Expert Consensus on the Diagnosis, Treatment, and Management of Numbness (2025) Postprint

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Date: 2026-03-20T09:14:55+00:00

Abstract

Numbness is a common clinical problem with complex etiologies and a lack of systematic clinical research data. It not only affects the physical and mental health of patients but also imposes a significant economic burden on society. This consensus was jointly authored by multidisciplinary experts from general medicine, neurology, geriatrics, and other fields. By reviewing and integrating cutting-edge evidence-based medical research results in the field of numbness from both domestic and international sources in recent years, this document elaborates in detail on the definition, classification, epidemiological characteristics, etiology, and pathogenesis of numbness. It comprehensively summarizes diagnostic methods for numbness (including detailed history taking, systematic physical examination, and auxiliary examinations) and specifically discusses individualized treatment principles and measures. Furthermore, this consensus emphasizes the comprehensive management of numbness, covering screening, follow-up, integrated intervention, health education, multidisciplinary diagnostic and therapeutic support, and hierarchical referral. It also proposes future directions for the diagnosis, treatment, and management of numbness from the perspectives of clinical practice, education and training, and scientific research innovation, aiming to provide a reference and guidance for the standardized implementation of numbness diagnosis, treatment, and whole-process management.

Full Text

Preamble

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General Practice Branch of the Cross-Straits Medicine and Health Exchange Association; General Practice Branch of the Zhejiang Medical Association; General Undifferentiated Disease Professional Committee of the Zhejiang Society of Mathematical Medicine; Chinese Geriatrics Society

Numbness is a common clinical issue characterized by complex etiologies and a lack of systematic clinical research data. It not only impacts the physical and mental health of patients but also imposes a significant economic burden on society. This consensus was jointly authored by a multidisciplinary team of experts in general practice, neurology, geriatrics, and other related fields. By reviewing and integrating recent cutting-edge evidence-based medical research from both domestic and international sources, this document provides a detailed exposition of the definition, classification, epidemiological characteristics, etiology, and pathogenesis of numbness.

Furthermore, this consensus comprehensively summarizes diagnostic methods —including detailed medical history taking, systematic physical examinations, and auxiliary investigations—and discusses individualized treatment principles and measures. The consensus emphasizes the integrated management of numbness, covering screening, follow-up, comprehensive intervention, health education, multidisciplinary team (MDT) support, and hierarchical referral systems. Finally, it proposes future directions for the diagnosis, treatment, and management of numbness in terms of clinical practice, education, training, and scientific innovation. This consensus aims to provide a standardized reference and guidance for the clinical management and full-course care of patients presenting with numbness.

Keywords: Numbness; Diagnosis; Treatment; Management; Multidisciplinary treatment; Hierarchical medical system; Expert consensus

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1. Introduction

Numbness is a subjective sensory abnormality frequently encountered in clinical practice, particularly in primary care settings. It often manifests as a loss of sensation, a "pins and needles" feeling, or tingling in various parts of the body. Despite its prevalence, the diagnostic process is frequently challenging due to the vast array of potential underlying causes, ranging from benign transient compression to severe systemic diseases or neurological disorders.

The lack of standardized protocols for the evaluation and management of numbness often leads to either over-investigation or delayed diagnosis of critical conditions. Consequently, there is an urgent need for a multidisciplinary consensus to guide clinicians—especially general practitioners—in the systematic approach to this condition.

2. Definition and Classification

2.1 Definition

Numbness is defined as a subjective sensory disturbance that may include anesthesia (complete loss of sensation), hypesthesia (diminished sensitivity to stimuli), or paresthesia (abnormal sensations such as tingling, pricking, or "crawling" feelings). It results from dysfunction or damage anywhere along the sensory pathway, from peripheral receptors to the cerebral cortex.

2.2 Classification

Numbness can be classified based on several dimensions: - **Duration:** Acute, subacute, or chronic. - **Distribution:** Mononeuropathy (localized to a single nerve distribution), polyneuropathy (symmetric, distal distribution), or central (involving the brain or spinal cord). - **Pathophysiology:** Neuropathic (nerve damage), vascular (ischemia), or psychogenic.

3. Epidemiology and Etiology

3.1 Epidemiological Characteristics

While precise global prevalence rates vary, numbness is one of the most common complaints in outpatient neurology and general practice. Its incidence increases with age, often correlating with the rising prevalence of chronic conditions such as diabetes mellitus and cardiovascular disease.

