The Urgent Need to Empower Rare Disease Organizations in China: An Interview-Based Study

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Abstract

Background: Each rare disease affects a small number of population, and thus is neglected. However, a total of 7,000 rare diseases may affect 10% of the population. Due to the severity and lack of rare disease awareness, rare disease represents a huge challenge for the healthcare system. In Western countries, patient organizations have been playing an integral role in raising awareness, advocating legislation, and supporting drug development. This study aims to assess the unmet needs of rare disease patient organizations in China, and identify their unmet needs, providing essential information for the government and legislators.

Results: A total of 28 individuals representing 28 patient organizations in China were interviewed. Most organizations do not have official registration, employees, written standard operation protocol, or reliable financial resources. Misdiagnosis or delayed diagnosis is common, and treatment is often lacking. Due to the lack of financial resources, no organizations have been able to sponsor academic research, unlike their counterparts in Western countries. As to challenges, 71.4% of interviewees listed lack of rare disease awareness among the general public, while 67.9% selected lack of financial resources. Further, only 7.3% of these organizations received support from the government, and 28.6% received support from the general public. As to recommendations to the government, 82.1% of interviewees selected special insurance programs for rare diseases because rare diseases have been generally excluded from the national medical insurance programs. In addition, 78.6% of interviewees recommended to stimulate rare disease research, 75% recommended to import orphan drugs, and 71.4% recommended legislation of an orphan drug act, highlighting the urgent need of therapies.

Conclusions: Due to lack of support and rare disease awareness, patient organizations in China are still in the early phase. To empower these patient organizations, recommendations from these patient organizations should be considered by the government and legislators.

Background

Rare diseases are diseases that affect a small number of population. Most rare diseases have identified genetic origins, and 50% of patients with rare diseases die before the age of 5 [1]. It was estimated that a total of 7,000 rare diseases affect 300 million people worldwide. The definition of rare diseases differs country by country. In the United States, a rare disease is defined as any disease with a prevalence of fewer than 200,000 patients. The equivalent number in Japan is 50,000 patients, while in the European Union, the definition is any disease that affects 1 in 2,000 people. Although rare diseases vary in etiology and clinical manifestations, most are associated with significant disease burden impacting physical and mental abilities, as well as life expectancy [2, 3, 4]. As a huge group, rare diseases constitute a significant challenge for the healthcare system and the economy, and thus should not be neglected by the society and the government [5, 6].

Patient organizations have been playing a critical role in forming supportive groups, advocating to reduce health disparity and discrimination, as well as building a sense of community [7]. Moreover, patient organizations are the driving force of the rare disease ecosystem and have a role at all levels, including supporting patients, initiating and sponsoring research, prompting legislation, generating educational materials, and raising public awareness [8]. Due to various reasons, the rare disease ecosystem in China is still underdeveloped. It is essential to evaluate the status quo of patient organizations, a key player in the ecosystem, and identify their unmet needs and ways to empower them. Therefore, an interview-based study was conducted, and recommendations were made for consideration of policymakers.

Results

Information about patient organizations

How interviewees got involved with a rare disease

A total of 28 interviewees, representing 28 patient organizations, participated in this study. Information about the 28 interviewees and their organizations is summarized in Table 1. Most (25/28, 89.3%) interviewees got involved because they or their family members had a rare disease. Twelve out of 26 respondents (46.1%) were funders of these patient organizations. Two organizations were started by individuals who were not personally affected by rare diseases.

Table 1
Information of patient organizations.

