

# A new approach to shortening the diagnostic odyssey



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*Front cover image by Manuel Polo*

*People living with rare disease often face a diagnostic odyssey, typically waiting years for a diagnosis and receiving multiple misdiagnoses along the way. Qualitative research conducted with members of Raremark's Fabry disease community highlighted how hard it can be to get an accurate diagnosis when the signs and symptoms of a rare disease resemble those of more common conditions. Specialty-focused medical educational efforts are under way, promising to raise awareness of rare disease among healthcare professionals. But real progress will also require cultural change on the part of doctors, writes Pete Chan*



Mention the phrase *diagnostic odyssey* to anyone in the pharma industry with an interest in rare disease and you're certain to elicit two responses. One is recognition of the long and often difficult route to diagnosis faced by many people with rare medical conditions. The other is frustration with how little has changed in this area in recent years.

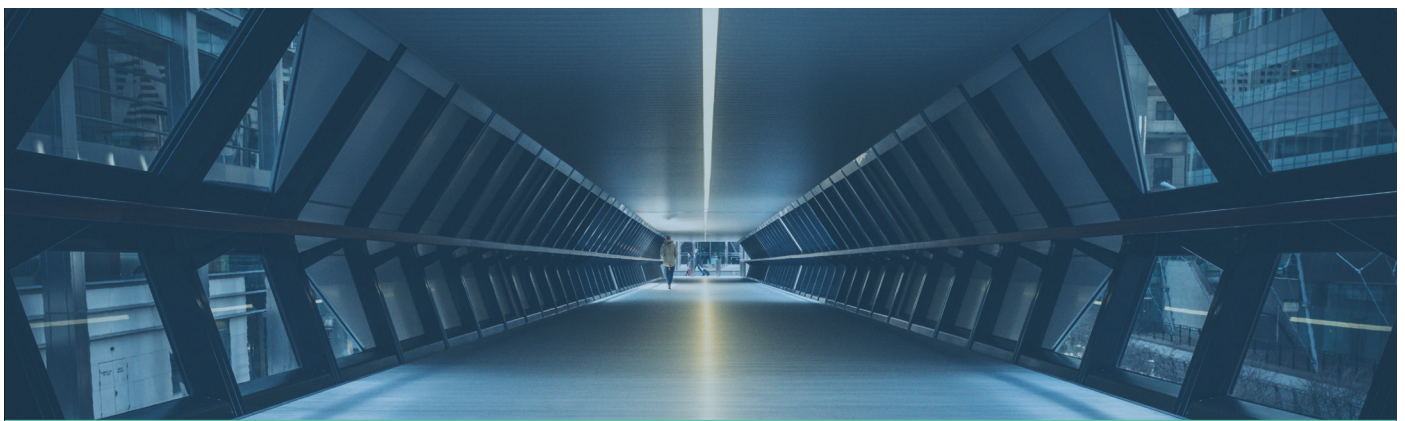
It has been more than a decade since Eurordis, a non-governmental organization representing European rare disease patient groups, conducted the largest study in this field. Eurordis surveyed 6,000 patients in 17 countries who were affected by one of eight rare diseases. Some 25% of them had to wait anywhere from five years to 30 years to receive a diagnosis and two-fifths were misdiagnosed at least once along the way (Eurordis, 2005; Eurordis, 2009).

More recent statistics paint a no-less-worrying picture. Research commissioned by Shire found diagnoses taking on average 7.6 years in the US and 5.6 years in the UK. Patients surveyed typically saw up to eight doctors and received two to three misdiagnoses (Shire, 2013). An international survey conducted by the market research company Engage Health on behalf of Global Genes, a US-based rare disease advocacy

group, found a mean time to diagnosis of 4.8 years, while the longest delay reported was 20 years (Engel et al., 2013). And doctors recognize the challenge: 98% of US physicians polled for the Shire report agreed that more office visits are required to diagnose a rare disease.

There are many implications for patients. Delays in diagnosis may lead to feelings of anxiety, frustration and stress. Misdiagnoses may result in inappropriate treatments, or to patients giving up the search for a diagnosis in the false belief they've received the right one (Eurordis, 2009). Prospective parents may hold back from having children because of uncertainty over genetic risks. Some patients make "medical pilgrimages" to reach specialist centers (Dharssi et al., 2017): 2% of respondents to the Eurordis survey travelled to a different country to get an accurate diagnosis (Eurordis, 2009). Out-of-pocket costs may put financial stress on patients and their families (Anderson, Elliott and Zurynski, 2013; Eurordis, 2009).

All the while, costs to governments rack up. Every test, procedure, treatment or referral based on a misdiagnosis amounts to wasted healthcare spend on individuals who are lost in the system.



