness was assessed based on the number of survey respondents living in each state or the District of Columbia and by the number of survey respondents per 10 million residents.

### Results

A total of 904 respondents with MPNs completed the survey. The recruitment method yielding the greatest number of respondents was advertisements on MPN-focused social media (47.6% of respondents), followed by emails (35.1%) and postcards (13.9%) sent through MPN advocacy groups. Home state information was provided by 775 respondents from 46 states (range of respondents per state, 1–89). The number of respondents per 10 million residents in the 46 states with respondents ranged from 12.1 to 52.7.

### Conclusions

Recruitment using social media and communications through patient groups and advocacy organizations are effective in obtaining geographically representative samples of individuals

with MPNs in the United States. These approaches may also be effective in other rare diseases.

## Introduction

Rare diseases, defined in the United States as conditions affecting fewer than 200,000 people at any given time [1], collectively represent a substantial societal burden and can significantly reduce quality of life for patients and caregivers. Patient-reported outcomes are critical to understanding the burden faced by individuals with rare diseases; however, small populations and lack of clinical knowledge and specialized care centers make it difficult to collect widely representative data [1]. Although recruitment strategies for surveys of individuals with highly prevalent diseases may include prospective recruitment at participating institutions [2–4] or identification of patients in existing medical claims databases [5], traditional methods are often inadequate for rare diseases. As such, communications from patient advocacy groups and postings or advertisements on social media websites may become valuable avenues for recruiting individuals with rare diseases [6, 7].

Myeloproliferative neoplasms (MPNs) are a group of rare, chronic, hematologic malignancies that include myelofibrosis (MF), polycythemia vera (PV), and essential thrombocythemia (ET). The age-adjusted prevalence rates for MF, PV, and ET in the United States are 4 to 6, 45 to 57, and 39 to 57 per 100,000, respectively [8]. Overall survival is reduced among individuals with MPNs compared with the general population [9, 10]. Individuals with MPNs face a pronounced symptom burden that typically includes fatigue, night sweats, bone pain, itching, problems with concentration, and splenomegaly-related symptoms [11, 12]. Furthermore, MPNs can negatively affect work ability and productivity, as well as overall quality of life [13, 14].

The Living with MPNs survey was designed to evaluate the impact of MPNs on employment and everyday life in the United States [13]. A variety of recruitment strategies were used to target a widely representative population. The objective of this analysis was to describe recruitment strategies and assess geographic representativeness of respondents in the Living with MPNs survey. The approach described here will be applicable to other rare diseases and may help to inform patient-centered care.

## Materials and methods

### Study design and participants

The Living with MPNs survey was a cross-sectional web-based questionnaire that has been previously described [13, 15]. In brief, individuals 18 to 70 years of age with a diagnosis of MF, PV, or ET and living in the United States were eligible to participate. The online survey was conducted between April and November 2016, and participants were offered an optional $25 incentive for completing the survey. Survey recruitment strategies consisted of posts on MPN-focused social media and patient advocacy websites; text or banner advertisements on selected medical websites, search engines (Google), and social media sites (Facebook); emails or postcards sent through MPN advocacy groups; and postcards sent to the offices of hematologists and oncologists for distribution. The survey was designed to take approximately 30 minutes to complete and included 100 questions evaluating patient demographics; MPN diagnosis and disease-related medical history; and the impact of MPNs on employment, work productivity, and activities of daily living. The Living with MPNs survey was approved by the Quorum Review Institutional Review Board, and all respondents provided written informed consent

electronically (by selecting "agree" on the consent page) before starting the survey. A copy of the full survey is available in S1 Appendix.

## Assessments and statistical analyses

Geographic representativeness was assessed based on the number of survey respondents living in each state or the District of Columbia and by the number of survey respondents per 10 million residents of each state or the District of Columbia, based on the 2015 population according to US Census Bureau National and State Population Estimates. Data were described using summary statistics. No formal statistical tests were conducted in the analysis.

