

# Niemann-Pick type C disease: Journey to Diagnosis

A Report for  
Neurologists



# Introduction

Niemann-Pick type C disease (NP-C) is a rare, autosomal recessive, neurological disease affecting about one in 120,000 people. It is characterized by toxic accumulation of lysosomal lipids, such as unesterified cholesterol and glycosphingolipids, which damage cells and tissues. Although early symptoms generally affect the liver and spleen, a number of highly variable, progressive, neurological symptoms increase in both severity and effect on quality of life in the late stages of the disease.

This report draws together the results of a much-needed piece of research among NP-C patients and their families. Interviews were conducted with parents and carers of patients with NP-C to provide an insight into their experience of the journey to diagnosis, the physical and emotional impact that this can have on families and the importance of support before, during and after receiving a diagnosis of NP-C. The research was carried out alongside in-depth qualitative interviews with four healthcare professionals (HCP) who are experts in the field of NP-C diagnosis and management.

Professor Frédéric Sedel addresses why the NP-C patient survey results are relevant and important to neurologists and how learning can be taken from these findings and implemented in practice to help speed up this journey to diagnosis:

“Neurologists play a huge role in diagnosing patients with NP-C as highlighted by these survey results. As a result it is key that neurologists are able to firstly recognize the disparate symptoms, which could be indicating a differential diagnosis of NP-C and secondly make links between these non-specific symptoms in order to be able to confirm a diagnosis. We are aware there is often a delay in the diagnosis of a patient with NP-C and this report clearly outlines why this may be the case and the role HCPs need to take in order to reduce this delay.

It is evident from the survey that three groups of patients were identified: those with prominent visceral symptoms; learning difficulty and finally psychiatric symptom presentation. From my perspective there is also a fourth group of patients, those with purely neurological symptoms starting in late adolescence or adulthood. A diagnosis of NP-C could be expedited through better awareness of these groupings amongst HCPs and of the potential for patients to cross between the groups, displaying different symptoms as they get older. However, the NP-C patient survey clearly highlights the difficulty that physicians experience in linking together symptoms that may appear at different stages in the patients life and how this can impact on the time taken to diagnosis. For example if a patient displays neonatal splenomegaly then this needs to be linked to symptoms that the patient might present with later on in life e.g. ataxia.

In addition; physicians must be able to identify very specific signs such as vertical supranuclear gaze palsy (VSGP) or splenomegaly. These signs which are highly suggestive of NP-C and which are almost always present are difficult to recognize if you have not seen them before. They may require specific investigations such as ocular saccades recordings or abdominal ultrasonography.

Lack of clear diagnosis can be extremely frustrating for physicians as well as the patients and their families and carers, where after three or four consultations a definitive diagnosis has still not been confirmed. A diagnosis of NP-C is important for everyone involved with the patient. Confirmation of diagnosis allows patients access to appropriate treatments, which is rewarding for the neurologist who is able to help patients manage their disease. Besides symptomatic treatments, an NP-C specific treatment is available. Therefore it is vital for neurologists to have a full understanding of NP-C and to be able to recognize the symptoms associated with this rare disease.

The Neurologist will often be the HCP to communicate the diagnosis of NP-C to the patient or their family or carer. They therefore must understand the consequence of this communication, how it will have a significant emotional impact upon the patient and their family, as outlined in this report.

Once a diagnosis has been confirmed a robust support system is essential to help patients with NP-C and their families to cope with managing the disease. It is important that there is an integrated care structure in place in specialist centers in order for diagnosis, communication of the diagnosis and follow-up consultations to be managed appropriately and effectively. Therefore from my viewpoint, there is also a need for more referral centers to be able to refer these patients to so they can receive this care.

The main call to action for neurologists is to increase awareness about this disease amongst the profession, from peer-to-peer. A patient may be presenting with symptoms of NP-C, but it will not necessarily be immediately obvious that this is the cause. Therefore the ability to link symptoms is vital, but physicians must be able to identify the most specific presenting symptoms first. Splenomegaly, cataplexy and VSGP are examples of particularly difficult symptoms to recognize if you have not seen them before, but key symptoms that can lead to a diagnosis.”



**Professor Frédéric Sedel MD PhD**

*Hospital Practitioner, Coordinator of Neurometabolic Unit, Reference Center for Lysosomal Diseases, Pitié-Salpêtrière Hospital, Paris*

# Forewords



## **Hans Klünemann, MD PhD**

*Professor of Psychiatry, University of Regensburg School of Medicine, Germany*

I saw my first patient with NP-C in a memory disorders clinic in 1996. She was in her mid-forties and was referred with a diagnosis of possible Alzheimer's disease. I am certain that NP-C is often undiagnosed in adult psychiatric patients. Educating physicians about NP-C will be extremely beneficial in terms of accessing treatments for these patients.



