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Keywords Normal pressure hydrocephalus/Diagnosis/Care

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In this article...

- Recognising symptoms of normal pressure hydrocephalus and the importance of early diagnosis
- The benefits of timely treatment and ongoing multidisciplinary care
- How to meet the needs of patients with normal pressure hydrocephalus and their families

Normal pressure hydrocephalus: recognition, diagnosis and care

NT SELF-ASSESSMENT

Test your knowledge. After reading this article go online to complete the self-assessment test. If you score 80% or more, you will receive a certificate that you can use as revalidation evidence.

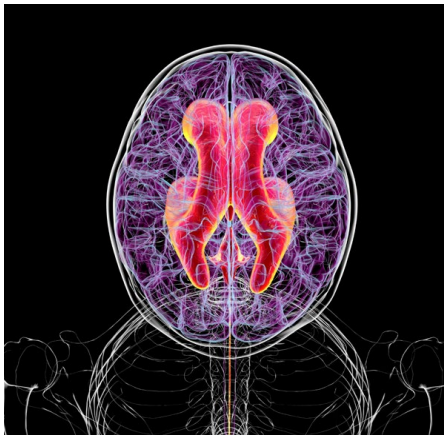
Key points

Normal pressure hydrocephalus is a progressive neurological condition and a potentially treatable cause of dementia

Characteristic symptoms are gait issues, cognitive impairment and urinary incontinence

Early diagnosis increases the chance of treatment eligibility

All patients with the condition benefit from multidisciplinary care, monitoring and support



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Abstract Normal pressure hydrocephalus is a progressive but potentially treatable cause of dementia in older adults that is often overlooked and misdiagnosed. Nurses play a vital role in recognising the symptoms – gait disturbance, cognitive impairment and urinary incontinence – and in facilitating early referral and diagnosis. Shunt surgery can improve quality of life for some, but ongoing multidisciplinary support is essential for all patients. Symptom recognition and management, care coordination, patient education, and patient and family support are key nursing priorities. Timely intervention improves patient outcomes and promotes independence.

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Normal pressure hydrocephalus (NPH) is a potentially treatable cause of dementia in older adults (Fernández-Méndez et al, 2025). The treatability of NPH makes recognition critical and sets the condition apart from better-known dementia causes. NPH diagnosis is frequently missed or delayed, and symptoms are often attributed to other conditions, including Alzheimer's disease and Parkinson's disease, or ageing.

Reported NPH prevalence varies widely but increases with age and may be higher in particular groups, including extended care and assisted living residents. With an estimated prevalence of 1.5% among those aged over 70 years (Constantinescu et al, 2024), NPH may affect around 145,500 people in the UK, highlighting a substantial but under-recognised burden of disease.

In NPH, the fluid-filled ventricles of the brain expand into and distort the surrounding tissues, causing a range of characteristic clinical symptoms (Fig 1). Intracranial pressure is not significantly elevated, unlike in other forms of hydrocephalus, but it is still clinically significant. Timely diagnosis remains important.

Clinical features

NPH is associated with progressive neurological symptoms resulting from gradual ventricle expansion and disruption of the surrounding brain tissue. The characteristic symptoms, known as Hakim-Adam's triad (also known as Hakim's triad), develop insidiously, typically in the following order:

- Gait disturbance: walking difficulty, shuffling, impression of feet being stuck to the floor (termed magnetic gait), balance problems, postural instability and falls (commonly backwards);
- Cognitive impairment: short-term memory loss, confusion, slowed thinking/mental processing, apathy/lack of motivation, difficulty concentrating or maintaining attention;
- Urinary incontinence: typically urge incontinence, which worsens over time. Patients may report frequency, urgency and/or leakage (Hakim and Adams, 1965).

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"Diagnosis is frequently missed or delayed, and symptoms are often attributed to other conditions"

Not all individuals with NPH will experience the full triad of symptoms, and differential diagnosis can be complex. The clinical features of NPH are similar to other conditions, such as Alzheimer's or Parkinson's disease (Table 1) and comorbidity can occur. Consequently, NPH is often misdiagnosed, diagnosed late, or not considered at all.