*Long path and few signposts marking the way*

*Image by Jez Timms*

## Box 1: Fabry disease in brief

Fabry disease is a rare metabolic condition with an estimated birth prevalence (in Europe) of 0.22 per 100,000 (Orphanet, 2016). It is an X-linked inherited disorder of glycosphingolipid metabolism due to deficient or absent lysosomal  $\alpha$ -galactosidase A activity (Germain, 2010). Fabry can affect a variety of organs, with signs and symptoms ranging from neurological, cutaneous and renal to cardiovascular and cerebrovascular (Germain, 2010). Both males and females are affected, and the age of onset is typically in childhood (Orphanet, 2017). Symptoms can be confused with those seen in some common diseases (Germain, 2010; Rozenfeld, 2009); Fabry is thought to be an underdiagnosed condition as a result (Hoffmann, 2009; Rozenfeld, 2009). Diagnoses are often made more than a decade after patients experience the first symptoms (Hoffmann, 2009; Reisin, Perrin and García-Pavía, 2017).

## Tech advances show early promise

The headline figures overshadow the progress being made on the back of technological advances. The advent of next-generation sequencing (NGS) holds particular promise for individuals with undiagnosed rare genetic diseases. The Individualized Medicine Clinic, part of the Mayo Clinic, offers a whole-exome sequencing (WES; a type of NGS) service to selected patients who cannot be diagnosed using single-gene-based tests. One early study pointed to a success rate of 29% (Lazaridis et al., 2016). The UK's 100,000 Genomes Project is sequencing the genomes of 25,000 cancer patients and around 17,000 people with rare diseases, as well as their families.

Meanwhile, the Undiagnosed Diseases Network (UDN), a National Institutes of Health-funded research study, has brought together expertise and advanced technologies to crack what it calls "challenging medical mysteries". The UDN is an extension of the Undiagnosed Diseases Program, with work conducted at eight research sites across the US.

Promising as they are, it will take some time for these endeavors to make an impact on

everyday clinical practice. NGS is not yet widespread and questions around its affordability have yet to be fully addressed. (Average per-patient costs in the Mayo Clinic WES study were approx. \$8,000 (Lazaridis et al., 2016)). The UDN is a relatively new initiative: it was only founded in 2015 and has diagnosed just 74 of the 545 cases it has reviewed (Gorman, 2017).

The prospects of more timely diagnosis some years into the future will provide little consolation to people searching for answers today. For them, the impact of having an undiagnosed condition that is severely debilitating or life-limiting cannot be overstated.

## Routes to diagnosis in Fabry disease

Against this backdrop, Raremark has been conducting qualitative studies with members of its online communities with a view to better understanding patients' routes to diagnosis. Raremark's Fabry disease community was selected for discussion in this report because the typical signs and symptoms can be mistaken for symptoms of more common conditions. In addition, diagnostic delays of more than a decade are typical (see Box 1).

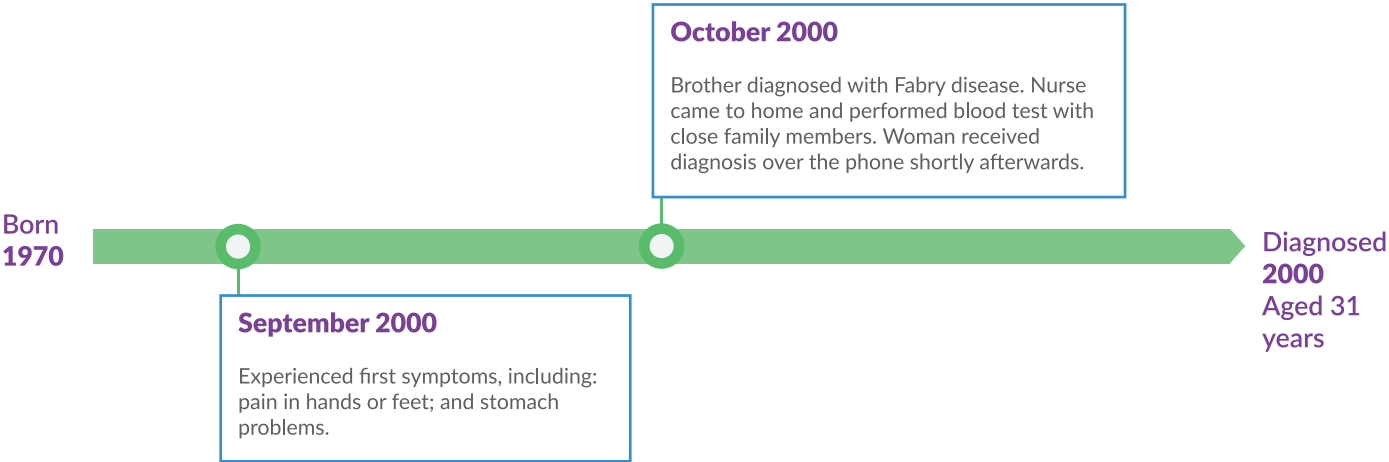
Raremark’s Fabry study focused on people who have received a confirmatory diagnosis, as their collective experiences may help individuals with Fabry at earlier stages in their journey to a diagnosis.

The study recruited 23 participants located in Canada (two), France (one), Russia (one), South Africa (one), the UK (eight) and the US (10). There was a greater representation of women (14) in the sample than of men (nine). The majority (19) were people with Fabry, while the remainder were family members, parents or partners. Participants ranged in age from 13-70 years, with a median age of 42 years. The study was

designed and conducted online in March 2017, with two additional telephone interviews in April.