## **Frits Wijburg**

*Metabolic Pediatrician and Professor at the Academic Medical Center in Amsterdam, The Netherlands*

During my career in metabolic diseases I have seen many patients with different metabolic disorders and I have learnt that NP-C is not only one of the more severe disorders but unfortunately also one of the most difficult to diagnose. Improving early clinical recognition is key and will decrease the often lengthy diagnostic odyssey by allowing for timely diagnosis. This report clearly shows the importance of this.



## **Jackie Imrie**

*Clinical Nurse Specialist, Niemann-Pick diseases (UK)*

Having been actively involved with families with Niemann-Pick disease for over a decade I felt I had a lot of insight that I could offer the steering group. The survey results document what myself, other professionals and families have been saying for many years and hopefully we can act on these concrete findings. Not all families want contact with support groups but we need to be able to offer something to support them to suit their needs. We need to have professionals and families working together to raise awareness of Niemann-Pick disease and hopefully decrease the time to diagnosis for most families.



## **Bruno Bembi**

*Pediatrician and Geneticist, Director of Regional Coordinator Center for Rare Diseases, University Hospital 'Santa Maria della Misericordia', Italy*

Rare diseases are often under diagnosed and under managed. This is particularly the case in NP-C, where patient presentations are not homogenous. That is why it is so important to educate healthcare professionals and parents about the course of this disease and the impact on patients and families of a long journey to diagnosis. Hopefully this report will play an important role in educating and increasing understanding of NP-C.



## **Jim Green**

*Chairman, Niemann-Pick Disease Group (UK), NPDG (UK)*

*Co-ordinator, International Niemann-Pick Disease Alliance, (INPDA)*

The collation and distribution of a patient survey for Niemann-Pick type C disease is something that has been needed for a long time. As someone who has been involved with this disease for 20 years I believe this report will help patients and their families feel less isolated by recognizing the issues they face. I believe too that it clearly outlines the reasons why professionals and support networks should explore all possible ways of working together in order to provide improved diagnosis, treatment and support. I am particularly pleased that the report recognizes that the issues raised are universal and unaffected by national boundaries. I hope that wherever the survey is read it will improve understanding and in so doing help those living with and managing this disease.



## **Sergio Vidal**

*Patron and member of the medical committee of the Spanish Niemann-Pick Foundation (Fundación Niemann Pick de España)*

I wished to have the opportunity of sharing my personal experience as an active member of the support organization and primarily, as a father of a child with NP-C. NP-C affects patients worldwide with the same emotional and physical impact, as highlighted in the report. This survey is very important as it is the first time that the reality of the disease known by patient organizations, NP-C patients and relatives will be collated and presented as a report. Healthcare professionals need to use this knowledge to educate themselves and others about the disease, the symptoms of the disease, how we can achieve an early diagnosis and the benefit of an early diagnosis. For patient and carers this report highlights the importance of receiving a diagnosis and the role that the patient organization can play in supporting the patient and their family.

# What is Niemann-Pick type C disease?

**Niemann-Pick type C disease (NP-C)** is an autosomal recessive, neurological condition characterized by toxic accumulation of lysosomal lipids, such as unesterified cholesterol and glycosphingolipids, which damage cells and tissues.<sup>1</sup> Although early symptoms generally affect the liver and spleen, a number of highly variable, progressive, neurological symptoms increase in both severity and effect on quality of life in the late stages of the disease (see Table 1). It is an inherited disease that may appear in young infants or not until late adulthood. Typically, it presents in mid-to-late childhood, with a child appearing clumsy and experiencing frequent falls.<sup>1,2</sup> However, more adults have been diagnosed with NP-C in recent years.<sup>3</sup>

Systemic symptoms	Neurological symptoms
<b>Hepatomegaly</b> (enlarged liver)	<b>Vertical supranuclear gaze palsy</b> (eye movement problems)
<b>Splenomegaly</b> (enlarged spleen)	<b>Ataxia</b> (balance disorder)
<b>Neonatal jaundice</b>	<b>Cognitive dysfunction</b> (problem with information processing or memory)
<b>Pulmonary infiltrates</b>	<b>Dysphagia</b> (difficulty swallowing)
	<b>Dysarthria</b> (slurred and irregular speech)
	<b>Dystonia</b> (sustained muscle contraction)
	<b>Gelastic cataplexy</b> (episodes of sudden muscular weakness)