Diagnosis

NPH is diagnosed based on clinical presentation, neuroimaging and other diagnostic tests. In patients exhibiting at least one of the clinical triad symptoms (that cannot be explained by other causes), test results indicating NPH include:

- Neuroimaging features: enlarged ventricles, compression and crowding of the fluid-filled spaces and grooves on the surface of the brain. The imaging pattern known as disproportionately enlarged subarachnoid space hydrocephalus (DESH) is highly suggestive of NPH (Petersen et al, 2024) – for images of DESH, see radiopaedia.org/articles/normal-pressure-hydrocephalus;
- Lumbar puncture/cerebrospinal fluid (CSF) tap test/extended or large volume lumbar drainage: CSF opening pressure is typically normal or near-normal (≤200mmH2O), with normal CSF composition (Grünewald, 2025). Improvement in symptoms, most commonly in gait and balance (Johnson and Williams, 2025), supports a diagnosis of NPH. Some evidence suggests that removal of larger volumes of CSF (>40ml, when a tap test typically involves removal of around 30-50mL of CSF), may be associated with greater improvement in gait (Liouta et al, 2024).

Treatment and management

The mainstay of NPH treatment is shunt surgery to implant a valved catheter system that drains excess CSF from the brain to the abdomen (Fig 2).

The ventriculoperitoneal shunts used for NPH often have a programmable valve that allows the valve opening pressure to be adjusted non-invasively. In patients