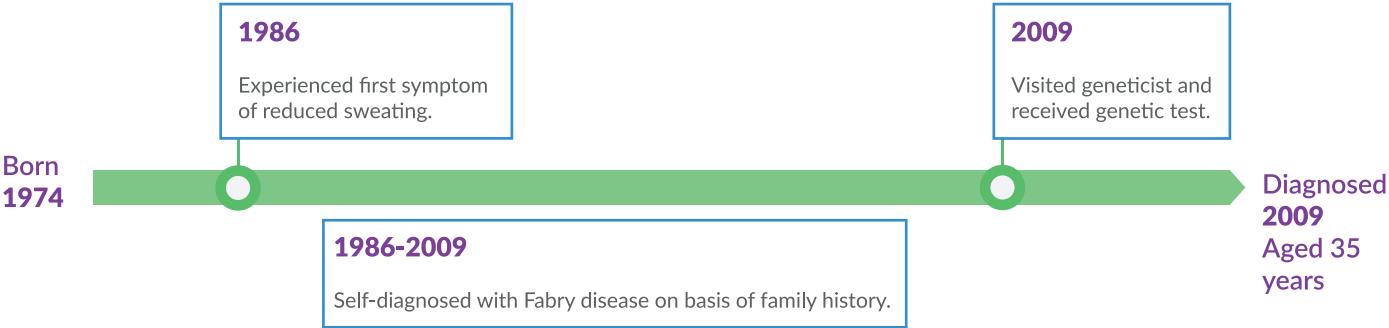
The standout finding of our research was that no two journeys to a diagnosis of Fabry disease are the same. At one end of the spectrum, the patient’s experience is not an odyssey at all: one woman was diagnosed aged 31 after a diagnosis of Fabry in her brother prompted a nurse to test all close members of his family. The woman had begun experiencing symptoms only one month earlier (see Figure 1). In another case, a man with a clear history of Fabry disease in his immediate family made a

**Figure 1: Route to diagnosis for woman with Fabry disease aged 47 years; living in the UK**



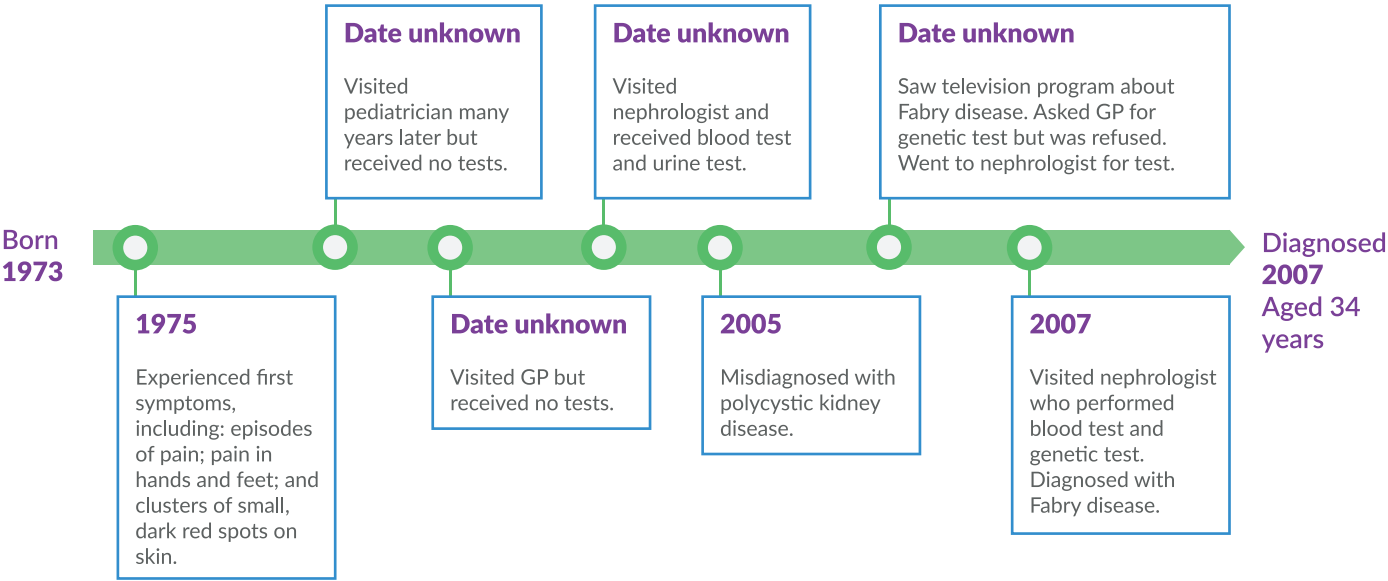
Source: Raremark research

**Figure 2: Route to diagnosis for man with Fabry disease aged 42 years; living in the US**



Source: Raremark research

Figure 3: Route to diagnosis for man with Fabry disease aged 44 years; living in the US