**Table 1. Symptoms of NP-C<sup>1,2</sup>**

## Who is affected by NP-C?

It is estimated that NP-C affects approximately 1 in 120,000 people;<sup>3</sup> however, the wide range of symptoms which often go undetected means that this is likely to be an underestimate.<sup>1</sup>

## How is NP-C diagnosed?

Diagnosis of NP-C is not straightforward. The low prevalence of the disease, wide range of non-specific symptoms and oligosymptomatology (symptoms can be few and mild) mean that it can often be either misdiagnosed or may go unnoticed for many years.<sup>1</sup> Confirmation of NP-C involves biochemical testing (limited to a number of specialist centers), histological analyses, genetic testing and imaging techniques.<sup>1</sup>

## How is NP-C managed?

Unfortunately there is no cure for NP-C. Management has focused on the use of anti-cholinergics, tricyclic anti-depressants and CNS stimulants to help alleviate some of the neurological symptoms of NP-C.<sup>1</sup> Supportive care involves physical therapy to help maintain mobility, speech or occupational therapy and prevention or management of secondary complications, such as chest infections or severe constipation.<sup>2</sup>

In 2009, the first NP-C-disease-specific therapy was approved in some countries for the treatment of progressive neurological manifestations in adults and children with NP-C. The treatment is based on the use of a small molecule, miglustat which is an iminosugar that reversibly inhibits glucosylceramide synthase, the first enzyme in the pathway responsible for glycosphingolipid synthesis.<sup>4,5</sup> It reduces the accumulation of glycosphingolipids in the brain and has been shown to stabilize key measures of neurological disease progression in NP-C, including horizontal saccadic eye movement (HSEM), ambulation, manipulation, language and swallowing.<sup>4-7</sup>

## NP-C research

Recent progress in understanding NP-C has identified many potential targets for specific therapies that may affect disease progression or long-term outcomes. Research has focused on replacement or repair of the NP-C gene, use of cholesterol-lowering agents, neurosteroid replacement and restoration of lipid trafficking with the GTPase enzyme.<sup>1</sup>

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# Overview of the NP-C Patient and Healthcare Professional Survey

The NP-C Patient and Healthcare Professional Survey provides new insight into the complexities of NP-C diagnosis. Parents, carers and healthcare professionals in six countries (UK, France, Germany, Italy, Spain and The Netherlands) shared their experiences of the journey to a diagnosis, its emotional impact on the family and the importance of a good support network when caring for a family member with NP-C.

## Methodology

In-depth qualitative interviews were carried out with representatives, either parents or carers, of 26 families with one or more family members diagnosed with NP-C. A total of 28 NP-C patients aged between 3 and 36 years were involved; 11 males and 17 females. Two families had more than one family member with NP-C and their interviews focused on the first member diagnosed as, in the majority of cases, family history and previous experience usually expedited diagnosis of the second family member.

This research was carried out alongside in-depth qualitative interviews with four healthcare professionals who are experts in the field of NP-C diagnosis and management – an NP-C specialist nurse, a neurological psychiatrist, a pediatric geneticist and a pediatrician who specializes in hereditary metabolic disease.

The research was conducted by Insight Research Group in January and February 2010. The aim of conducting the research was to understand the following aspects of diagnosis:

- Whether parent or carer experiences of the journey to diagnosis could help raise awareness of NP-C and so reduce the time it takes to reach a diagnosis and start effective management of the condition
- The emotional impact of NP-C from a patient or carer perspective and the benefits of finally achieving a diagnosis of the condition and access to support
- Whether any differences exist in different countries with regard to diagnosis, emotional impact and support and to determine if it is beneficial to share practices

## Results: The journey to diagnosis

Interviews with parents and carers highlighted the lengthy and challenging nature of the journey to diagnosis of NP-C. Time to diagnosis is very much influenced by the type of symptoms patients experience and how quickly they are recognized, suggesting that increased awareness and greater knowledge of NP-C symptoms amongst healthcare professionals would facilitate earlier referral for specialist care. The average time from onset of noticeable symptoms to diagnosis for the families interviewed was slightly over five years, however timescales varied from a few months to 19 years. The survey identified three specific patient types and classified them according to type of symptom presentation and time taken to diagnosis (see Table 2).