3.2 Etiology and Pathogenesis

The causes of numbness are diverse and can be broadly categorized into: - **Peripheral Nervous System Disorders:** Including diabetic neuropathy, carpal tunnel syndrome, cervical/lumbar radiculopathy, and nutritional deficiencies (e.g., Vitamin B12 deficiency). - **Central Nervous System Disorders:** Including stroke, multiple sclerosis, and spinal cord tumors. - **Systemic and Metabolic Factors:** Chronic kidney disease, hypothyroidism, and autoimmune vasculitis. - **Infectious and Toxic Factors:** Viral infections (e.g., Herpes Zoster) and neurotoxicity from heavy metals or chemotherapy.

4. Diagnosis and Evaluation

A systematic approach is essential for identifying the underlying cause of numbness.

4.1 Medical History

Clinicians should focus on the onset, duration, distribution, and quality of the numbness. Associated symptoms (e.g., weakness, pain, autonomic dysfunction) and relevant medical history (e.g., diabetes, alcohol use, medication history) are critical for narrowing the differential diagnosis.

4.2 Physical Examination

A thorough neurological examination is mandatory. This includes: - **Sensory Testing:** Assessing light touch, pain (pinprick), temperature, vibration, and proprioception. - **Motor Testing:** Evaluating muscle strength, tone, and reflexes. - **Autonomic Assessment:** Checking for skin changes or orthostatic blood pressure variations.

4.3 Auxiliary Investigations

Based on the clinical suspicion, further tests may include: - **Laboratory Tests:** Blood glucose, HbA1c, Vitamin B12 levels, renal and thyroid function. - **Electrophysiology:** Nerve conduction studies (NCS) and electromyography (EMG) to localize nerve damage. - **Imaging:** MRI or CT scans for suspected central nervous system involvement or spinal compression.

5. Individualized Treatment and Management

5.1 Treatment Principles

The primary goal is to treat the underlying cause while managing the symptoms. Treatment should be individualized based on the patient' s age, comorbidities, and the severity of the numbness.

5.2 Comprehensive Management

Effective management extends beyond pharmacological intervention: - **Screening and Follow-up:** Regular monitoring of patients with chronic conditions to prevent progression. - **Multidisciplinary Support:** Collaboration between general practitioners, neurologists, and specialists in pain management or rehabilitation. - **Health Education:** Educating patients on lifestyle modifications, foot care (for diabetics), and the importance of medication adherence. - **Hierarchical Referral:** Ensuring timely referral from primary care to specialist centers when "red flag" symptoms are present or when the diagnosis remains unclear.

6. Future Directions

The consensus identifies several areas for future development: - **Clinical Practice:** Standardizing the diagnostic pathway in primary care. - **Education:** Enhancing the training of general practitioners in neurological assessment. -

Research: Promoting multicenter studies to better understand the epidemiology of numbness in the

Abstract

Numbness is a common clinical problem with complex etiology and a lack of systematic clinical research data, affecting patients physical and mental health and imposing an economic burden on society. This consensus was written by multidisciplinary experts including general practice, neurology, and geriatrics. By reviewing and integrating the cutting-edge domestic and international evidence-based medical research results in the field of numbness in recent years, it elaborates in detail on the definition, classification, epidemiology, etiology and pathogenesis, comprehensively summarizes the diagnostic methods of numbness, including detailed consultation, systematic physical examination, and auxiliary examination, and specifically expounds the individualized treatment principles and measures for numbness. The consensus also emphasizes the comprehensive community management of numbness, including screening, follow-up, comprehensive interventions, health education, multidisciplinary diagnostic support, and graded referral systems. Furthermore, it proposes future directions for the diagnosis, treatment, and management of numbness from the perspectives of clinical practice, education and training, and scientific research innovation. The ultimate aim is to provide guidance and support for the standardized diagnosis, treatment, and whole-process care of patients with numbness.

Keywords: Numbness; Diagnosis; Therapy; Management; Multidisciplinary diagnosis and treatment; Grading diagnosis and treatment; Expert consensus

Numbness is a common clinical symptom of sensory abnormality; when severe, it can significantly impair a patient' s quality of life. The etiology of numbness is complex and its clinical presentations are diverse. Furthermore, the field faces several challenges, including a lack of epidemiological data, inconsistent diagnostic criteria, relatively subjective assessment methods, limited therapeutic options, and insufficient long-term management. Currently, there is a lack of unified diagnostic and treatment standards for numbness both domestically and internationally, highlighting an urgent need to establish standardized clinical pathways and management strategies. This consensus aims to integrate multidisciplinary expertise to provide clinical guidance.