Source: Raremark research

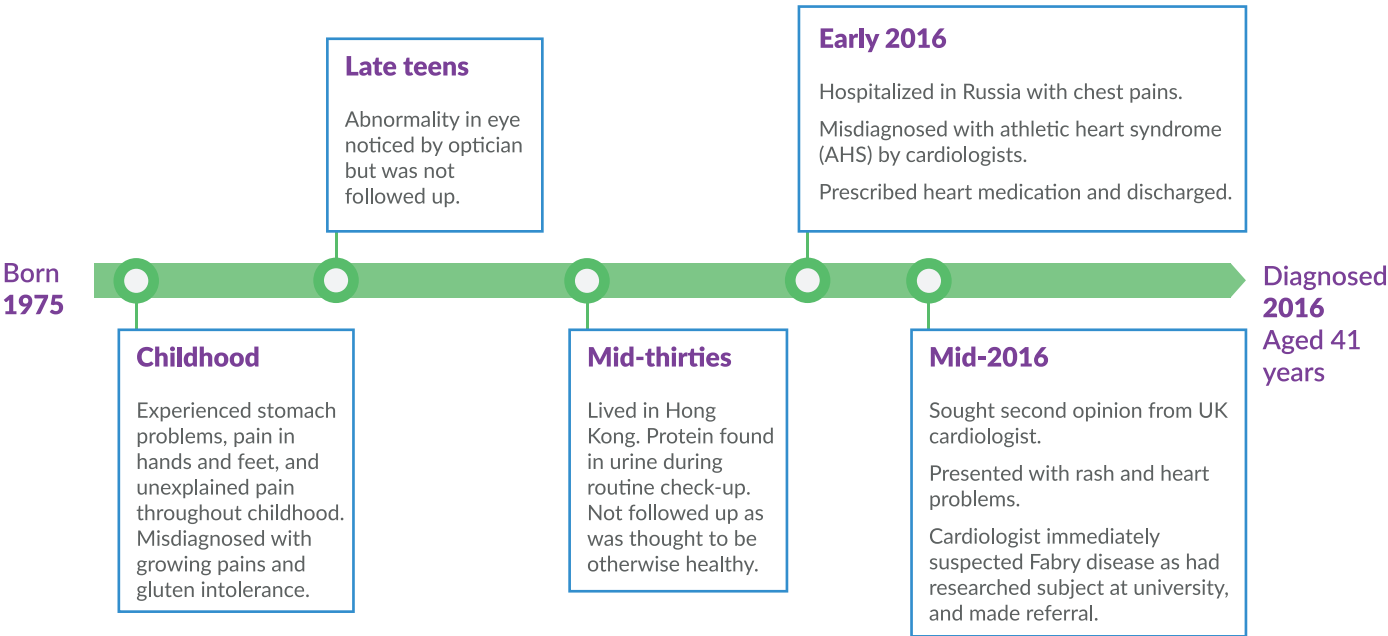
self-diagnosis when he was 12, after noticing the symptom of reduced sweating. He received a confirmatory diagnosis at the age of 35, when he visited a geneticist (see Figure 2). But in the main, patients’ routes to diagnosis were longer, and more complex.

One man began experiencing pain in his hands and feet, and developed spots on his skin at the age of two. His first visit to a pediatrician took place some years later – but no tests were performed. Blood and

urine tests carried out by a nephrologist later in life led to the misdiagnosis of polycystic kidney disease. In his 30s, he learnt about Fabry disease on television and went to see a different nephrologist, who ordered blood and genetic tests. He was diagnosed at the age of 34 (see Figure 3).

Another man’s route to diagnosis only began in earnest in early 2016, when he was admitted to a Russian hospital with chest

Figure 4: Route to diagnosis for man with Fabry disease aged 41 years; living in the UK & Russia



Source: Raremark research

pains. He was misdiagnosed with athletic heart syndrome, prescribed some drugs and discharged. He sought a second opinion in the UK and, by chance, the cardiologist had learnt about Fabry disease at university. A referral led to a positive MRI scan and a confirmatory diagnosis through a blood test in mid-2016, at the age of 41 (see Figure 4). In retrospect, he realized there had been several opportunities for doctors to make an earlier diagnosis. But because his symptoms were not severe enough, or because they didn't appear at the same time, physicians failed to join the dots (see Box 2).

A 70-year-old participant best exemplified the diagnostic odyssey in Fabry disease. The woman's journey from first symptoms to diagnosis lasted more than 50 years. It involved visits to cardiologists, a gastroenterologist, a nephrologist, and rheumatologists. And she received multiple misdiagnoses, including rheumatoid arthritis, fibromyalgia and osteoarthritis. She was finally diagnosed at the age of 67 when a cardiologist suggested blood and genetic testing to get to the root cause of her condition (see Figure 5 and Box 3).

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## Diagnostic odysseys common in Fabry

Across the whole sample, the Raremark Fabry study found a median time to diagnosis of 18 years. The mean number of different physicians visited by patients was 2.5 (some visited up to eight); these included, in rank order, geneticists, neurologists, rheumatologists, gastroenterologists, and dermatologists (see Table 1). The majority

of participants received a confirmatory diagnosis from a geneticist, or from other specialists who requested genetic tests. Half of participants received at least one misdiagnosis.

The most common symptoms first experienced were stomach or gastrointestinal problems, and pain in the hands or feet. In smaller numbers, participants also reported first experiencing symptoms such as episodes of pain, reduced sweating, tinnitus and cloudy vision (see Table 2).