Fig 1. **Normal pressure hydrocephalus: ventricle expansion and key symptoms**

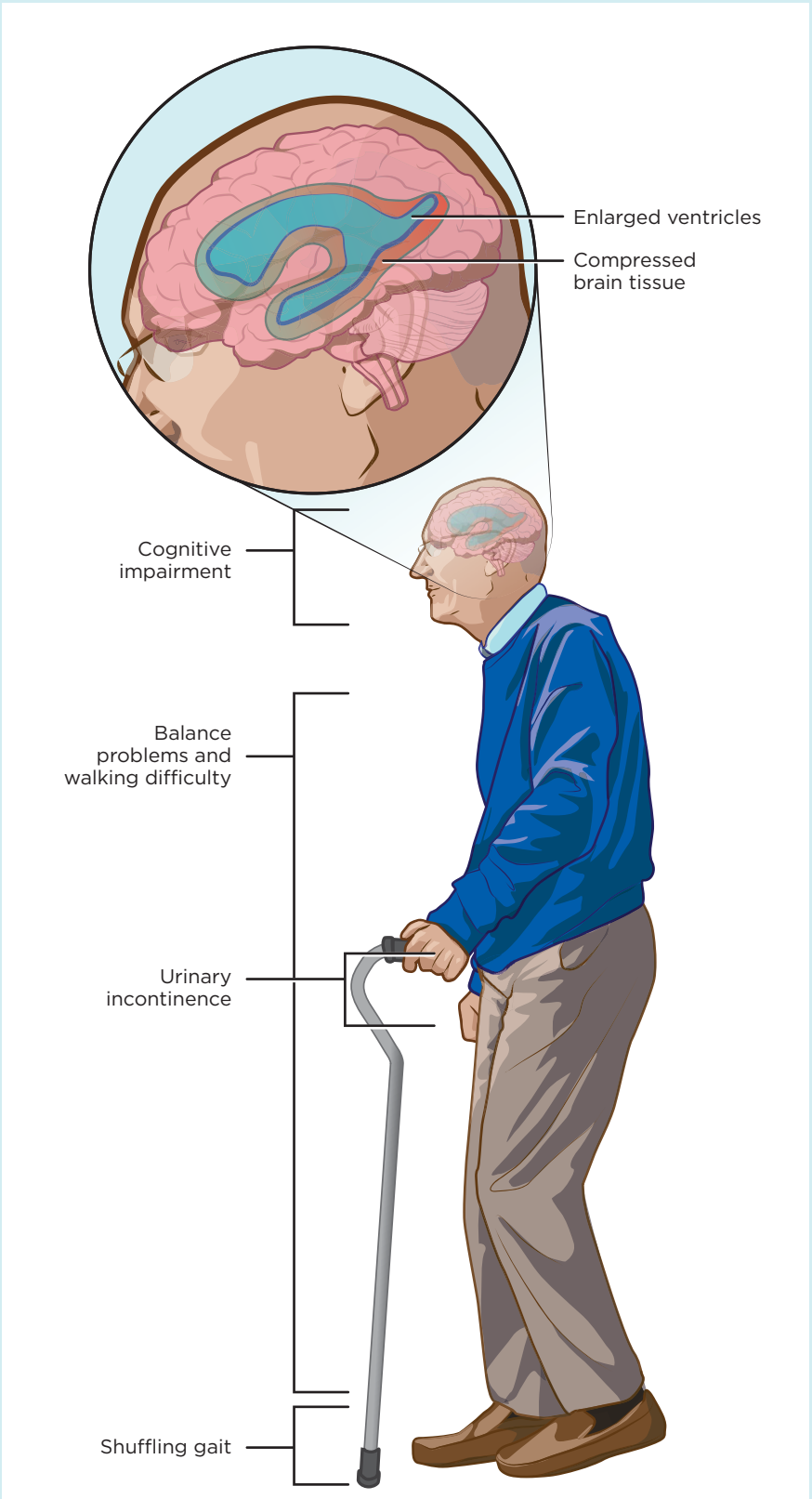

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Table 1. **Comparing the clinical features of NPH, Alzheimer's disease and Parkinson's disease**

Clinical features	NPH	Alzheimer's disease	Parkinson's disease
Mobility symptoms	• Slow, shuffling, wide-based, frozen/magnetic gait • Multistep turns • Instability when walking • Balance problems, particularly when turning • Difficulty getting in/out of seats or up from the floor • Unexplained falls, backward falls when sitting or standing	• Less affected than in other causes of dementia • Can display slower gait, shorter steps, and/or increased gait variability	• Small, stiff steps • Freezing of gait • Tremors and rigidity common in upper and lower body • Stooped posture
Cognitive symptoms	• Typically occur after gait and/or continence symptoms • Impaired attention, processing speed, verbal fluency and executive function • Milder disorientation and memory impairment • Low mood/depression • Apathy	• Occur early, often the first and most prominent symptom • Progressive dementia causing severe impairments with memory, learning, language and orientation • Personality/behaviour changes	• Appear later (Parkinson's dementia), after motor symptoms • Slower processing speed • Visuospatial difficulties • Low mood/depression
Bladder and bowel symptoms	• Urinary incontinence – frequency, urgency, leakage, reduced emptying control • Faecal incontinence is less common but occurs if anal tone/bowels are affected	• Urinary and/or faecal incontinence appear at a later stage • Incontinence typically relates to awareness and forgetfulness	• Urinary and/or faecal incontinence can appear at a later stage as mobility becomes more impaired

*NPH = normal pressure hydrocephalus
Sources: Hydrocephalus Association (2025); Johnson and Williams (2025)

Fig 2. **Ventriculoperitoneal shunt**

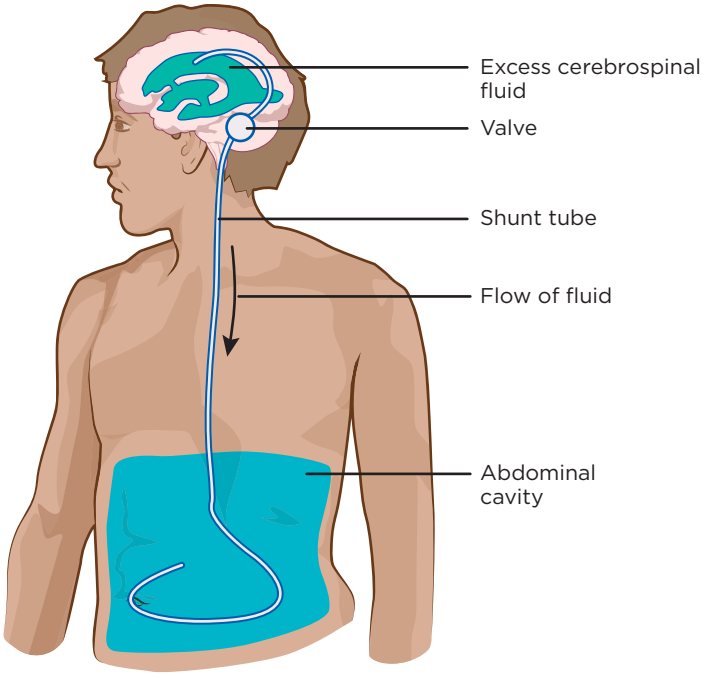

Illustration: Courtney Stabb

who are screened for frailty and shunt responsiveness, treatment can markedly improve symptoms and preserve independence. This is particularly true if NPH is treated early in the disease course.