Organizations	Disease of interest	Relationship to a rare disease?	Is the interviewee the founder?	Current members	Total patients in China	Reliable financial resource	Official registration?	Employee?	Office space
Anning's Mother PKU Chat Group	Phenylketonuria	Family	Yes	1,000	140,000	No	No	No	No
MPS I Chinese Patients Community	Mucopolysaccharidosis type I	Self	Yes	Not sure	Not sure	No	No	No	No
Cushing Syndrome Community	Cushing syndrome	Self	Yes	800	4,000	No	No	No	No
Nanjing Rare Disease Help Center	Acromegaly	No	Yes	800	100,000	No	Yes	No	No
Usher Syndrome Chat Group	Usher syndrome	Self	No	Not sure	30,000–40,000	No	No	No	No
Beijing Zhi'ai DMD Help Center	Duchenne muscular dystrophy	Family	No	5,000	70,000	No	Yes	Yes	No
Sichuan Huntington's Disease Community	Huntington's disease	Self	No	600	4,000–5,000	No	No	No	No
Gaucher Disease Patient Club	Gaucher disease	Self	No	300	400	No	No	No	No
Body Odor Chat Group	Unidentified diseases that cause body odor	Self	Yes	2,000	20,000–50,000	No	No	No	No
Acromegaly Communication Center	Acromegaly	Self	Yes	600	100,000	NO	No	Yes	No
Shanghai ALD Mutual Help Group	Adrenoleukodystrophy	Family	No	1000	Not sure	No	No	No	No
CAH & AHC Help Center	Congenital adrenal hyperplasia, adrenal hypoplasia congenita	Family	Yes	10,000	100,000	No	No	No	No
SPE Patients Chat Group	Symmetrical progressive erythrokeratoderma	Family	No	Not sure	1,000–10,000	No	No	No	No
VWD Patient Community	Von Willebrand disease	Self	Yes	200	160,000	No	No	No	No
CGL Patient Community	Chronic Granulocytic Leukemia	Self	Yes	Not sure	Not sure	No	No	No	No
LCA Patients Club	Leber congenital amaurosis	Self	No	300	30,000	No	No	No	No
Shandong Osteogenesis Imperfecta Chat Group	Osteogenesis imperfecta	Self	No	600	Not sure	No	No	No	No
Pompe Patients Help Center	Pompe disease	Self	No	400	5,000	No	No	Yes	No
LNS-China	Lesch–Nyhan syndrome	Family	Yes	15	200	No	No	Yes	No
Chinese Fabry Patients Club	Fabry disease	Self	No	300	1,000	No	No	No	No
Zhuo Wei Chang Dao	Dravet syndrome	Family	Yes	1,000	20,000	No	No	No	No
Beijing Zhengyu MPS Disease Center	Mucopolysaccharidoses	Family	No	400	2,000–3,000	No	No	No	Yes

SOP, standard operation protocol.

Organizations	Disease of interest	Relationship to a rare disease?	Is the interviewee the founder?	Current members	Total patients in China	Reliable financial resource	Official registration?	Employee?	Office space
MMA Patients Community	Methylmalonic acidemia	Self	No	800	50,000	No	No	No	No
Butterfly Baby Help Center	Epidermolysis bullosa	Self	No	300	2,000	No	Yes	No	No
Chongqing Hemophilia Patients Club	Hemophilia	Self	No	3,000	100,000	No	No	No	No
Seven-Pansy Rare Disease Community	All rare diseases	No	Yes	10,000	20,000,000	No	Yes	Yes	No
Henan Neurofibromatosis Patients Club	Neurofibromatosis	Self	No	500	100,000	No	No	No	No
TSC Patient Communication & Help Center	Tuberous sclerosis complex	Self	No	3,000	100,000	No	No	No	No

SOP, standard operation protocol.

Organizations

All organizations were started between 2012 to 2019. Only one, Seven-Pansy Rare Disease Community, which is a national umbrella organization for all rare disease patients in China, has a website. Most interviewees believed that financial and technical difficulty was the major reason that their organizations did not have websites. All 27 organizations were mainly formed through online chat group (initially QQ, now WeChat). Nowadays, WeChat has over 1.1 billion active users, and constituted an essential part of social life in China. Some interviewees expressed the concern over the usage of WeChat. As an instant communication tool, it is difficult to categorize, store, and search for useful information. Seven patient organizations had WeChat blogs that publish useful materials, which can be read and commented on. WeChat blogs are easier to manage than websites, but still create some difficulty for patient organizations. Only 5 organizations were officially registered. One interviewee explained that official registration would not provide extra benefits. Only 5 organizations had full-time or part-time employees, only 1 organization had an office, and only 9 organizations had written standard operation protocols. Most interviewees attributed this to the lack of funding sources. Proper training and financial support are needed.