The Raremark study demonstrated that data gathered directly from patients can confirm much of what has been published in the medical literature about diagnostic delays in Fabry.

A previous study of 366 patients in 11 European countries – sourced from the Fabry Outcome Survey (FOS), a registry sponsored by Shire – found male patients waited 13.7 years for a correct diagnosis, while for females, the delay lasted 16.3 years (Mehta et al., 2004). An analysis of a larger patient cohort, involving 1,765 patients worldwide, found the delays to be 14 years for males and 19 years for females (Eng et al., 2007). More recent research on the FOS database looked at 194 adults diagnosed with Fabry between 2007 and 2013. The median delays to diagnosis were 9.5 years for men and 11 years for women (Reisin, Perrin and García-Pavía, 2017).

Interestingly, the gender pattern seen in earlier work was reversed in Raremark's analysis: the median delay for males was 19 years, while for females it was 12.5 years. A major concern for Fabry patients is



## Box 2: Signs and symptoms missed by doctors in several countries

I went to see my doctor here in Russia with chest pains and was admitted to hospital because they thought I'd had a heart attack, although I hadn't.

The cardiologists noticed some problems with my heart and couldn't work out why. Their tests showed I had an enlarged heart and thickened arteries, and that there was something wrong with my ECG. They suggested I might have had heart failure, or possibly had athletic heart syndrome, but I'm no sportsman! They then prescribed me drugs including aspirin and beta blockers, and I was discharged. I walked out of the hospital with a lot of question marks in my head.

Afterwards, I was talking to a friend whose dad had seen a cardiologist in the UK. I wanted a second opinion, so I went to see her a few weeks later. At the time of my visit, I also had a rash and as soon as the cardiologist saw it, she suspected I had Fabry disease.

We talked about some of the other symptoms I'd experienced over the years and it all started to piece together. She'd never actually seen anyone with Fabry before, but had carried out a research project on the condition at university and thankfully remembered it from her studies.

Then I was referred to another specialist, an MRI scan came back positive, and my diagnosis was confirmed through a blood test.

Since finding out I have Fabry disease, I've spent some time speaking with my parents about my childhood. It turns out that I'd had stomach problems when I was born, followed by pain in my hands and feet that nobody could do anything about. When I was 18, I remember an optician finding something weird in my eye, but they didn't know what it was. I also spent some time in Hong Kong with my job and every time I went for a check-up, there was protein in my urine. I now know that was another symptom of Fabry.

There have been plenty of chances when my condition could have been picked up. But now I can look back and understand why all those things happened. It's taken me 41 years to find out.

After I was diagnosed, the rest of my family was tested and we found out that my daughter also has Fabry. We would never have known otherwise and I'm glad we can do something for her now. The uncertainty of the disease is the biggest thing I struggle with, and the fact that my daughter has it. Explaining it to people, explaining it to doctors and planning your life around it. It's so all-consuming.

**Story of man with Fabry disease aged 41 years; living in the UK and Russia**

- Interview by Sarah Venugopal, Lead Community Manager, Raremark

### Box 3: Classic diagnostic odyssey over five decades

“My hands and feet are so painful, they feel like they’ve been beaten.” I couldn’t describe my symptoms in any other way; it was such an extreme pain. When I said stuff like that to doctors, they would just start looking at me like I was crazy.

I don’t really expect a GP to know about these things. I know there are so many rare diseases out there and they can’t know about all of them. My GP was helpful and never hesitated to send me off to a consultant. But that’s when I think things need to improve. By the time you get to a consultant or a specialist, they should know more about your condition. I think all cardiologists should know about Fabry disease, or at least be able to recognize symptoms which should prompt further investigation.

I’m sure that I was only diagnosed in 2014 because the cardiologist I saw had specifically studied Fabry disease and was screening people with certain symptoms. On that occasion, I’d come to the hospital with particularly bad chest pains, as a result of trying a lower dose of my treatment. I went to the hospital for an ECG and when the cardiologist saw me, they recognized my symptoms and sent me for a genetic test.

Imagine if I’d seen that cardiologist the first time I had an ECG 23 years earlier, in 1991, when I first started experiencing chest pain – I could have had a diagnosis 23 years earlier. Instead I was sent to a cardiologist who gave me an ECG and didn’t notice anything unusual, so they said it was probably stress-related.

I think that if there had been more joined-up care with my medical records, a diagnosis could have been made years ago – even without genetic testing. Each specialist I went to just performed the test they knew how to perform, and then when the results didn’t show anything – which they never did – they just sent the results back to my GP.

I’ve lost count of the number of times I was referred to a cardiologist for my chest pain and was offered a chest X-ray or ECG. After a while I stopped complaining about my chest pains to anybody because I knew these were the only tests they would offer me.