## Results

### Patient recruitment and demographics

A total of 904 respondents with MPNs completed the survey, with 779 (86.2%) accepting the optional $25 incentive. The recruitment approach yielding the greatest number of respondents was survey advertisements in MPN-focused social media groups (47.6% of respondents), followed by emails and postcards sent to patients by MPN groups (35.1% and 13.9% of respondents, respectively; Fig 1). In total, 96.6% of respondents were recruited through MPN patient groups, whereas banner advertisements on medical websites, Google, or Facebook methods accounted for just 3.2% of overall recruitment.

Two-hundred seventy respondents (29.9%) reported a diagnosis of MF, 393 (43.5%) reported a diagnosis of PV, and 241 (26.7%) reported a diagnosis of ET. The mean (SD) reported age of all respondents was 55.1 (10.9) years; most respondents (70.9%) were 40 to 65 years of age at the time of the survey. Most respondents (73.2%) were female, 46.1% reported ≥1 comorbid condition, and 65.5% were employed full- or part-time at the time of MPN diagnosis. At the time of the survey, the mean (SD) reported MPN disease duration for all respondents was 5.7 (6.4) years.

### Geographic distribution of respondents

Home state information was provided by 775 respondents, representing 46 states; the number of respondents from each of the 46 states ranged from 1 to 89. The states with the most respondents
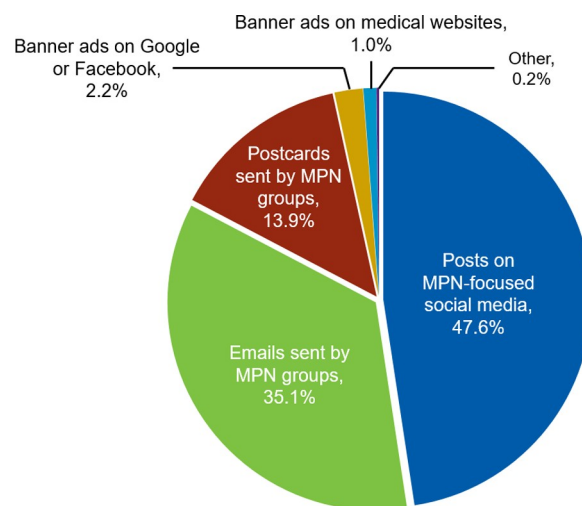


**Fig 1. Recruitment method.** MPN, myeloproliferative neoplasm.

were California (n = 89), Texas (n = 65), New York (n = 52), Florida (n = 45), and Pennsylvania (n = 45; Fig 2). Seven states had >30 respondents, 11 states had >15 to ≤30 respondents, 15 states had >5 to ≤15 respondents, and 13 states had ≥1 to ≤5 respondents. No respondents reported being from Delaware, Hawaii, Montana, Vermont, or the District of Columbia.

The number of respondents per 10 million residents in the 46 states with survey participants ranged from 12.1 to 52.7 (Fig 3). The states with the highest response rates per 10 million residents were Nebraska (52.7), Iowa (51.2), Arkansas (43.7), North Dakota (39.6), Maine (37.6), and New Hampshire (37.6). Ten states had >30 individuals per 10 million residents who responded to the survey, 21 states had >20 to ≤30 respondents per 10 million residents, and 15 states had >12 to ≤20 respondents per 10 million residents.