Prevalence

Although some academic researchers performed epidemiology studies for some rare diseases [9, 10], few national prevalence studies have been conducted [11]. Interviewees estimated the number of patients based on their judgment (Table 1). In 2018, the Chinese government issued the First National List of Rare Diseases, including 121 rare diseases [12]. However, there are no official definitions of rare disease in China. Therefore, the total number of rare disease patients remains unknown. It was estimated that there were 16.8 million rare disease patients in China. However, it may be a significant underestimation. In the United States, there are 30 million rare disease patients, constituting 10% of its population [13]. It was estimated that the total number of rare disease patients in the world to be 300 million, constituting approximately 4% of the world population [14]. An estimated 5000 to 8000 rare diseases have been identified worldwide, affecting approximately 6 to 8% of the population [15]. Considering the 1.4 billion population of China, the total number of rare disease patients may be significantly over 16.8 million. Since a rare disease usually causes significant economic and psychological burden to a family [4], the number of people impacted by rare diseases would be even more.

Outreach to patients

For most patient organizations, reaching out to patients or their families were initially difficult. Most patient organizations were started by several families that acquainted with each other in hospitals. Then, the core families took the initiative to contact others. Currently, the major source is the internet. Another source is referrals from other patients in hospitals. For instance, at Xinhua Hospital, Shanghai, where many patients with mucopolysaccharidoses, received transplant, patient families lived there for a while for recovering from transplant surgery. They formed an online chat group, which accumulated 500 members over time. Five interviewees mentioned referrals from doctors as a source of recruitment. Only 46.4% (13/28) of interviewees had been asking the family history of new members to identify carriers and potential patients. Since genetic counseling is not widely available in China, and people generally lack the genetics knowledge, it is important to understand the family history to identify carriers and potential patients. Otherwise, the diagnosis of patients in those families may be delayed, and timely treatment cannot be conducted. In some diseases, for instance, Fabry disease, an X-linked recessive disease, female carriers would have some symptoms that need to be treated as well [16].

Financial status: None of these organizations had reliable funding sources, while most (17/28, 60.7%) did not have any funding sources. Out of the 10 organizations (35.7%) that had some funding sources, five (17.9%) relied on the founders' personal incomes, three (10.7%) received public donations through crowdfunding, and two received donations from corporations. Some interviewees believed that this was because corporations were not motivated enough to donate, and rare disease awareness was lacking among the general public. One interviewee commented: 'Unlike China, many patient organizations in the USA received donations from corporations, pharmaceutical or other industries, because these corporations would receive tax benefits.' Another interviewee mentioned that 'Some corporations in the USA have a special team to donate when approaching the tax filing date so that they can get a tax cut.'

Rare diseases

Diagnosis

Genetic testing is largely unavailable or unaffordable, and there lacks genetic counseling. According to these interviewees, patients and families often receive a report full of jargon and technical terms without sufficient explanations or firm conclusions. It usually turns out that 'the genetic test report generated more questions than it answered.' All interviewees expressed concern over misdiagnosis and delayed diagnosis. Newborn screening was believed to be essential, and some interviewees initiated campaigns to implement newborn screening programs in China. Through one interviewee's efforts, MPS I was included in a newborn screening panel in several hospitals in Beijing. She commented that 'Although national newborn screening is not realistic now, this is an initial step.'