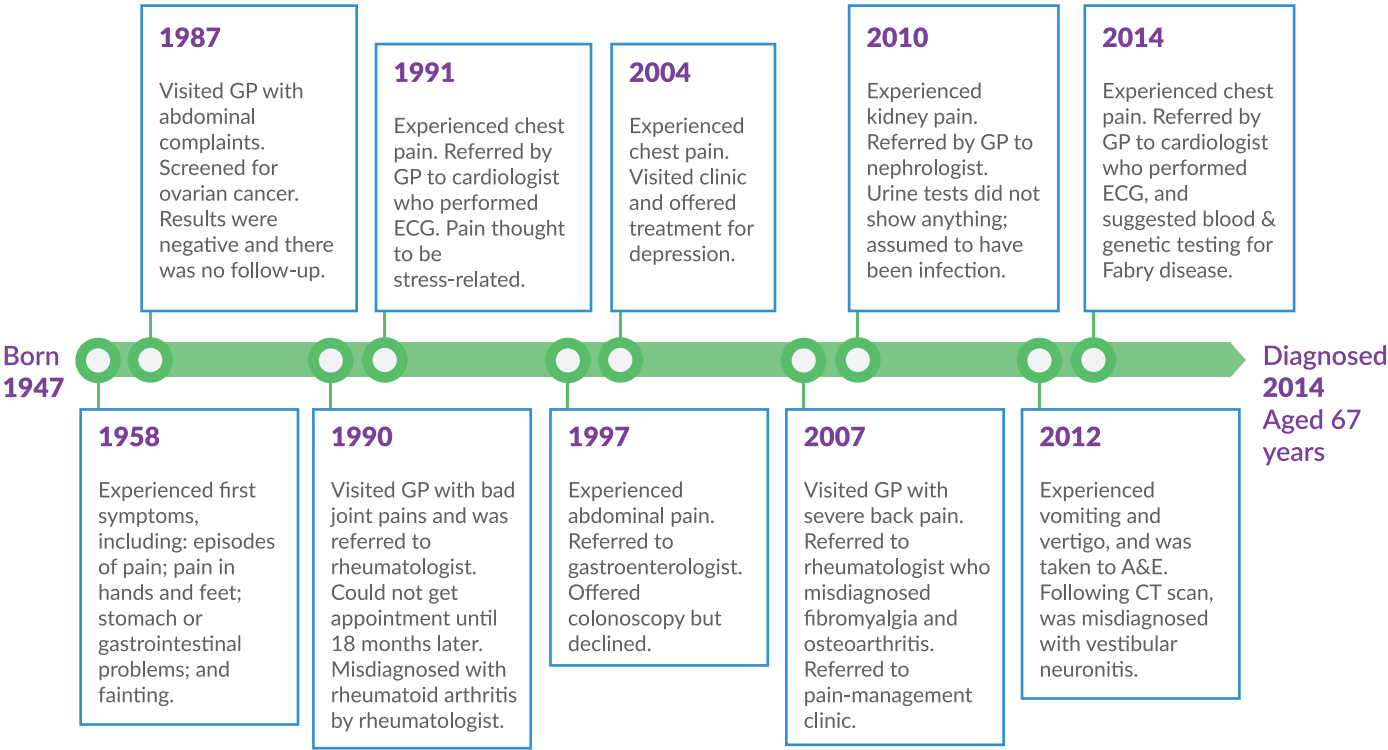
I don’t think I would have received so many misdiagnoses if each of my doctors had had a record of the other symptoms I’d experienced in the past. I’ve been misdiagnosed with rheumatoid arthritis, depression, fibromyalgia and osteoarthritis. If, for example, my rheumatologist knew I’d visited specialists previously for stomach problems and chest pain, surely they wouldn’t have diagnosed me with rheumatoid arthritis. Perhaps if they’d had records of my previous doctor visits they might have decided to look into my case further and researched my symptoms a bit more.

I think the one thing that would have helped me get a timelier diagnosis is knowledge. If specialists had more knowledge about different symptoms to look out for, and if doctors and medical professionals could share their knowledge about a particular patient, then I think a diagnosis could be made much more quickly.

**Story of woman with Fabry disease aged 70 years; living in the UK**

- Interview by Megan Truman, Community Manager, Raremark

Figure 5: Route to diagnosis for woman with Fabry disease aged 70 years; living in the UK



Source: Raremark research

Table 1: Medical professionals visited before diagnosis of Fabry

Medical professional (type / specialty)	% of total sample
General practitioner (GP)	50
Geneticist	33
Pediatrician	25
Neurologist	21
Cardiologist	21
Rheumatologist	17
Ophthalmologist	13
Nephrologist	8
Gastroenterologist	8
Cardio-geneticist	8
Nurse	4
Dermatologist	4
Internist	4

Source: Raremark research; sample = 23 participants; surveyed March 2017

the possibility of irreversible organ damage taking place before clinicians can diagnose the condition and make an appropriate medical intervention (Hoffmann, 2009). The patient-reported data on diagnostic delays presented here bring this risk into sharp focus.

A notable area of divergence between Raremark’s findings and those in the literature relates to patients’ first symptoms. The study conducted by Eng and colleagues found the most frequent presenting symptom, by quite some margin, to be neurological pain; and this was seen in both males and females (Eng et al., 2007). In the Raremark study, participants reported first experiencing stomach or gastrointestinal problems, and pain in the hands or feet in equal numbers. The implication is that gastrointestinal symptoms in Fabry disease may be more frequent than commonly believed. But additional work is needed to confirm whether this pattern will persist in a larger sample from the Raremark patient community.