	Key symptoms	Time to diagnosis
<b>Visceral symptoms</b>	Hepatomegaly or splenomegaly and/or suffering from jaundice	Average 9 months
<b>Developmental delay</b>	Clumsiness, ataxia or declining academic performance	Average 6 years
<b>Psychiatric symptoms</b>	Hallucinations, aggressive behavior or paranoia (often in their teens)	Up to 19 years

Table 2: The three types of prevalent symptoms displayed by NP-C patients

“ *The symptoms will have been there for years, just that they become more severe. They will be severe enough to not just be noted by the patient and close family, but the doctor will also have to admit that this is not just a bad day.*

**Healthcare professional**

In patients exhibiting severe **visceral symptoms**, such as hepatomegaly, splenomegaly or persistent jaundice, the family is usually immediately referred to a pediatrician such as an infectious disease specialist, a metabolic disease specialist or a liver specialist and reasonably prompt diagnosis follows. However, these symptoms are not always recognized in infancy and can be attributed to viral or immune disease (see Figure 1) or subside by themselves over time.

For those patients exhibiting symptoms of **developmental delay**, such as clumsiness, ataxia or reduced academic performance, diagnosis may not be confirmed until they are between four and eight years old, sometimes even later. These symptoms initially resemble more common disorders such as dyslexia, dyspraxia or general learning difficulties and the gradual decline can often be difficult to see, especially in a family environment (see Figure 1).

Whilst some parents worry that they may be over-reacting, especially if it is a first child, others instinctively know there is a problem but they may be dismissed as over-anxious or neurotic when regular medical investigation fails to identify a physical illness to explain the symptoms.

A general practitioner (GP) or community pediatrician may refer them to a psychiatrist for behavioral problems or learning difficulties but it isn't until acquired skills are lost or severe physical symptoms, such as seizures or cataplexy appear, that a patient is referred to a neurologist.

Patients presenting with **psychiatric symptoms** experience the longest journey to diagnosis – sometimes up to 19 years. Symptoms, such as mood or behavior disturbances often emerge in the teenage years before other, physical symptoms are noticed and are commonly misdiagnosed as schizophrenia, autism with psychotic features or bipolar disorder (see Figure 1). Sometimes, their symptoms may be attributed to a rare metabolic disorder, multiple sclerosis or non-specific neuro-degenerative disease. Eventually, they develop progressive cognitive dysfunction leading to dementia as well as clear neurological symptoms such as ataxia, dystonia, cataplexy, dysarthria and eye palsy and are diagnosed with NP-C by a neurologist or a metabolic disease specialist.

“ *There were things that we didn't even notice as parents; for example, he could no longer hold the fork properly or hold his own cup, and whilst others would take note of that, we thought that perhaps he was simply mimicking his baby brother in order to attract attention.*

**Parent, Germany**

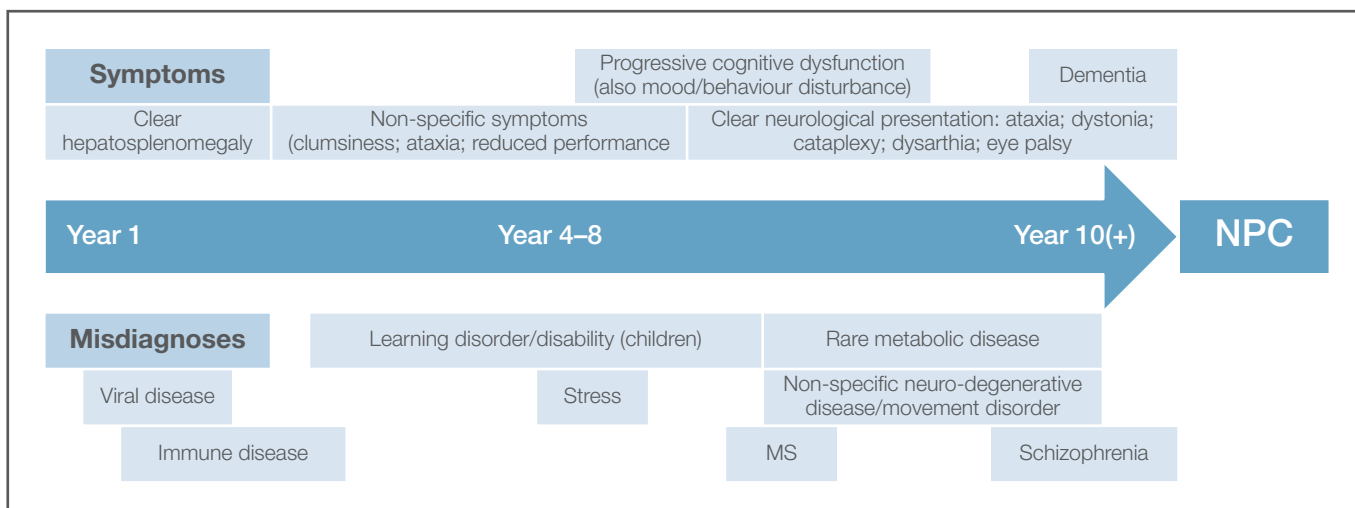


Figure 1: Common misdiagnoses of NP-C

## Linking the symptoms

Interviews with parents and carers as well as healthcare professionals suggests that encouraging healthcare professionals to discuss symptoms with colleagues in other disciplines could facilitate early diagnosis by allowing symptoms to be linked together and then linked to the possibility of NP-C. Healthcare professionals could help parents by prompting them to share more background information about seemingly unrelated symptoms to ensure that healthcare professionals receive the wider picture.