General Practice Branch of Cross-Straits Medicine Exchange Association, General Practice Branch of Zhejiang Medical Association, General Undifferentiated Disease Professional Committee of Zhejiang Society of Mathematical Medicine, et al. Expert consensus on the diagnosis, treatment, and management of numbness (2025) [J]. Chinese General Practice, 2026. [Epub ahead of print] Editorial Office of Chinese General Practice.

This consensus provides systematic guidance for physicians on the definition, epidemiological characteristics, etiology and pathogenesis, diagnostic methods,

treatment regimens, and community management of numbness. It also proposes future research directions and constructs a comprehensive "bio-psycho-social" medical management model for numbness. The objective is to enhance the standardization and effectiveness of clinical diagnosis and treatment, thereby improving patient prognosis and quality of life.

The formulation of this consensus followed scientific and rigorous procedures: (1) Establishment of a drafting expert group: A multidisciplinary team was formed, comprising experts from fields such as general practice, evidence-based medicine, neurology, orthopedics, internal medicine, geriatrics, traditional Chinese medicine, rehabilitation medicine, and nursing. (2) Literature review: Systematic searches and reviews of domestic and international literature regarding the epidemiology, etiology, diagnosis, and treatment of numbness were conducted across databases including PubMed, Cochrane Library, Embase, Web of Science, CNKI, Wanfang Data, and VIP. (3) Expert discussion: A preliminary draft of the consensus was developed through multiple rounds of expert deliberations. (4) Revision: The draft underwent several rounds of refinement and improvement based on feedback. (5) Final review: The expert group conducted a final review to ensure the scientific validity, practicality, and instructional value of the consensus.

This consensus has been registered with the International Practice Guidelines Registry and Transparency Platform (Registration Number: PREPARE-2025CN1398). Following its approval, release, and publication, it will be disseminated, implemented, evaluated, and updated periodically as planned. This consensus is applicable to medical institutions at all levels that treat patients with numbness. The intended users include general practitioners, specialists, nurses, technicians, and researchers involved in the clinical care and study of numbness and related medically undifferentiated diseases (MUD).

1.1 定义

Numbness is a non-painful sensory nervous system symptom characterized by paresthesia (such as tingling, formication, or electric shock sensations), hypesthesia, or anesthesia occurring either spontaneously or upon contact. Within the theoretical framework of Traditional Chinese Medicine (TCM), numbness falls under the categories of "Bi disease" (arthralgia-syndrome) or "Blood Bi." It is defined as a state that is neither painful nor itchy; "numbness" (Ma) resembles the sensation of insects crawling, while "insensitivity" (Mu) refers to a lack of awareness even when the skin is pressed or scratched. The core pathogenesis involves the failure of Qi and blood to nourish the skin, muscles, and meridians. The etiology, pathogenesis, and clinical manifestations of numbness are complex and can be classified across multiple dimensions, including etiology, lesion location, pathogenic mechanisms, and clinical severity assessment.

This consensus adopts an etiology-based classification method. The causes of numbness vary significantly among specific populations, such as children, adoles-

cents, and the elderly. The etiological spectrum for numbness in children differs markedly from that in adults, being primarily dominated by congenital and hereditary diseases. In adolescents, functional factors are relatively common. Conversely, numbness in the elderly is frequently associated with degenerative changes and chronic cumulative diseases, with more than 58.6% of cases involving multimorbidity.

1.2.1 按病因分类

Numbness can be classified into physiological and pathological types. Pathological numbness involves a variety of etiologies, including organic factors, drug-induced factors, and psychogenic factors (see Section 2.1).

1.2.2 按病变部位分类

(1) Neurogenic numbness. The etiology directly involves the nervous system. Common causes include cerebrovascular disease, peripheral neuropathy, demyelinating diseases, and spinal cord disorders [**?**].

(2) Non-neurogenic numbness. This is indirectly caused by diseases of other systems, including blood circulation disorders, endocrine and metabolic diseases, rheumatic immune system diseases, and psychological factors [**?**].

1.2.3 按发病机制与定位分类

(1) Central Numbness: This occurs when lesions involve the brain or spinal cord. It typically presents as hemilateral or segmental numbness and is frequently accompanied by pyramidal tract signs.

(2) Peripheral Numbness: This occurs when lesions involve the peripheral nerves. It presents as either symmetrical or asymmetrical numbness and is often associated with motor weakness.

(3) Other Types of Numbness: These may be caused by circulatory disorders, vitamin deficiencies, rheumatic and immune system diseases, medications, toxins, or psychological factors.