## Discussion

The Living with MPNs survey attracted more than 900 respondents with MPNs from 46 states. The vast majority of respondents (95%) were recruited through MPN patient groups, and about half of these participants were recruited via social media posts. In fact, MPN-focused social media was the most effective recruitment method for this rare disease survey. These findings are supported by other studies demonstrating that social media recruitment, particularly via Facebook and when in partnership with advocacy organizations, increases accessibility to target populations and yields higher response rates in understudied and demographically-diverse populations [16–18]. In a previous study of recruitment strategies for pediatric patients with Klinefelter syndrome, web-based and social networking strategies successfully recruited a greater proportion of participants (91%) than traditional approaches (letters, brochures, clinic referral; 9%) [19]. Geographic distance from the study site was one of
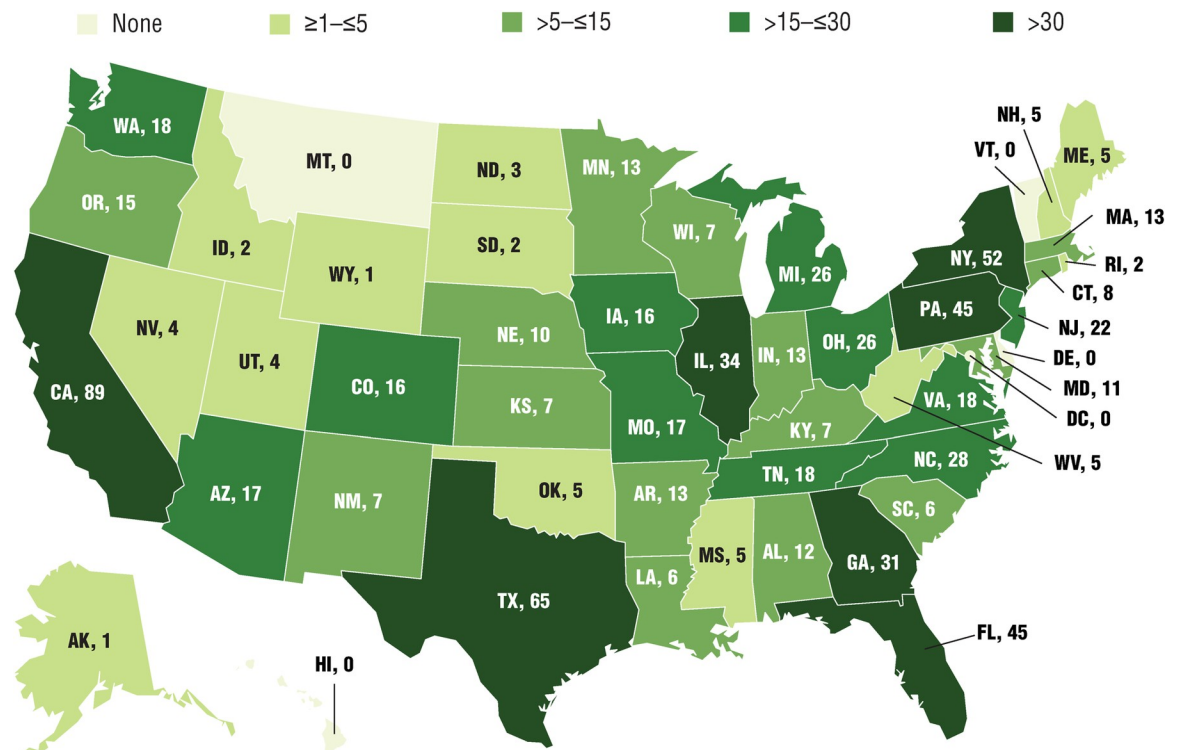