Information is not always shared between departments and patients may see several different specialists for treatment of individual symptoms or be in the care of several specialists simultaneously. This may obstruct a physician from taking a holistic view of the patient's clinical signs and symptoms.

The healthcare professionals interviewed suggested that a symptom checklist for identifying metabolic disease may help reduce the time taken to confirm a diagnosis. Currently, it is only when progressive neurological and cognitive decline finally leads to referral to a neurologist or a metabolic disease specialist that NP-C is confirmed through biochemical testing or histological analyses.

Similarly, heightened awareness amongst the various specialists who may see and treat individual symptoms will also achieve greater opportunity for earlier diagnosis and initiation of early treatment to stabilize disease progression in those patients with neurological symptoms (see Table 3).

Additionally, it was felt that greater symptom awareness in the community or educational setting, for example amongst GPs and school doctors, could potentially help identify children appropriate for further investigation. The symptoms that GPs and school doctors might see include excessive clumsiness, deterioration in ability, irregular eye movements and memory difficulties.

Specialists	Typical symptoms they might see
Hepatology/liver specialists	Prolonged neonatal jaundice/hepatomegaly or splenomegaly
(Neuro-) psychiatrists	Ataxia
Pediatricians (if also see teenagers)	Dystonia
(General) neurologists	Dysarthria
Ophthalmologists	Dysphagia
	Cognitive dysfunction (may include behavioral disturbance; paranoia; hallucinations)
	Vertical supranuclear gaze palsy

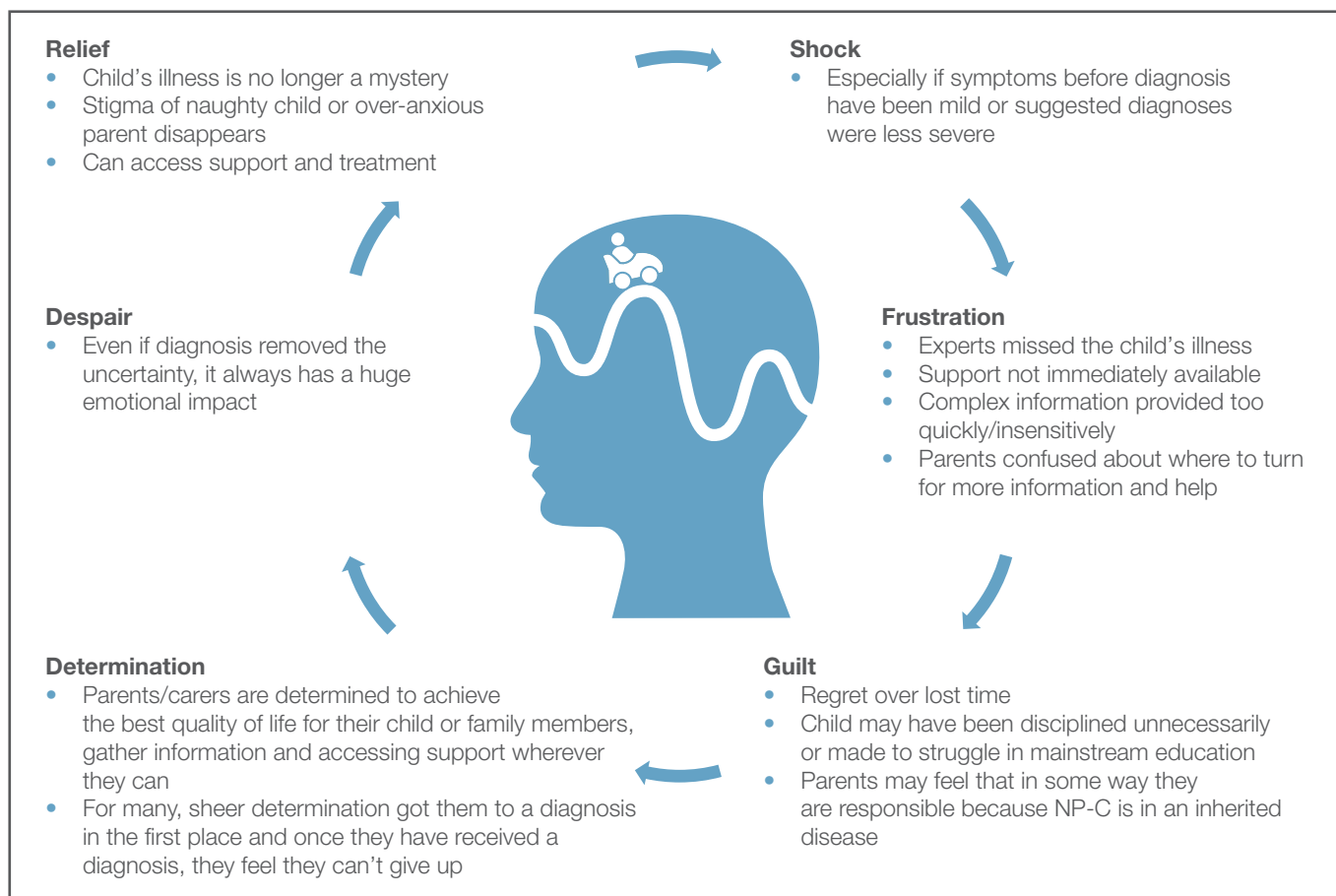
**Table 3: Targets and symptoms for earlier diagnosis of NP-C aimed at professionals seeing individual symptoms**