1.2.4 按病情评估分类

(1) **Simple Numbness.** This manifests solely as numbness without accompanying symptoms. The etiology is typically localized nerve irritation or early-stage mild peripheral neuropathy. Intervention should prioritize treating the primary underlying disease.

(2) **Complex Numbness.** This is accompanied by symptoms such as pain, weakness, speech impairment, or bowel and bladder dysfunction. These

signs suggest a more extensive lesion or a more severe condition, requiring timely referral to a specialist.

(3) **Refractory Numbness.** This refers to cases where symptoms show no improvement after more than three months of standardized treatment (e.g., neurotrophic therapy, treatment of potential primary diseases, symptomatic pain relief) or cases characterized by recurrent episodes. Such instances necessitate multidisciplinary collaboration to further clarify the etiology.

A diagnosis of numbness can be established if a patient meets any of the following subjective sensory criteria. Integrating these with objective examination standards can enhance diagnostic accuracy and clinical utility. Furthermore, the diagnosis of pathological numbness requires the prior exclusion of physiological numbness.

1.3.1 主观感觉标准

(1) The patient presents with complaints of sensory diminution, paresthesia, or sensory loss in a specific area of the limbs or trunk (including the face). This is clinically manifested as a decrease or total loss of tactile sensation, pain perception, thermal sensation, or proprioception.

(2) For individuals unable to accurately describe the specific location or nature of the numbness (such as children or patients with cognitive or language impairments), a diagnosis of numbness can be established if any of the following criteria are met:

- The patient describes abnormal sensations in the affected area, such as a "woody feeling," "formication" (crawling sensation), "pins and needles," or a "glove-and-stocking" distribution of sensory loss.
- The patient exhibits diminished responsiveness to external stimuli, such as reduced sensitivity to heat and cold or an inability to clearly perceive objects upon contact.
- Family members or caregivers observe behavioral changes related to sensory impairment during activities of daily living, such as frequent falls, accidental burns, or unexplained scratches.
- The patient receives an abnormal score during an evaluation using standardized scales for numbness-related neuropathy (see Section 3.3.2).

1.3.2 客观检查标准

(1) Physical examination confirms the presence of one or more of the following sensory impairments: Superficial sensory impairment: diminished or absent sensation to pinprick, touch, or temperature. Deep sensory impairment: diminished or absent position sense, vibration sense, or kinesthesia.

Combined (cortical) sensory impairment: diminished or absent topognosis

(localization), two-point discrimination, graphesthesia, or stereognosis. (2) Abnormal results in auxiliary examinations, such as: nerve electrophysiological studies, quantitative sensory testing (QST), or intraepidermal nerve fiber density (IENFD) testing.

1.3.3 麻木的不同病程类型

[12-13], as shown in Table 1 .

Acute numbness (onset $<$ 4 weeks): Includes cerebrovascular disease, trauma, acute infection, or poisoning. Requires emergency evaluation.

Vitamin B complex deficiency, etc.

Chronic numbness (onset $>$ 12 weeks): Includes diabetic peripheral neuropathy, cervical spondylosis, etc. Requires long-term management.

1.4 分级与分度

The criteria for grading or scaling the severity of numbness vary across different diseases and evaluation systems; therefore, grading should ideally refer to standardized scales specific to the corresponding condition. During the undifferentiated stage of the disease, the severity of numbness can be categorized using a Numerical Rating Scale (NRS). In this system, a score of 0 represents the absence of numbness, with higher scores indicating increasing severity, up to a maximum of 10, which represents intolerable, extreme numbness. Alternatively, numbness can be graded based on the specific sensory impairment symptoms and their subsequent impact on activities of daily living (Table 2).

Grading based on sensory impairment symptoms and impact on daily life: - Paresthesia or hypesthesia; minor impact on daily life (e.g., difficulty buttoning clothes, handling utensils, etc.). - Loss of sensation; significant impact on daily life (e.g., difficulty walking, inability to perform fine motor tasks, etc.).

1.5 流行病学

There is currently a paucity of comprehensive epidemiological research regarding the general prevalence of numbness. A survey targeting community residents in Chengdu, China, indicated that the prevalence of numbness among the elderly is approximately 34.67%. Similarly, a Japanese study reported a general prevalence of 13.7%; however, as the population ages, over 20% of the general population has experienced numbness, with the prevalence rising to 30% among those over 75 years of age.