**Fig 2. Number of survey respondents in each state.** 775 respondents provided home state information.

https://doi.org/10.1371/journal.pone.0243562.g002
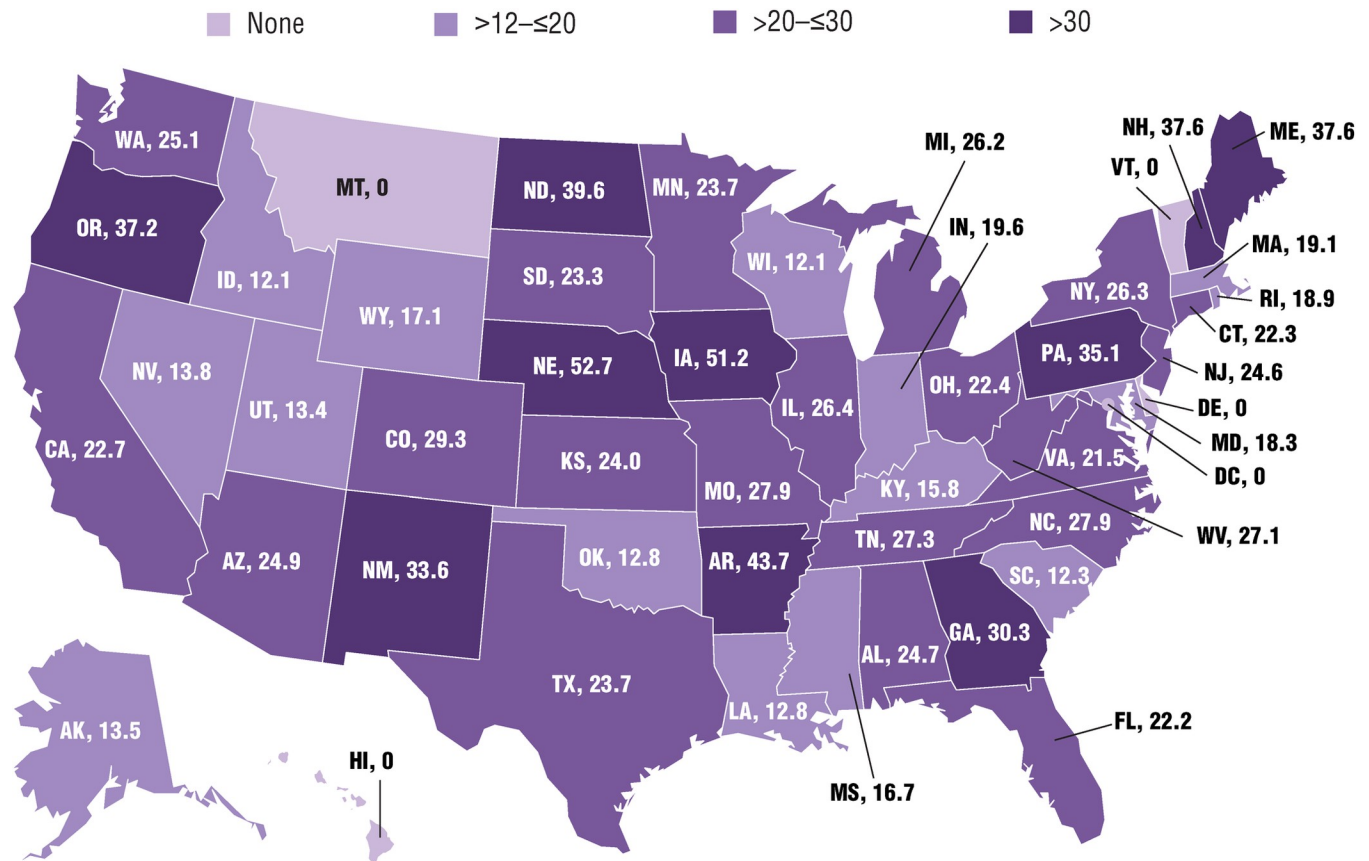
**Fig 3. Survey respondents per 10 million residents in each state.** 775 respondents provided home state information.

the most frequent reasons for declining participation (22%) [19]. Accordingly, web-based recruitment methods and social media posts, such as those employed in the Living with MPNs survey, may offer several advantages compared with traditional methods (eg, face-to-face interviews with treating physicians or recruitment of patients through registry databases). Web-based approaches may increase survey participation, which is crucial for understanding rare disease states, by allowing patient self-identification, increased accessibility, and reduced time burden [20], as well as increased willingness to participate due to anonymity of the online platform [21]. In agreement with these interpretations, a previous study of symptom burden in individuals with ankylosing spondylitis demonstrated that review of social media posts captured a greater number of symptoms than surveys conducted during face-to-face interviews or through group concept mapping [21].

The use of social media to recruit respondents is associated with limitations, however, including inability to validate diagnosis and demographic information [20]. Recruitment by advocacy groups (eg, targeted emails) may avoid self-identification bias because individuals belonging to such groups are often referred by treating physicians after diagnosis. In the Living with MPNs survey, the proportions of patients diagnosed with MF (30%), PV (44%), and ET (27%) were comparable to those from the US patient population of the MPN Landmark survey (MF, 25%; PV, 47%; ET, 28%) [11]. The MPN Landmark survey had a similar geographic distribution as the Living with MPNs survey, including respondents from 47 states and the District of Columbia, although detailed geographic information was not reported.

Limitations of this study included potential selection bias regarding who completed the study. Furthermore, participant recruitment was limited to individuals who could be reached via email, postcard mailings, social media, and Google search advertising. Geographic data collected did not include necessary information to stratify patients by urban and rural regions. Finally, demographic data were not compared among recruitment strategies to assess which strategy resulted in the most representative patient sample.