Treatment and management

A previous study showed that most rare disease patients had experienced difficulty in access to treatment, and fewer than 10% have received disease-specific treatment [11]. None of the rare diseases associated with these organizations are curable, only 10 (37.0%) have disease-specific treatment. Even when there is an option, the delayed diagnosis or misdiagnosis would have already costed patients the opportunities to receive timely treatment. For instance, MPS I disease can be treated by stem cell transplantation, which can halt neurological deterioration and improve quality of life if performed before age 2. One organization, Seven-Pansy had been trying to import orphan drugs through a government-sponsored special project called Hainan Boao Lecheng International Medical Tourism Pilot Zone [17]. This project aims to import drugs due to urgent clinical needs for us in designated medical institutions. Based on patients' needs, Seven-Pansy had drafted a list of orphan drugs for the Boao project.

Activities

Rare disease awareness

Large organizations in Western countries, for instance, the National Organization for Rare Disorders (NORD) in the United States and the European Organization for Rare Diseases (EURORDIS) in Europe, have been contributing significantly to raising rare disease awareness. The Rare Disease Day event, initiated by EURORDIS, has now become a well-known event worldwide. However, such a national platform or information hub with a similar influence still lacks in China. As shown in Fig. 1A, 23 of 28 organizations (82.1%) had activities to raise rare disease awareness, mainly through the internet. Several interviewees mentioned that they had organized members to hand out pamphlets on the street. There has been increasing rare disease awareness in China [9, 18], which may be attributed to the efforts of patient organizations.

Patient support

Since most of these organizations had no reliable funding source, only 4 organizations (14.3%) were able to provide financial support to patients and families. A total of 24 organizations (85.7%) provided education materials with input from physicians and researchers. However, none of these organizations were able to generate educational materials to guide physicians, which have been attempted by organizations in Western countries. For instance, NORD issued a comprehensive physician guide to rare diseases [8]. Most organizations (20/28, 71.4%) provided consulting services to patients and families. This was mainly through expert patients or occasionally through invited physicians. Another form of patient support is local meetup, which had been performed by 13 organizations (46.4%). Three interviewees commented that local meetups could provide more direct communication, which is important to relieve stress and seek comfort from each other.

Research

In Western countries, many patient organizations sponsor academic research with the main focus on therapy development [19, 20]. For instance, many organizations, such as NORD (USA), Association Française contre les

Myopathies (France), Children Living with Inherited Metabolic

Disorders (UK), Sanfilippo Children's Foundation (Australia), have annual grant programs to support rare disease research. Also, several patient organizations in Europe, Australia, and the United States contributed millions of dollars and helped ABO-101 and ABO-102, two gene therapy products for MPS III diseases, reach the clinical trial stage. In contrast, patient organizations in China, mainly due to the lack of financial support, have been not able to sponsor academic research. Out of these 28 organizations, 5 (17.9%) had helped to recruit patients for clinical trials, and 13 (46.4%) maintained patient registries. Although it is essential to have a national registry for rare diseases, these organizations have not been able to establish one. In Western countries, there also has been a transition of patients as participants or financial supports into collaborators in research. Members of patient organizations have been actively involved in academic research and drug development, resulting in peer-reviewed publications and patents [21, 22]. This is rarely seen in China, and none of the interviewees in this study had played such a role in academic research.

Unmet needs of patient organizations

Challenges

Most organizations (20/28, 71.4%) listed the lack of rare disease awareness among the general public as a major challenge. Also, 19 organizations (67.9%) listed the lack of financial sources as a major challenge. Fifteen organizations (53.6%) believed contacting other patients was challenging, 14 (50%) selected communication with doctors, while 14 (50%) selected the lack of reliable information source (Fig. 1B). Three interviewees mentioned that the availability and affordability of orphan drugs were poor.

Support received

Only 1 (3.6%) received support from the central government, and only 2 received support from the local governments (Fig. 1C). Only 8 (28.6%) received support from the general public. The major source of support these organizations received came from non-profit organizations (21/28, 75%), pharmaceutical companies (14/28, 50%), and hospitals (15/28, 53.6%). These results indicated a significant lack of support from the government and the general public.