The 2025 randomised PENS (Placebo-Controlled Efficacy in Idiopathic Normal Pressure Hydrocephalus Shunting) trial showed that shunt placement led to significant improvements in gait speed and overall gait and balance at three months in patients who had responded to temporary CSF drainage. However, there were no significant improvements in cognition or incontinence (Luciano et al, 2025).

An earlier meta-analysis had suggested that over 75% of patients improve after shunt surgery. Gait is the most responsive symptom, improving in 75% of patients, with cognitive function improving in over 60%, and incontinence in 55%. Using programmable valves led to fewer cases of revision surgery and subdural fluid collections following the procedure (Giordan et al, 2019).

Early intervention is associated with better treatment response, preserved cognitive and mobility function, and

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Post-operative wound following shunt surgery

Image: Shutterstock

increased survival. Treatment delays lead to worsening symptoms, reduced improvement after treatment, and higher mortality (Johnson and Williams, 2025; Chidiac et al, 2022; Kajimoto et al, 2022; Andrén et al, 2021).

Some patients may not be eligible for surgery due to other medical conditions, such as cardiovascular conditions that increase anaesthetic risk, overall frailty, or a lack of improvement after lumbar drainage procedures (Popal et al, 2021).

All individuals with NPH, regardless of whether they have undergone surgery, benefit from ongoing input from a range of clinical services (Isaacs et al, 2019). Patients benefit from a multidisciplinary approach to care, with input from neurology, neurophysiotherapy, occupational therapy, neuropsychology, continence services, general practice, pharmacy and social care.

Prognosis

Shunts can be effective in managing NPH symptoms, but they do not cure the condition and are not suitable for all patients. NPH is progressive and without treatment, symptoms continue to worsen over time, with the condition eventually becoming life-limiting. The rate of NPH symptom progression varies widely between individuals, and it is currently not possible to predict how quickly changes will occur. Progression may happen over months or years, and symptom severity can fluctuate from day to day. It is because NPH symptoms progress over time that early diagnosis and treatment (where possible) are so important (Johnson and Williams, 2025).

"The mainstay of normal pressure hydrocephalus treatment is shunt surgery"

The type and level of support required to maintain health and independence in NPH patients vary from person to person. Many can maintain a good quality of life after successful shunt treatment, and even modest functional improvements can have a considerable impact. For example, improved gait and balance with physiotherapy can reduce the risk of falls, which in turn reduces the risk of injury, alleviates anxiety and promotes independence (Nikaido et al, 2023).

Common ongoing challenges experienced by people living with NPH include:

- Problems with mobility/balance and falls;
- Cognitive impairments: processing speed, short-term memory, executive functioning;
- Continence issues;
- Headaches;
- Anxiety/depression.

Nursing implications and opportunities

Symptom recognition, referral and signposting

Early recognition of NPH symptoms and prompt referral can have a great impact on a patient's diagnostic journey, treatment options and long-term outcomes (Johnson and Williams, 2025; Chidiac et al, 2022; Kajimoto et al, 2022; Andrén et al, 2021). It is important to be aware of the persistent risk of NPH progression, even after treatment. Support needs to be in place, and prompt referrals made if symptoms worsen.

It is helpful to be familiar with local pathways to guide and support patients throughout the diagnostic process. It is also useful to signpost to relevant support organisations, such as the charity Shine and the Admiral Nurse Dementia Helpline. Signposting helps patients and their families to access specialist advice, peer support and practical resources.

Patient communication

Effective communication is an important aspect of nursing care for patients with NPH. Patients can be supported by asking what adjustments would help them during consultations, providing written summaries of key information and advice, and encouraging note-taking. Using appointment reminders via text, phone, email or post can help patients stay organised. Allowing extra processing time for answering or asking questions aids patients with cognitive needs.