**Table 2: First symptoms of Fabry experienced**

Symptom	% of total sample	% of men in sample	% of women in sample
Stomach or gastrointestinal problems	58	56	60
Pain in hands or feet (acroparesthesias)	58	56	60
Episodes of pain	38	33	40
Reduced sweating	29	44	27
Clusters of small, dark red spots on skin (angiokeratoma)	17	44	7
Ringling in ears (tinnitus)	17	11	27
Hearing loss	8	0	20
Cloudy vision	4	11	7

Source: Raremark research; sample = 23 participants; surveyed March 2017

## Unmet need for medical education

Raremark’s Fabry study offers two take-home messages. One is that physicians still struggle to recognize its signs and symptoms. The knowledge gap is not limited to primary-care physicians: there were multiple missed chances to make a diagnosis when patients saw specialists as well.

This leads to the second message: that the greatest opportunity to bring about positive change in the short term is through better medical education for physicians of all specialties. We are not the first to reach this conclusion. The Engage Health / Global Genes study surveyed more than 360 healthcare professionals and found broad recognition of the importance of timely referrals. Yet the fact the patients surveyed saw on average 7.3 physicians was a sign that “referrals are not targeted correctly, or

that the referred physicians are not well-versed in the diagnosis of rare diseases” (Engel et al., 2013). “Although there has been a good deal of dialogue about the need to refer patients, it appears that robust educational programs regarding targeting referrals or how to diagnose a rare disease in referred patients are also necessary,” wrote the authors.

Others point to the need for education at all stages of a doctor’s career. Dr Robert Saul, director of pediatrics at Greenville Memorial Hospital in South Carolina and an advocate for better rare disease-focused medical education, told *Medscape*: “We think it’s undergraduate education and then graduate medical education. We think it’s residency, then continuing medical education, and then maintenance of certification.” In short, the need for education is “across the spectrum” (Medscape, 2016).

Nobody is arguing for doctors to be able to diagnose every rare disease they encounter.

Striving for this outcome is neither feasible nor necessary. Instead, the objective is for doctors to know that a particular symptom, or groups of otherwise common symptoms presenting together, in a given patient in a certain scenario might be a sign of a rare disease requiring appropriate action.

"We don't teach about diseases because patients don't walk in with diseases, with a diagnosis on their forehead. They walk in with symptoms," says Dr Mark Korson, medical director of the Genetic Metabolic Center for Education (GMCE), an educational service for healthcare professionals based in Salem, Massachusetts (Global Genes, 2016). Rare metabolic diseases of genetic origin can affect any part of the body and can manifest in multiple organ systems. As Dr Korson explains, the first physician a person with an undiagnosed rare metabolic disease sees

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is not going to be a metabolic specialist. More likely, it will be a specialist who deals with the patient's predominant symptoms. "Specialists are often organ-oriented," says Dr Korson, "so if you see a patient with symptoms that may involve more than one organ system, that may be lost on the specialist."

GMCE takes a specialty-relevant and case-oriented approach to education. If, for

instance, patients arrive in the emergency room with profound lethargy, the goal is for the treating physician to know what types of metabolic disorders might be implicated – and what to do next (Global Genes, 2016).

Fabry disease, the focus of our own study, would be a good model for evaluating the effectiveness of specialty-focused educational approaches in future. Previous work conducted by Oxford PharmaGenesis, a communications agency, involved the creation of a booklet to educate cardiologists that an atypical electrocardiogram (ECG) pattern might be a sign of Fabry disease (Gosling, 2016).

Physician-focused education is also being driven by the patient advocacy sphere. A series of 'Physician Guides' is available on the website of The National Organization for Rare Disorders (NORD). Each guide is disease-specific and written by a subject matter expert, typically with funding from a pharma or biotech company. A total of 18 Physician Guides has been published to date, including guides to: Gaucher disease (supported by Pfizer); homozygous familial hypercholesterolemia (Aegerion; now Novilion Therapeutics); and myelofibrosis (Incyte).

NORD also hosts continuing medical education events for physicians. Its next one, titled "Finding a Zebra Among Many Horses", will take place in Washington, DC in June. It promises to shed light on diagnostic hurdles, as well as tools and resources to aid timely diagnosis.

And in the UK, enterprising young doctors have established [students4rarediseases](#), a



network that connects rare disease societies from medical schools, helping increase understanding of rare disease among the next generation of physicians. Its most recent educational event took place in London in May, with financial support from Alexion and Sobi.

But as advocates and providers of education are starting to discover, making information available is only half the battle. The other is convincing physicians of the importance of the education on offer. Dr Korson has approached several high-profile adult teaching hospitals, offering to educate their faculty about treatable rare metabolic diseases. He was often told: “We don’t see those patients here.” Dr Korson argues: “That’s a huge red flag because they don’t know what they don’t know.”

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## Networks to boost diagnostic yield

The fact that 80% of rare diseases have a genetic origin suggests that a physician’s prompt decision to order a genetic test, or to make a timely referral to a geneticist, might accelerate a diagnosis. Yet access to genetic tests is far from straightforward.