Interviewees' recommendations to the government: As shown in Fig. 1D, 23 interviewees (82.1%) selected 'special insurance program for rare diseases or inclusion of rare diseases into the Critical Illness Insurance Program'. Twenty-two interviewees (78.6%) selected 'stimulate rare disease research', 21 (75%) selected 'import more orphan drugs', and 21 (75%) selected 'establish a platform to provide reliable information'. Also, 20 interviewees (71.4%) selected 'legislate orphan drug act', 17 (60.7%) selected 'provide financial support to patients', and 15 (53.6%) selected 'provide financial support to patient organizations'. Additionally, 14 (50%) selected 'address discrimination in school', 10 (35.7%) selected 'simplify registration process of organizations', and 2 (7.1%) selected 'disability certificate'. One interviewee commented that 'raise public awareness so that patients can be respected, understood, and equally treated by employers'. He further explained: 'some local governments had written policies to exclude patients with acromegaly while hiring civil servants.' This practice of the local governments is directly against the Law of the People's Republic of China on the Protection of Disabled Persons [23].

Discussion

Patient organizations have been playing a critical role in advancing the field of rare diseases by advocating patient's voices and addressing the unmet needs of patients. In the 1980s, the NORD organized a series of headline events that raised wide public awareness and prompted the legislation of the world's first orphan drug act [24, 25]. This act provides incentives, including market exclusivity, tax benefits, fast track approval, and government subsidy, to stimulate orphan drug development. These incentives have been to be particularly appealing to pharmaceutical companies [26, 27]. The number of orphan drugs increased from 38 in 1983 to over 500 in 2018. Therefore, similar acts have been established in many other countries and districts, including Japan, European Union, Singapore, South Korea, and Australia [28, 29]. EURODIS and Canadian Organization for Rare Diseases (CORD) also have been playing an integral role in spearheading rare disease and orphan drug legislation, patient support, raising awareness, and sponsoring academic research.

Compared with patient organizations in the United States, Europe [30], Australia [31], and India [32], patient organizations in China are still in the early phase. This is mainly due to the lack of support from the government and rare disease awareness among the public. This study identified key challenges and unmet needs of patient organizations in China. To empower patient organizations in China and thus advance this field, key recommendations that outline top priorities that the government and legislators should consider are listed as follows.

1. 1. Legislate an Orphan Drug Act to stimulate orphan drug development (orphan drug exclusivity, tax incentives, market exclusivity).
2. 2. Issue official definition of rare disease.
3. 3. Raise rare disease awareness to shorten the diagnosis odyssey.
4. 4. Implement prenatal and newborn screening of a subset of rare diseases.
5. 5. Establish special insurance programs to cover the cost of the treatment and long-term management of rare diseases.
6. 6. Issue regulations to protect rare disease patients from discrimination in education and employment.
7. 7. Import more orphan drugs.
8. 8. Stimulate donations to rare diseases by tax deduction or other types of tax benefits for individuals and corporates.

Conclusions

Rare disease patient organizations have been playing a critical role in advocating patients' voice, prompting legislation, raising awareness, educating and supporting patients, and sponsoring academic research. However, unlike their counterparts in Western countries, patient organizations are less developed due to lack of support and rare disease awareness among the public. This study evaluated the current status of 28 patient organizations through an interview-based study and identified their unmet needs. Recommendations have been made for the policymakers to consider to empower patient organizations in China.

Methods

Ethics, consent, and permission

The study was approved by the Institutional Ethics Committee of Guangzhou Medical University. Potential interviewees were invited to participate this study, and only those who signed the informed consent participated in this study. All the interviewees acknowledged: 1) the affiliation of the investigators; 2) the sponsor of the study; 3) the objectives of the study, 4) that the information collected will only be used for academic research; 5) that they will participate in this study anonymously; 6) that they can decline to answer any of the questions; 7) that they can quit the study at any time; 8) that the results will be published in a scientific journal without seeking their approval of the manuscript; and 9) that they will not be paid for participating in this study.