Support before treatment

The wait for surgery can be difficult for patients and their families, especially if there are significant delays. Nurses can provide support during this time by ensuring patients' needs are being addressed and that they feel cared for:

- Listening to patient concerns and giving reassurance can help to alleviate stress;
- Coordinating referrals to relevant services aids patients with their mobility, continence, cognition, pain and mental health;

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Fig 3. **Symptoms of subdural haematoma**

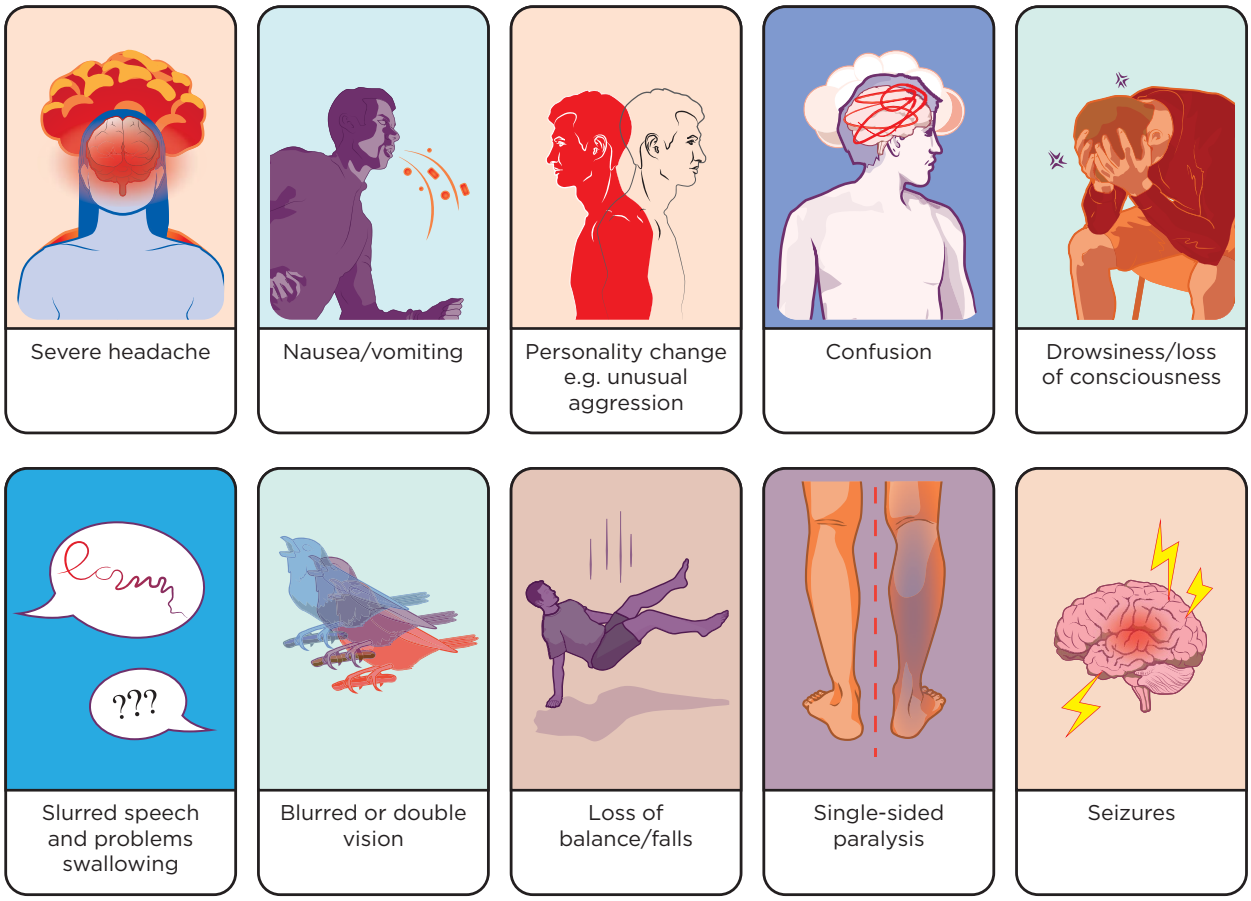

Illustration: Courtney Stabb. Original source: NHS (2025)

- Supporting patients in managing symptoms and bolstering their general health before surgery can improve outcomes;
- It is particularly important to encourage strengthening exercises during the wait for surgery, and when safe to do so after, as deconditioning can delay improvements in quality of life. Building and preserving muscle strength helps people maintain independence and reduces their risk of falls.