## Conclusions

Analysis of recruitment data from the Living with MPNs survey suggests that recruitment strategies using patient groups, advocacy organizations, and social media are effective for obtaining geographically representative samples of individuals with MPNs in the United States. These findings may extend to other rare or orphan disease states in which traditional patient recruitment methods are limited.

## Supporting information

**S1 Appendix. Living with MPNs patient survey.**
(PDF)

## Acknowledgments

The authors wish to thank the survey respondents who participated in the study and Shraddha Shinde (Incyte Corporation, Wilmington, DE, at the time of the study) for her contributions to the study design and analysis. Medical writing assistance was provided by Jane Kovalevich, PhD, an employee of ICON (North Wales, PA).

**Disclosure of previous presentation:** This work was previously presented at the ISPOR 22nd Annual International Meeting, May 20–24, 2017, Boston, MA.

## Author Contributions

**Conceptualization:** Jingbo Yu, Dilan Paranagama, Shreekant Parasuraman.

**Data curation:** Jingbo Yu, Dilan Paranagama, Shreekant Parasuraman.

**Formal analysis:** Jingbo Yu, Dilan Paranagama, Shreekant Parasuraman.

**Writing – original draft:** Jingbo Yu, Dilan Paranagama, Shreekant Parasuraman.

**Writing – review & editing:** Jingbo Yu, Dilan Paranagama, Shreekant Parasuraman.

## References

1. Slade A, Isa F, Kyte D, Pankhurst T, Kerecuk L, Ferguson J, et al. Patient reported outcome measures in rare diseases: a narrative review. Orphanet J Rare Dis. 2018; 13(1): 61. https://doi.org/10.1186/s13023-018-0810-x PMID: 29688860

2. Tevaarwerk AJ, Lee JW, Terhaar A, Sesto ME, Smith ML, Cleeland CS, et al. Working after a metastatic cancer diagnosis: factors affecting employment in the metastatic setting from ECOG-ACRIN's Symptom Outcomes and Practice Patterns study. Cancer. 2016; 122(3): 438–46. https://doi.org/10.1002/cncr.29656 PMID: 26687819

3. Vacante M, Malaguarnera G, Pennisi M, Gosso G, Salomone S, Drago F, et al. Work productivity and activity impairment in breast cancer patients treated with capecitabine. J Canc Ther. 2013; 4(7): 1224–7.

4. Lathan CS, Cronin A, Tucker-Seeley R, Zafar SY, Ayanian JZ, Schrag D. Association of financial strain with symptom burden and quality of life for patients with lung or colorectal cancer. J Clin Oncol. 2016; 34(15): 1732–40. https://doi.org/10.1200/JCO.2015.63.2232 PMID: 26926678

5.   Yu J, Brenneman SK, Sazonov V, Modi A. Reasons for not initiating osteoporosis therapy among a managed care population. Patient Prefer Adherence. 2015; 9: 821–30. https://doi.org/10.2147/PPA.S81963 PMID: 26150702

6.   Basch E, Bennett AV. Patient-reported outcomes in clinical trials of rare diseases. J Gen Intern Med. 2014; 29(suppl 3): S801–3. https://doi.org/10.1007/s11606-014-2892-z PMID: 25029974

7.   Davies W. Insights into rare diseases from social media surveys. Orphanet J Rare Dis. 2016; 11(1): 151. https://doi.org/10.1186/s13023-016-0532-x PMID: 27829465

8.   Mehta J, Wang H, Iqbal SU, Mesa R. Epidemiology of myeloproliferative neoplasms in the United States. Leuk Lymphoma. 2014; 55(3): 595–600. https://doi.org/10.3109/10428194.2013.813500 PMID: 23768070

9.   Hultcrantz M, Kristinsson SY, Andersson TM, Landgren O, Eloranta S, Derolf AR, et al. Patterns of survival among patients with myeloproliferative neoplasms diagnosed in Sweden from 1973 to 2008: a population-based study. J Clin Oncol. 2012; 30(24): 2995–3001. https://doi.org/10.1200/JCO.2012.42.1925 PMID: 22802311