The epidemiological characteristics of numbness vary significantly depending on the underlying etiology. Within the spectrum of neurological disorders, limb numbness is a common symptom of sensory impairment. Statistics show that the incidence of numbness among patients with cerebrovascular diseases ranges

from 50% to 80%. In Traditional Chinese Medicine (TCM) classifications of post-stroke limb numbness, three primary syndromes are identified: Wind-Phlegm and Stasis Obstruction, Qi Deficiency and Collateral Stasis, and Liver-Kidney Deficiency. Among these, the Wind-Phlegm and Stasis Obstruction type has the highest incidence, accounting for approximately 72.19%. While research from the National Clinical Research Center for Neurological Diseases indicates that the prevalence, incidence, and mortality rates of stroke are 1,114.8 per 100,000 person-years, 246.8 per 100,000 person-years, and 114.8 per 100,000 person-years respectively, direct epidemiological studies specifically focused on numbness symptoms remain limited.

Numbness is also a hallmark symptom in patients with Guillain-Barré syndrome, with studies reporting an incidence of approximately 31.25%. Diabetic Peripheral Neuropathy (DPN) is a common complication of diabetes and a significant cause of numbness; its prevalence has risen annually alongside the increasing incidence of diabetes. Distal Symmetric Polyneuropathy (DSPN), typically characterized by numbness in the distal extremities, is the most common form, accounting for approximately 75% of DPN cases.

Furthermore, the incidence of numbness among patients with cervical spondylosis is approximately 47.03%. Infectious diseases, such as leprosy, can also present with numbness, with a reported prevalence of approximately 55.56%. Orthopedic procedures may also induce numbness; for instance, a survey of patients following hip arthroscopy revealed a postoperative numbness incidence ranging from 1% to 20%.

2 病因与发病机制

The causes of numbness are diverse, and classification methods vary significantly across the literature. These causes involve multiple anatomical sites and various diseases, often resulting in overlapping categories. This consensus classifies the etiology of numbness into physiological and pathological factors. Pathological factors are further subdivided into organic factors, drug or substance-induced factors, and psychological factors. The pathophysiological mechanisms of numbness primarily involve damage to signaling pathways, abnormalities in signal transduction, and the disruption of homeostasis within the neural microenvironment.

2.1.1 生理性因素

Improper postures, such as prolonged sitting, squatting, crossing one' s legs, or poor sleeping positions, can lead to localized nerve compression or restricted blood flow, resulting in limb numbness and tingling [**?**]. Furthermore, fluctuations in hormone levels and premenstrual edema during the menstrual cycle can heighten nerve sensitivity, potentially inducing or exacerbating temporary numbness.

Sleep deprivation may also contribute to these symptoms by causing neurological dysfunction and impairing circulatory metabolism. Additionally, the prevalence of numbness increases significantly with age due to age-related neurodegenerative changes [**?**]. Environmental factors, such as cold or dry conditions, can further induce transient or persistent numbness by affecting peripheral circulation and nerve conduction.

2.1.2 病理性因素

(1) Organic Factors: Neurological diseases: Various diseases of the central and peripheral nervous systems can lead to numbness . Musculoskeletal diseases: Conditions such as cervical spondylotic myelopathy, spinal stenosis, ossification of the posterior longitudinal ligament, cauda equina syndrome, spinal tumors, and intraspinal abscesses or hematomas can compress the dural sac. This results in damage to the spinal cord, conus medullaris, or cauda equina, leading to numbness in the trunk and limbs below the level of the lesion. Nerve root cervical spondylosis and lumbar disc herniation compress nerve roots, causing numbness and pain in the corresponding dermatomes. Thoracic outlet syndrome, cubital tunnel syndrome, carpal tunnel syndrome, meralgia paresthetica, and tarsal tunnel syndrome [**?**] involve nerve entrapment along the peripheral nerve course, subsequently triggering numbness. Endocrine and metabolic diseases: Diabetes is the most common cause of peripheral neuropathy, typically manifesting as symmetrical distal limb numbness. Both hypothyroidism and hyperthyroidism can lead to numbness. Nutritional and metabolic disorders, such as B-vitamin deficiencies (particularly Vitamin B_1 and Vitamin B_{12}), as well as electrolyte imbalances like hypocalcemia or hyperphosphatemia, can also induce paresthesia.