# Results: The emotional impact of receiving a diagnosis of NP-C

**According to parents and carers interviewed, receiving a confirmed diagnosis of NP-C has a huge emotional impact on the patient's family, showing that as well as facilitating diagnosis, healthcare professionals have an important role in helping families access the information and support they need. Families may need to find local patient organizations, social services and family networks to help them to manage the challenges of coping with NP-C.**

The views outlined in figure 2 were echoed by the healthcare professionals interviewed, who often encountered families of newly-diagnosed patients who do not really understand what diagnosis means, have

little or no information about the disease and have no idea how to access the educational, social and psychological support they desperately need.



**Figure 2: Parent and carer interviews provided insight into the range of strong emotions experienced at the time of diagnosis**

## Results: The value of having a diagnosis

**All families interviewed, whether experiencing prompt or delayed diagnosis of NP-C, emphasized that early diagnosis not only helps families access support, advocacy and appropriate treatment earlier but also helps them to prepare emotionally and physically for their child's future. They can spend more quality time with their child before the disease progresses, for example, prioritize holidays and plan for the future.**

### The importance of support

Looking after a seriously ill child puts a great deal of physical and emotional strain on a family. There is the physical struggle of identifying available services, coordinating efforts across numerous healthcare teams and providing 24-hour care as symptoms become progressively worse. In addition, there is often the emotional struggle of balancing relationships with partners and other children.

### An optimal support structure

Parents and carers interviewed have a clear idea of what an optimal support structure should comprise. They describe a model with the mother, or parents, at the center surrounded by layers of support comprising social workers, healthcare practitioners, local government and charities (see Figure 3). In reality, this is rarely achieved. Access to day-to-day support varies significantly within countries, with availability of financial support for alterations to the home, respite care or counseling services for the family often depending on the child's age and local policies.

## Most valuable forms of support

Even though the circumstances of the families interviewed differed extensively in terms of the support they receive, they were unanimous in their view of the most valuable elements of support:

- **A voice on the phone** – someone to talk to about a child's day-to-day symptoms
- **A central point of coordination for advocacy** – someone who knows what services and treatment are available and can help them prepare all the necessary documentation
- **Coordination of services** – a wider team that provides consistency of in-home services and supports the family in caring for the patient