Referrals to physiotherapy or neurophysiotherapy, where available, can provide patients with personalised programmes. Support with conditioning is also available from the Shine charity.

Discharge planning

By leading and supporting discharge planning, nurses can help to ensure a smooth and safe transition home for patients. To be certain that discharge planning is timely and effective, it should begin before or soon after a patient with NPH is admitted to the hospital. Nurses play an essential role in providing and coordinating care, working with patients and their families, and keeping plans focused on patient safety and needs. This includes assessments to ensure that the home environment is safe and suitable for the patient, supporting carers, managing medications, and developing clear and patient-centred care plans that are then reviewed regularly.

Complications

There are complications of shunt surgery that it is important to be aware of. NPH patients may have reduced compliance (increased stiffness) of the brain tissue, so pressure reduction after shunting can cause the brain to pull away from the covering membranes. This can cause bleeding and lead to subdural haematoma (SDH) formation.

QUICK FACT **1.5%** Prevalence of normal pressure hydrocephalus among people aged over 70 years

The risk of SDH is highest in the months immediately following shunt surgery. Patients and their families should be alert to the symptoms, shown in Fig 3, and know how to seek assessment urgently if SDH is suspected.

Once inserted, a shunt usually remains in place for life and does not require routine replacement. However, lifelong follow-up is required because the valve may need adjustment or the shunt may need revision or replacement if it becomes blocked, infected or malfunctions. Note that blockage, infection or malfunction is rarer in older adults. Shunt malfunction is relatively uncommon in older adults, but is indicated by a return of pre-treatment NPH symptoms.

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Box 1. **Further resources**

- *The BMJ* has published best practice guidelines for normal pressure hydrocephalus (NPH): Grünewald (2025)
- International guidelines for the treatment and management of NPH have been developed: Hamilton et al (2025); Roman et al (2023)
- The charity Shine offers NPH support services across England, Wales and Northern Ireland. Support and information can be requested by patients and carers via the website **shinecharity.org.uk**, by phone (01733 555988) or via email: firstcontact@shinecharity.org.uk
- Shine welcomes professional members who want to learn more about NPH. Join Shine Professionals for free via the website and receive access to a CPD-accredited e-learning module on the condition. Professional members can also contact specialist teams for advice and support, including accessing equipment and adaptations, strengthening exercises and care planning
- The Patient Safety Learning Hub has published an article including a case study from a Shine member detailing their NPH journey: Shine (2025)

Shunt infection is also possible following surgery, and signs may include redness or swelling along the shunt tract and/or fever (Hydrocephalus Association, 2024; Pujari et al, 2008).

Over-drainage is a complication that can cause low-pressure postural headaches, nausea and slit ventricles.

Under-drainage is suggested by persistent or returning NPH symptoms after shunting (Toma, 2023).

Referral to neurosurgery for evaluation is indicated where shunt malfunction is suspected or drainage adjustment may be required.

Support for those not eligible for treatment

Patients who do not receive treatment require close monitoring and coordinated symptom management through specialist referrals. Ongoing emotional and practical support is important; patients and families often need help planning and preparing for possible deterioration.

Continence support

Continence teams play an important role in supporting patients with NPH. Nurses working in these teams can help prescribe appropriate medications, provide access to containment products, and supply skincare products, as well as bed and chair protection. Helping patients obtain equipment, such as commodes and bedpans, makes daily care easier and more comfortable.

Home care may be needed in those with advanced NPH or for those with reduced mobility or dexterity, or cognitive impairments that make self-management difficult. Nurses providing home care can assess continence needs, support families, and coordinate with other health professionals to ensure appropriate care plans are in place.

"Ongoing, multidisciplinary care and support for normal pressure hydropcephalus patients preserves independence and quality of life"

Box 1 features a list of further resources for nurses and anyone interested in learning more about the condition or getting involved.

Conclusion

NPH is under-recognised but clinically important. Timely diagnosis and treatment are essential for patient health and survival. Ongoing multidisciplinary care and support for NPH patients preserves independence and quality of life. Earlier intervention can improve the chances of shunt eligibility and responsiveness. It can also help to ensure other clinical and lifestyle measures are in place to keep patients safe and well for as long as possible. **NT**

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