Sudden-onset unilateral numbness or numbness in the trunk and limbs below the level of a lesion may indicate acute pathology. Rheumatic and immunological diseases: Chronic synovitis caused by rheumatoid arthritis and tissue fibrosis resulting from systemic sclerosis can compress peripheral nerves. Various autoantibodies produced in systemic lupus erythematosus can directly attack nerve tissue. Sjögren' s syndrome characteristically involves the dorsal root ganglia. Vasculitis (such as polyarteritis nodosa) can cause nerve infarction, while Raynaud' s disease may present with digital artery spasms and ischemia. All of the above conditions can lead to numbness. Infectious diseases: Various pathogens can invade peripheral nerves or central sensory pathways. Bacterial infections, such as Lyme disease (*Borrelia burgdorferi* infection), can cause peripheral neuropathy. HIV-associated distal symmetric polyneuropathy is a potential cause of numbness, and cytomegalovirus infection can lead to polyradiculopathy. Schistosomiasis and cryptococcal meningitis can also invade neural tissues, resulting in localized or widespread numbness. Circulatory system diseases: Lower extremity atherosclerosis can lead to arterial stenosis or occlusion, causing ischemic neuropathy. Among thromboembolic diseases,

atrial fibrillation may lead to cerebral embolism, and deep vein thrombosis of the lower extremities can also cause localized limb symptoms. Dermatological diseases: Primarily seen in varicella-zoster virus infections, which often present with paresthesia such as numbness in addition to neuralgia. Leprosy and neurocutaneous melanosis can also cause numbness. Neoplastic diseases: These can be classified into three categories: direct neurological involvement, including glioma, meningioma, cavernous hemangioma, hamartoma, and Ewing' s sarcoma [**?**]; secondary nerve injury due to compression, including intracranial or intraspinal metastases, angiomas, schwannomas, and lymphomas; and immune-mediated nerve injury, primarily T-cell-mediated paraneoplastic neurological syndromes. Other conditions: Trauma can directly cause nerve injury, leading to numbness and loss of function in the corresponding innervated area. Hand-arm vibration syndrome is observed in manual laborers who use high-intensity electric vibrating tools for extended periods. (2) Drug or Substance Ingestion: Chemical agents, organophosphates, heavy metals (lead, mercury, arsenic, etc.), and alcohol can damage peripheral nerves, causing sensory loss and numbness. Among these, vinca alkaloids and platinum-based chemotherapy drugs are common causes .

Ischemic or hemorrhagic cerebrovascular diseases; inflammatory diseases: infectious encephalitis, brain abscess, autoimmune encephalitis, etc.; demyelinating encephalopathy: multiple sclerosis, neuromyelitis optica spectrum disorders, etc.; neurodegenerative diseases: multiple system atrophy, etc. Vascular diseases: spinal cord infarction, hemorrhage, vascular malformations, etc.; nutritional and metabolic diseases: subacute combined degeneration, copper deficiency myelopathy, etc.; autoimmune diseases: paraneoplastic myelopathy, neurosarcoidosis, etc.; infectious diseases: HIV infection, herpes virus infectious myelopathy, etc.; compressive diseases: disc herniation, tumor compression, etc. Taxanes: paclitaxel, docetaxel, etc. Vinca alkaloids: vincristine, vinblastine, vinorelbine, etc. Platinum-based agents: oxaliplatin, cisplatin, etc. Other chemotherapy drugs: epothilones, bortezomib, thalidomide, etc. Antitubercular/Antibiotics: isoniazid, linezolid, etc. Antiepileptics: phenobarbital, carbamazepine, etc. Statins: simvastatin, pravastatin, fluvastatin, etc. Immunosuppressants: adalimumab, infliximab, etc. Others: levodopa, metronidazole, metformin, etc.

(3) Psychological Factors: These are commonly seen in somatic symptom disorders and anxiety disorders. Somatic symptom disorder is primarily characterized by various physical discomforts that lack a clear organic pathological basis.

[**?**]. Patients with anxiety disorders may also experience paresthesia such as numbness and tingling, especially during panic attacks. Furthermore, anxiety can exacerbate paresthesia occurring in the context of other underlying diseases. Any abnormality occurring at any point along the sensory receptors or conduction pathways can trigger numbness. While numbness can result from a single mechanism, it is usually caused by the synergistic effect of multiple interrelated

mechanisms.

2.2.1 信号通路损伤

Factors such as intervertebral disc herniation and tumors can cause compression of sensory nerve pathways or destroy their physical integrity and anatomical continuity, thereby preventing the normal conduction of neural signals. Ischemia, inflammation, or immune attacks can trigger apoptosis or necrosis of nerve cells, leading to a reduction in the number of nerve fibers. Furthermore, metabolic toxins, chemical agents, and mechanical trauma can directly result in axonal degeneration, interruption of axoplasmic transport, or demyelination, which subsequently blocks signal transduction.