Data collection and analysis

The interviewees, usually a key person in a patient organization, were recruited through online advertisements. An online webinar was held to brief potential participates on the background of the study and answer their questions. Then, the investigators contacted potential participants to confirm the interests and schedule the interview. Finally, the interviews were performed via a 1 to 2-hour phone talk. All interviews were conducted by the investigators between March to May 2020. The interviews were audio-recorded with the interviewees' permission and transcribed verbatim for further analysis.

Abbreviations

National Organization for Rare Disorders (NORD), European Organization for Rare Diseases (EURORDIS), Canadian Organization for Rare Diseases (CORD)

Declarations

Ethics approval and consent to participate

The study was approved by the Institutional Ethics Committee of the Guangzhou Medical University, China. All interviewees signed the informed consent and agreed to participated this study voluntarily.

Consent for publication

Not applicable

Availability of data and materials

The interview transcripts are not publicly available due to the agreement between the investigators and the interviewees.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

XL, LO, and SZ designed the study. ZL and JZ performed interviews and data analysis. XZ, BL, JZ performed statistical analysis. LO wrote the manuscript.

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References

1. Genes G. Rare Facts. https://globalgenes.org/rare-facts/. Accessed August 10, 2020.
2. Cohen JS, Biesecker BB. Quality of life in rare genetic conditions: a systematic review of the literature. Am J Med Genet A. 2010;152A:1136–56.
3. Schieppati A, Henter JI, Daina E, Aperia A. Why rare diseases are an important medical and social issue. Lancet. 2008;371(9629):2039–41.
4. Schadewald A, Kimball E, Ou L. Coping Strategies, Stress, and Support Needs in Caregivers of Children with Mucopolysaccharidosis. JIMD Rep. 2018;42:89–97.
5. Angelis A, Tordrup D, Kanavos P. Socio-economic burden of rare diseases: a systematic review of cost of illness evidence. Health Policy. 2015;119(7):964–79.
6. Wästfelt M, Fadeel B, Henter JI. A journey of hope: lessons learned from studies on rare diseases and orphan drugs. J Intern Med. 2006;260(1):1–10. doi:10.1111/j.1365-2796.2006.01666.x.
7. Lasker JN, Sogolow ED, Sharim RR. The role of an online community for people with a rare disease: content analysis of messages posted on a primary biliary cirrhosis mailinglist. J Med Internet Res. 2005;7(1):e10.
8. Aymé S, Kole A, Groft S. Empowerment of patients: lessons from the rare diseases community. Lancet. 2008;371(9629):2048–51.
9. Shi X, Liu H, Zhan S, Wang Z, Wang L, Dong C, et al. Rare diseases in China: analysis of 2014–2015 hospitalization summary reports for 281 rare diseases from 96 tertiary hospitals. Orphanet J Rare Dis. 2019;14(1):160.
10. He J, Tang M, Zhang X, Chen D, Kang Q, Yang Y, et al. Incidence and prevalence of 121 rare diseases in China: Current status and challenges. Intractable Rare Dis Res. 2019;8(2):89–97.
11. Melnikova I. Rare diseases and orphan drugs. Nat Rev Drug Discov. 2012;11(4):267–8.
12. Notice on the first official list of rare diseases (in Chinese). http://www.nhc.gov.cn/yzygj/s7659/201806/393a9a37f39c4b458d6e830f40a4bb99.shtml. Accessed August 10, 2020.
13. NIH. FAQs about rare diseases. https://rarediseases.info.nih.gov/diseases/pages/31/faqs-about-rare-diseases. Accessed August 10, 2020.
14. Nguengang Wakap S, Lambert DM, Olry A, Rodwell C, Gueydan C, Lanneau V, et al. Estimating cumulative point prevalence of rare diseases: analysis of the Orphanet database. Eur J Hum Genet. 2020;28(2):165–73.