10.  Price GL, Davis KL, Karve S, Pohl G, Walgren RA. Survival patterns in United States (US) Medicare enrollees with non-CML myeloproliferative neoplasms (MPN). PLoS One. 2014; 9(3): e90299. https://doi.org/10.1371/journal.pone.0090299 PMID: 24618579

11.  Mesa R, Miller CB, Thyne M, Mangan J, Goldberger S, Fazal S, et al. Myeloproliferative neoplasms (MPNs) have a significant impact on patients' overall health and productivity: the MPN Landmark survey. BMC Cancer. 2016; 16: 167. https://doi.org/10.1186/s12885-016-2208-2 PMID: 26922064

12.  Emanuel RM, Dueck AC, Geyer HL, Kiladjian JJ, Slot S, Zweegman S, et al. Myeloproliferative Neoplasm (MPN) Symptom Assessment Form Total Symptom Score: prospective international assessment of an abbreviated symptom burden scoring system among patients with MPNs. J Clin Oncol. 2012; 30 (33): 4098–103. https://doi.org/10.1200/JCO.2012.42.3863 PMID: 23071245

13.  Yu J, Parasuraman S, Paranagama D, Bai A, Naim A, Dubinski D, et al. Impact of myeloproliferative neoplasms on patients' employment status and work productivity in the United States: results from the Living With MPNs survey. BMC Cancer. 2018; 18(1): 420. https://doi.org/10.1186/s12885-018-4322-9 PMID: 29653557

14.  Harrison CN, Koschmieder S, Foltz L, Guglielmelli P, Flindt T, Koehler M, et al. The impact of myeloproliferative neoplasms (MPNs) on patient quality of life and productivity: results from the international MPN Landmark survey. Ann Hematol. 2017; 96(10): 1653–65. https://doi.org/10.1007/s00277-017-3082-y PMID: 28780729

15.  Yu J, Paranagama D, Geyer HL, Parasuraman S, Mesa R. Relationship between symptom burden and disability leave among patients with myeloproliferative neoplasms (MPNs): findings from the Living with MPN patient survey. Ann Hematol. 2019; 98(5): 1119–25. https://doi.org/10.1007/s00277-019-03610-4 PMID: 30694363

16.  Burton-Chase AM, Parker WM, Hennig K, Sisson F, Bruzzone LL. The use of social media to recruit participants with rare conditions: Lynch syndrome as an example. JMIR Res Protoc. 2017; 6(1): e12. https://doi.org/10.2196/resprot.6066 PMID: 28115298

17.  Gorman JR, Roberts SC, Dominick SA, Malcarne VL, Dietz AC, Su HI. A diversified recruitment approach incorporating social media leads to research participation among young adult-aged female cancer survivors. J Adolesc Young Adult Oncol. 2014; 3(2): 59–65. https://doi.org/10.1089/jayao.2013.0031 PMID: 24940529

18.  Fenner Y, Garland SM, Moore EE, Jayasinghe Y, Fletcher A, Tabrizi SN, et al. Web-based recruiting for health research using a social networking site: an exploratory study. J Med Internet Res. 2012; 14(1): e20. https://doi.org/10.2196/jmir.1978 PMID: 22297093

19.  Close S, Smaldone A, Fennoy I, Reame N, Grey M. Using information technology and social networking for recruitment of research participants: experience from an exploratory study of pediatric Klinefelter syndrome. J Med Internet Res. 2013; 15(3): e48. https://doi.org/10.2196/jmir.2286 PMID: 23512442

20.  Rothman M, Gnanaskathy A, Wicks P, Papadopoulos EJ. Can we use social media to support content validity of patient-reported outcome instruments in medical product development? Value Health. 2015; 18(1): 1–4. https://doi.org/10.1016/j.jval.2014.10.001 PMID: 25595228

21.  Humphrey L, Willgoss T, Trigg A, Meysner S, Kane M, Dickinson S, et al. A comparison of three methods to generate a conceptual understanding of a disease based on the patients' perspective. J Patient Rep Outcomes. 2017; 1(1): 9. https://doi.org/10.1186/s41687-017-0013-6 PMID: 29757313