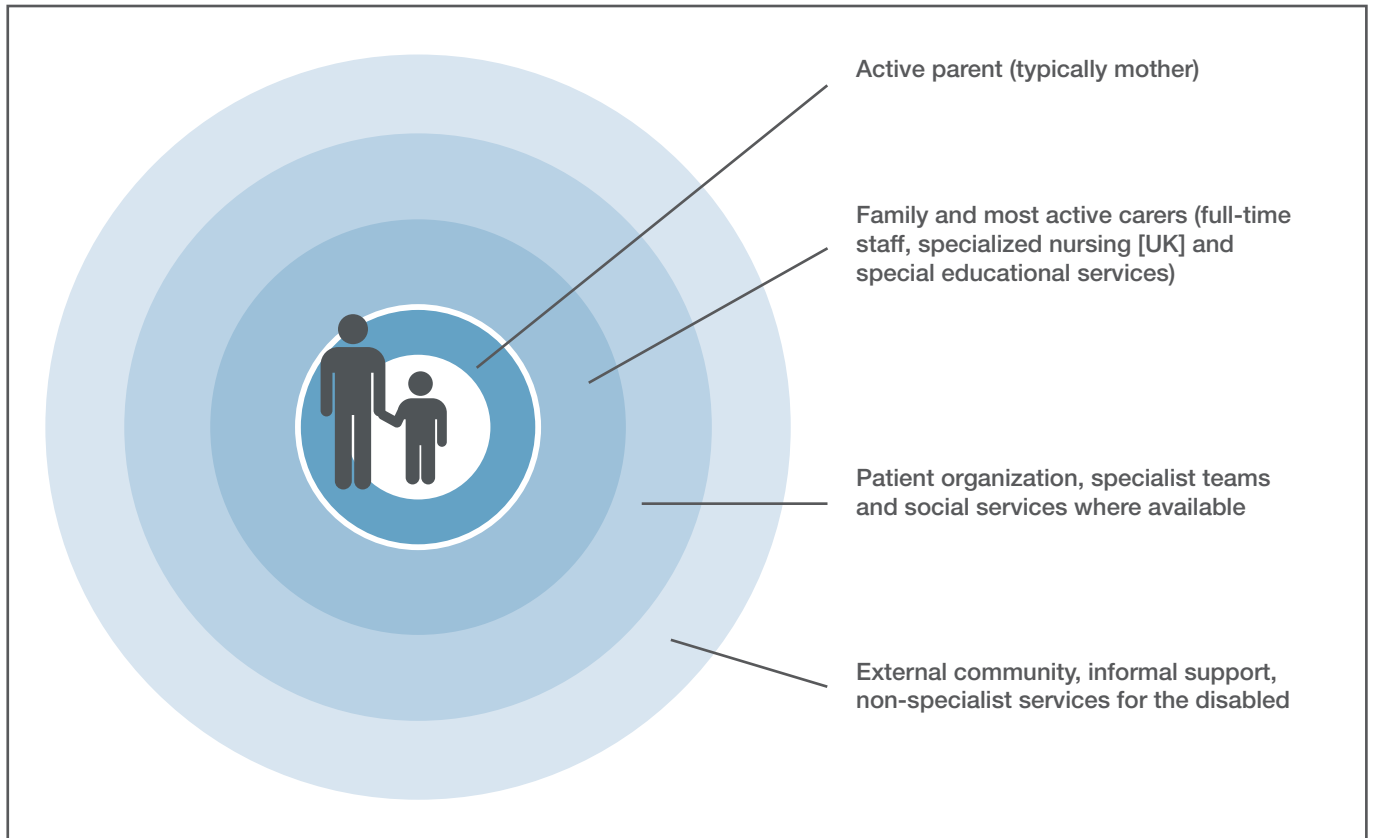


Figure 3: The optimal support structure for a family affected by NP-C

“ I think that patients definitively have this unmet need [for early diagnosis]. If you look at cases that are left without a diagnosis, family members will be wondering why their children are ‘different’, why can they no longer do certain things?... The patient is accused of being stubborn, lazy or uncooperative. Parents will be looking for all sorts of explanations – for the movement disorder as well as the mental deterioration. I think the family and the patient are relieved once they have the correct diagnosis. Finally, they have an explanation for the symptoms and know what is wrong. I think the diagnosis is not only a relief in terms of a social and psychological context, but also because it is now possible to start a treatment that is dealing with the root cause of the illness.

**Healthcare professional**

# Neurological NP-C case reports

**The following case histories depict the accounts of two adult patients diagnosed with NP-C. These case histories were provided by Professor Frederic Sedel of the Neurology Department, Pitié-Salpêtrière Hospital, Paris. These cases highlight the need to recognize the symptoms of NP-C and linking these together to reduce time to achieving a confirmed NP-C diagnosis.**

## Patient 1

A female patient aged 40 years had a relatively normal school life apart from experiencing difficulty in looking downwards as a child. As an adult she married, had children and became an educational worker for young children. It was not until she was aged 39 years that she began to exhibit further symptoms, presenting with ataxia and frontal dementia. She lacked concentration, had difficulty in making decisions and she became less inclined to perform normal daily activities such as bathing. However, she presented with no psychiatric symptoms. She was referred to the dementia department where she saw a neurologist who had experience with diagnosing NP-C patients. He examined her ocular movements, establishing the cause was not purely frontal dementia. This led to recognition of vertical supranuclear gaze palsy (VSGP) and therefore to the diagnosis of NP-C.