2.2.2 信号传导异常

The structural integrity of the nerves remains intact, but the signal transmission functions of the neural cells exhibit abnormalities. For instance, dysfunction in sodium and potassium ion channels can lead to neurons entering a refractory period following hyperexcitability or directly resulting in conduction blocks. Furthermore, impaired synaptic transmission within the neuro-dominant regions can manifest as numbness.

The clinical presentation of numbness varies by etiology: - **Compressive Neuropathy:** Numbness caused by various types of compression. - **Mononeuritis Multiplex:** The distribution of numbness involves the territory of two or more peripheral nerves and is typically asymmetrical. This is often seen in rheumatic immune system diseases such as vasculitis overlapping with peripheral neuropathy, or infectious neuritis. - **Polyneuropathy:** Numbness is primarily concentrated in the distal parts of the limbs, presenting in a "glove-and-stocking" distribution. Common causes include endocrine and metabolic diseases; immune-related peripheral neuropathies (such as Guillain-Barré syndrome and chronic inflammatory demyelinating polyradiculoneuropathy); paraneoplastic peripheral neuropathy; and reactions to specific medications.

This condition is associated with an imbalance in central integration and an increased release of inhibitory neurotransmitters, which leads to enhanced inhibitory effects at the spinal cord level. Furthermore, pathological remodeling occurs within the functional mapping of the primary somatosensory cortex, resulting in a diminished capacity to analyze and interpret tactile signals.

2.2.3 神经微环境稳态失衡

Hyperglycemia, ischemia, and hypoxia can lead to mitochondrial dysfunction in nerve cells. Furthermore, the formation of harmful microenvironments—driven by inflammatory factors, uremic toxins, and other toxic substances—damages neuronal lipids and proteins. Combined with a reduction in growth factors and a deficiency of key cofactors such as vitamin B12, these conditions prevent nerve

cells from maintaining normal metabolism and impair their repair capabilities, ultimately leading to neurological dysfunction.

Etiology and Pathogenesis in Traditional Chinese Medicine

In Traditional Chinese Medicine (TCM), numbness falls under the category of "blood bi" (blood obstruction). The disease is localized in the skin, muscles, and meridians, and is closely related to the spleen, lungs, kidneys, and liver. The primary etiologies of blood bi can be summarized as deficiency of vital qi (zheng xu), invasion by pathogenic factors (xie qin), blood stasis (xue yu), and internal stirring of liver wind (gan feng nei dong). The core pathogenesis involves disharmony between the nutrient (ying) and defensive (wei) systems, obstruction of qi and blood, and the subsequent failure to nourish the skin and muscles.

2.3.1 正虚

This primarily refers to the deficiency of qi and blood caused by congenital insufficiency, excessive physical strain, or recovery from illness or childbirth. Such deficiency constitutes the internal factor of blood stagnation (xue bi) and plays a decisive role in its pathogenesis. When qi and blood are insufficient, pathogenic wind, cold, and dampness can invade the limbs and skin, leading to the obstruction of qi and blood circulation, which ultimately triggers the onset of the disease.

2.3.2 邪侵

This primarily refers to the invasion of external pathogenic factors such as wind, cold, and dampness. Key contributing factors to the onset of blood stagnation (Xue Bi) include exposure to wind after sweating, sleeping outdoors at night, wading through water or being caught in the rain, abnormal climatic shifts, or poor living environments. These external influences serve as critical conditions for the development of the disease.

2.3.3 血瘀

The pathogenesis of blood-bolus (xuebi) primarily involves the disruption of qi and blood within the meridians by pathogenic factors. This interference leads to impaired circulation or even complete obstruction, resulting in the deprivation of nourishment to the skin and muscles. This lack of nourishment manifests as numbness and loss of sensation, which constitutes the critical mechanism in the development of the disease.

2.3.4 肝风内动

Overwork and emotional internal injuries can deplete the yin of the liver and kidney, leading to a state of yin deficiency with yang hyperactivity. When

"water fails to nourish wood," a prolonged imbalance occurs where yang becomes increasingly buoyant while yin further diminishes. Consequently, the liver' s yang-qi rises and moves without restraint, eventually reaching an extreme state that transforms into internal wind. This development of internal wind agitation manifests clinically as numbness in the limbs.

The causes of numbness are numerous and the underlying mechanisms are complex; in some patients, multiple factors overlap, making them difficult to distinguish entirely. General practitioners should conduct a comprehensive evaluation by integrating the distribution of symptoms, accompanying clinical features, medication history, and relevant systemic diseases. Particular emphasis should be placed on identifying drug-induced numbness and occult systemic disorders.