15. Council Recommendation of 8 June. 2009 on an action in the field of rare diseases (2009/C 151/02). https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2009:151:0007:0010:EN:PDF. Accessed August 10, 2020.
16. Bouwman MG, Rombach SM, Schenk E, Sweeb A, Wijburg FA, Hollak CEM, et al. Prevalence of symptoms in female Fabry disease patients: a case-control survey. J Inherit Metab Dis. 2012;35(5):891–8.
17. Decision of the State Council to Provisionally Adjust the Implementation of the Relevant Provisions of the Regulations for the Implementation of the Drug Administration. Law of the People's Republic of China in Hainan Bo'ao Lecheng International Medical Tourism Pilot Zone. http://en.pkulaw.cn/display.aspx?cgid=6c28fc65c14adb80bdfb&lib=law. Accessed August 10, 2020.
18. Rinaldi A. Adopting an orphan. EMBO Rep. 2005;6(6):507–10.
19. Young A, Menon D, Street J, Al-Hertani W, Stafinski T. Exploring patient and family involvement in the lifecycle of an orphan drug: a scoping review. Orphanet J Rare Dis. 2017;12:188.
20. The Role of Solidarity(– ies
Mascalzoni D, Petrini C, Taruscio D, Gainotti S. The Role of Solidarity(– ies) in.
21. Rare Diseases Research. Adv Exp Med Biol. 2017;1031:589–604.
22. Marshall E. Genetics. Patient advocate named co-inventor on patent for the PXE disease gene. Science. 2004;305(5688):1226.
23. Rodriguez-Viciana P, Tetsu O, Tidyman WE, Estep AL, Conger BA, Santa Cruz M, et al. Germline mutations in genes within the MAPK pathway cause cardio-facio-cutaneous syndrome. Science. 2006;311(5765):1287–90.
24. Law of the People's Republic of China on the Protection of Disabled Persons. (2018 Amendment). http://www.lawinfochina.com/display.aspx?id=cb5da4033c39055cbdfb&lib=law. Accessed August 10, 2020.
25. NORD 35th Anniversary Blog Series. The Early Years (1980s).
26. https://rarediseases.org/nord-35th-anniversary-blog-series-early-years-1980s/. Accessed August 10, 2020.
27. Mikami K, Sturdy S. Patient organization involvement and the challenge of securing access to treatments for rare diseases: report of a policy engagement workshop. Res Involv Engagem. 2017;3:14.
28. Haffner ME. Adopting orphan drugs–two dozen years of treating rare diseases. N Engl J Med. 2006;354(5):445–7.
29. Cheung RY, Cohen JC, Illingworth P. Orphan drug policies: implications for the United States, Canada, and developing countries. Health Law J. 2004;12:183–200.
30. Review of 11 national policies
Dharssi S, Wong-Rieger D, Harold M, Terry S. Review of 11 national policies.
31. for rare diseases. in the context of key patient needs. Orphanet J Rare Dis.
32. 2017.;12:63.
33. Orphan Drug Programs/Policies in Australia
Scott DL, Alder S, Usui E, Lui K. Orphan Drug Programs/Policies in Australia.
34. Japan, Canada. Drug Inf J. 2001;35:1–16.
35. van de Bovenkamp HM, Trappenburg MJ, Grit KJ. Patient participation in collective healthcare decision making: the Dutch model. Health Expect. 2010;13(1):73–85.
36. Pinto D, Martin D, Chenhall R. The involvement of patient organisations in rare disease research: a mixed methods study in Australia. Orphanet J Rare Dis. 2016;11:2.
37. Choudhury MC, Saberwal G. The role of patient organizations in the rare disease ecosystem in India: an interview based study. Orphanet J Rare Dis. 2019;14(1):117.