## Patient 2

A male patient aged approximately 40 years was diagnosed with NP-C following his sister receiving a diagnosis a few months previously. He had experienced developmental delay since childhood, with problems learning to read and write. However, this was his only symptom during childhood, which then stabilized until the age of about 40 years. He then experienced a lack of interest and concentration in carrying out daily tasks and after visiting a neurologist it was recognized that he was displaying signs of VSGP. His sister had presented with more classical symptoms from 16 years of age, starting with cognitive problems ataxia. She became pregnant and gave birth at the age of 17 but she did not take care of the baby. She then displayed progressive symptoms including frontal dementia, ataxia, VSGP and deafness leading to the diagnosis of NP-C at the age of 37.

## What does this research mean?

**The NP-C Patient and Healthcare Professional Survey highlights an overwhelming need for change. The lack of diagnosis of NP-C or common misdiagnosis is a great burden to patients and their families. There is low knowledge and awareness of metabolic storage diseases, such as NP-C, amongst GPs and pediatricians. Not only does this delay diagnosis but it can also lead to feelings of anger and frustration amongst parents whose instincts tell them there is a serious physical problem in their child, yet their concerns go unacknowledged.**

As well as a combined effort to improve symptom recognition and creation of the opportunity for earlier diagnosis of NP-C, the survey also shows the desperate need for better provision of co-ordinated healthcare.

A centralized team approach where there is three-way communication between the carer/patient, healthcare team and patient advocacy/support group will not only enable families to access earlier treatment but also harness the social support that will enable them to achieve the best quality of life possible for their child.

# Taking action

**Earlier diagnosis of NP-C would allow families to access disease-specific treatment that can potentially slow disease progression. It would also provide healthcare professionals with an opportunity to advise and educate families about NP-C, direct them towards advocacy and support services and offer earlier genetic counseling.**

## So how can healthcare professionals help?

Firstly, there needs to be a greater focus on raising awareness of the visceral symptoms in infants which may be the first sign of NP-C. Proactive testing of neonates with enlarged spleens and ongoing severe jaundice before symptoms subside could result in earlier diagnosis in many patients. Secondly, for those patients whose first symptoms are that of developmental delay, specialists and pediatricians need to recognize when several specific symptoms are presenting and to be aware this could be pointing to NP-C as the cause. Sharing information amongst different specialists can help link together previously unrelated symptoms and reveal the wider picture. In patients with psychiatric symptoms, healthcare professionals need to look outside the familiar symptoms for others, usually somatic, that do not fit the current diagnosis.

The results of this survey provides extensive insight into the huge emotional and social burden that families face when caring for a child with NP-C, emphasizing that more needs to be done to help these families cope. It also highlights the need for the provision of fully co-ordinated healthcare teams around the family in order to provide a support structure that enables them to achieve the best quality of life they can for their child both in the early stages of NP-C and as the disease progresses.

## So how can healthcare professionals help patients and carers?

They should direct parents and carers towards the information sources and patient associations that provide useful, unbiased disease information, social and psychological support and contact with other NP-C families. If possible, they should also refer parents and carers to 'one point of contact,' preferably a specialist nurse, who can provide healthcare advice and act as an advocate for services and day-to-day needs.

## A call to action for everyone affected by NP-C

### 1. Increase awareness of NP-C symptoms amongst healthcare professionals:

- Better healthcare professional knowledge of the visceral (classic) symptoms of NP-C would facilitate the earlier specialist care referral of infants and those children who present in early school years with visceral (classic) symptoms

### 2. Consider a diagnosis beyond the obvious:

- Specialists need to ensure that they are looking at all the symptoms a patient presents with and linking these symptoms together
- Specialists need to be informed about all the signs and symptoms of NP-C in order to enable them to link together seemingly unrelated features

### 3. Share information:

- Parents should be encouraged to share with their GP more background information and history about all the symptoms their child has ever had, if they continue to be concerned
- Both generalists and specialists need to ensure they share all disease history information with the specialist they are referring the patient on to so that specialists are able to recognize the wider picture
- Parents and carers could seek the support of teachers or other social networks to gain extra evidence when presenting concerns to healthcare professionals

### 4. Seek support:

- Parents and carers should be proactive in seeking support from patient organizations, social services and family networks to ease the emotional impact of receiving a diagnosis of NP-C and to help manage challenges in coping with the condition

# Acknowledgements

We are grateful to all the families who took part in this educational research. The stories of their experiences will help both healthcare professionals understand the need for improved education and earlier diagnosis of NP-C and also help families to persist and seek the support and help they need.

The quotes used in this report are taken from individual face-to-face interviews carried out by Insight Research Group in January and February 2010.

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## Further information

For more information on NP-C please visit the following website:

- [www.npc-info.com](http://www.npc-info.com)

This survey is sponsored by Actelion Pharmaceuticals Ltd

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