The challenges are best illustrated in Europe. An analysis of Orphanet, an orphan-disease database, found that there were more than 1,600 European laboratories at the end of 2014; collectively providing diagnostic tests for more than 2,500 genes and over 3,300 rare diseases. But the number of rare disease-associated genes that could be

tested for at a country level ranged from as few as 18 genes in a small European country up to more than 2,100 in Germany (European Commission, 2015). In addition, for 27% of the rare diseases for which a genetic test exists, the only labs with the requisite capabilities were located in a single European country.

Viewed through this lens, it’s plausible that some of the delays in reaching a diagnosis could be the result of challenges around cross-border genetic testing (for example: in time, expense and logistics). But Europe is also the stage for innovations that may clear some of the roadblocks to timely diagnosis and treatment.

This March marked the opening of a system of European Reference Networks (ERNs), serving as virtual platforms for healthcare professionals to exchange knowledge about rare diseases, seek opinions from therapeutic-area experts, and network with other clinicians, irrespective of location. Exploring the use of ERNs to support cross-border genetic testing for rare diseases was one of the recommendations the Commission Expert Group on Rare Diseases (CEGRD) put to the European Commission and EU member states in 2015 (European Commission, 2015). At the time of the ERNs’ launch, there were 900 specialized units in 26 countries grouped into 24 disease-related themes (European Commission, 2017).

A key early priority for one network, known as ERKNet, will be reaching consensus on diagnostic algorithms for rare kidney diseases. EURO-NMD, focusing on rare neuromuscular disorders, aims to shorten timelines to diagnosis by 40% within its first



*With hope, not a withholder of useful information*

*Image by DarkoStojanovic*

five years, as well as improving diagnostic yields by 15% (European Commission, 2017).

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## But will doctors listen?

While advances are being made in technology and in international coordination, one fundamental challenge has received little attention in rare disease: that of persuading doctors to believe what their patients tell them.

Published literature has brought to light the risks when patients have more knowledge than their doctors, but physicians choose to exercise their relative power – to the detriment of patients. UK researchers have warned of insufficient attention being paid to “power imbalances that suppress the patient’s voice” (Greenhalgh et al., 2015). In a review of the role played by patients and carers in evidence-based medicine, they found examples of “doctors dismissing symptoms that were not explained by blood tests, ignoring patient experience that did not correspond to textbook descriptions, using medical jargon to re-establish a position of power, and actively withholding information or services”. Their work did not have a rare disease focus. But it doesn’t take a big leap to imagine similar interactions

between doctors and people who walk into their offices with rare medical conditions they don’t understand.

In a 2016 report, Rare Disease UK, a national campaign group, described patients having their conditions dismissed as psychological and some parents being described as neurotic (Rare Disease UK, 2016). In the Eurordis study, doctors made the effort to discuss diagnoses and genetic risks to

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**Researchers found examples of doctors dismissing symptoms that were not explained by blood tests, ignoring patient experience that did not correspond to textbook descriptions, and actively withholding information or services.**

patients in only 40% of cases (Eurordis, 2005; Eurordis, 2009). Eurordis also found that diagnostic delays were longer if a patient or family member, rather than a healthcare professional, suggested the case may be a rare disease (Eurordis, 2009). Consequently, families may find they have to push doctors hard for action. One member of Raremark’s Fabry patient community said she only managed to get the family doctor to refer her daughter to a geneticist when



*Better journey ahead*

*Image by Mike Wilson*

she “went into mommy mode and made him listen”.

What can be done? The answer will require cultural change among physicians; in particular, acceptance that rare disease patients have valuable experiences that can complement their own medical training.

For a model of the future, it’s instructive to look at work conducted by *The BMJ* in the last three years. In 2014, the medical journal launched its ‘Partnering with Patients’ strategy. Authors have been encouraged to involve patients and carers in their research. *The BMJ* has recruited more than 300 patient reviewers and it has an international panel with more than 40 members.

“Improving healthcare depends on health professionals having a better understanding of the burdens of illness and treatment and of the difficulties and dangers that patients encounter while navigating fragmented delivery systems,” wrote members of *The BMJ*’s editorial team (Richards, Snow and Schroter, 2015).

To this end, *The BMJ* publishes occasional “Patient Journey” articles; each one written in the first person and complemented by a clinician’s perspective. Articles have helped shed light on patients’ perspectives in Addison’s disease, amyloidosis, Duchenne muscular dystrophy, Friedreich’s ataxia and primary biliary cirrhosis, among other rare conditions. It’s hard to gauge how much of an impact this program has had. But the argument that real and compelling patient case studies may enlighten previously uninformed physicians is robust.

Crowdsourced data about rare disease patients’ routes to diagnosis promise to bring tremendous value to doctor-patient interactions. And demonstrating to physicians just how often they and their peers are missing opportunities to diagnose rare diseases, and in which contexts, will open their eyes to the worth of rare disease-focused educational programs. The importance of empowering rare disease patients with actionable information to help themselves is widely acknowledged. Now it’s time to do the same for their physicians.

*Pete Chan is Head of Research & Analysis at Raremark.*

Email: [pete.chan@raremark.com](mailto:pete.chan@raremark.com)

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