Figures

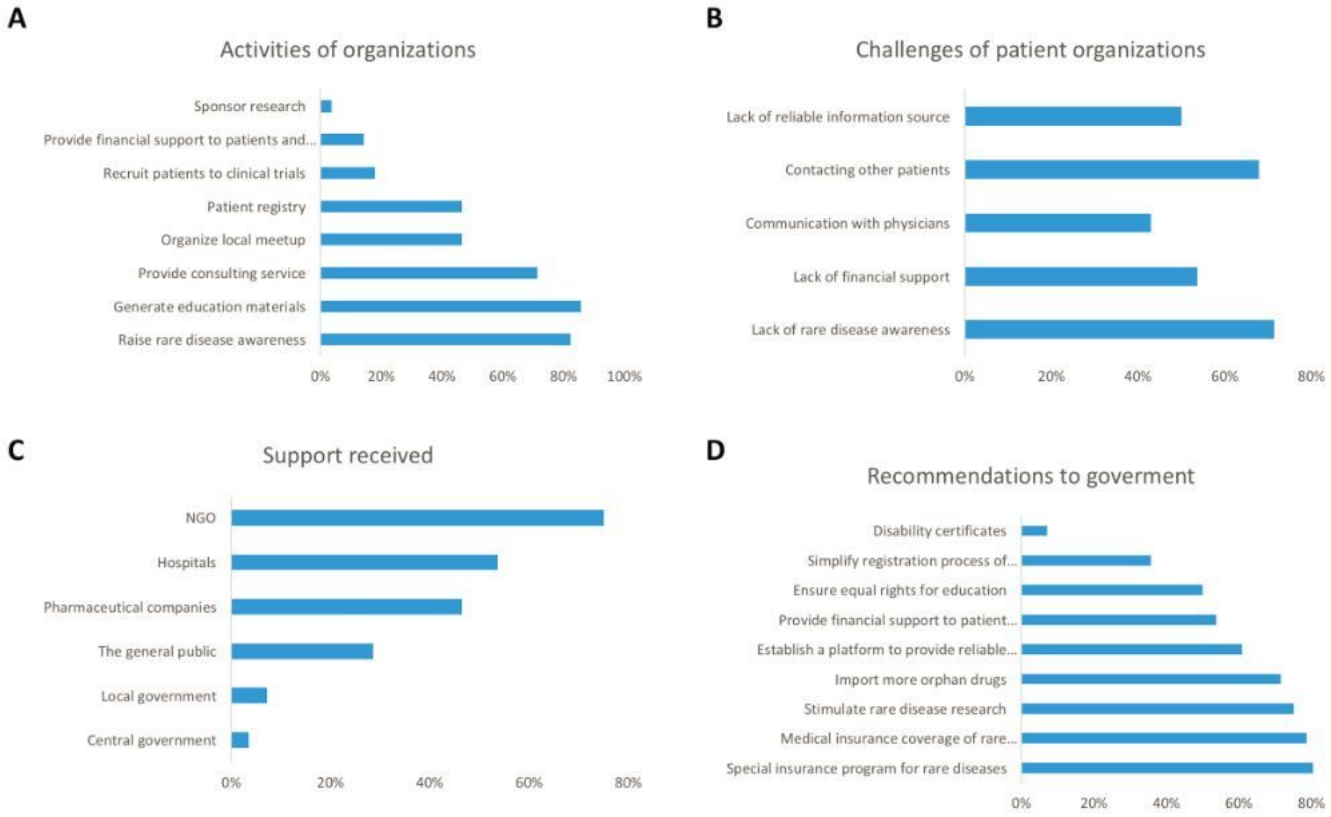

Figure 1

Activities, challenges, support received, and recommendations of patient organizations. Activities (A), challenges (B), support received (C), and recommendations (D) were shown, respectively. Information was collected through one-on-one interview with leaders from 28 patient organizations in China.