3 诊断

The diagnosis of numbness requires a comprehensive approach that integrates detailed clinical interviewing, systematic and standardized physical examinations, relevant assessment scales, targeted auxiliary investigations, and the Murtagh safety diagnostic strategy.

For the clinical interview, the RICE method (Table 5) can be employed to conduct an in-depth inquiry centered on key elements of the patient' s medical history. Furthermore, clinicians must remain vigilant for the presence of "red flags" (warning signs), which may indicate the possibility of serious underlying diseases (refer to Section 3.1.4).

3.1.1 就诊原因

Identifying the direct reason for the patient' s visit is the starting point for establishing effective doctor-patient communication. General practitioners can use open-ended questions to guide patients in providing a detailed description of their most troubling symptoms or the issues they most hope to resolve. Building upon this, the RICE inquiry method can be employed to further explore the patient' s perspective ().

Clarifying the characteristics of numbness and its accompanying symptoms: What is the primary **reason** for the patient' s visit? What does the patient believe is wrong (**idea**)? This involves further exploring the potential causes behind the numbness. What is the patient worried about (**concern**)? It is essential to listen to the patient' s true underlying needs and understand their opinions regarding diagnosis and treatment to achieve shared medical decision-making. What are the patient' s **expectations** regarding what the doctor can do to help?

3.1.2 起病情况与症状特点

(1) **Triggers of Numbness.** Inquiries should include specific times, seasons, living environments, or temperature changes; irregular dietary habits; im-

proper posture or limb compression; history of smoking and alcohol consumption or sudden withdrawal; emotional fluctuations; physical labor; recent history of infection; medication history; and changes in sleep patterns. For female patients, it is necessary to determine whether there is a correlation between the occurrence of numbness and the menstrual cycle.

(2) **Location of Numbness.** Patients should be guided to describe the numbness down to the smallest identifiable area. It is essential to clarify whether the numbness is unilateral, bilateral, localized, or widespread. Clinicians must determine if the affected area is symmetrical, follows a specific dermatomal segment, or is distributed along a peripheral nerve path, and whether the location remains consistent during each episode.

(3) **Nature of Numbness.** It is critical to distinguish whether the patient' s "numbness"refers to anesthesia (loss of sensation), hypesthesia (diminished sensation), paresthesia (abnormal sensation such as tingling), or pain.

(4) **Onset and Pattern.** The clinical course should be identified as acute, subacute, or chronic. The frequency of episodes must be recorded as either intermittent or persistent, with particular attention paid to any correlation with circadian rhythms.

(5) **Aggravating and Alleviating Factors.** Aggravating factors may include external environmental stimuli, specific movements or postures, limb compression, physical activity, emotional stress, medications, specific times of day, or fluctuations in underlying diseases. Alleviating factors may include rest, warmth, massage, postural adjustments, or pharmacological interventions.

(6) **Severity and Progression.** The Numerical Rating Scale should be used to assess the patient' s current level of numbness. Additionally, clinicians should inquire whether the numbness is progressively worsening, alleviating, or fluctuating. The progression of the condition should be evaluated across three dimensions: the anatomical extent of the affected area, the severity of the numbness, and the frequency of episodes.

3.1.3 伴随症状

Accompanying symptoms of numbness serve as critical clues for both localization and qualitative diagnosis. In general practice, systematically inquiring about and identifying these accompanying symptoms can effectively narrow the scope of differential diagnosis and clarify the direction of subsequent investigations. Accompanying neurological symptoms are presented in , while accompanying symptoms involving other systems are detailed in .

3.1.4 预警征

[54-58], as shown in Table 8 .

3.1.5 诊疗经过

Warning Signs of Numbness and Potential Serious Etiologies

It is essential to document all relevant details when seeking medical attention for numbness. This documentation should include the date and time of the visit, the healthcare facility, and the specific department consulted (e.g., Neurology, Orthopedics, or Emergency Medicine). Furthermore, patients should record the diagnostic procedures performed, the treatment measures administered, and the subsequent clinical outcomes or therapeutic efficacy.

Warning Signs and Red Flags

While numbness is often benign, certain "red flag" symptoms necessitate immediate medical evaluation. These include a sudden onset of symptoms, numbness localized to one side of the body (hemiparesthesia), or numbness accompanied by significant motor weakness, slurred speech, or visual disturbances. Such presentations may indicate acute neurological events, such as a stroke or transient ischemic attack (TIA).

Potential Serious Causes

Numbness can be a manifestation of various underlying pathological conditions ranging from peripheral nerve compression to central nervous system disorders. Potential serious causes include:

- **Neurological Disorders:** Multiple sclerosis, transverse myelitis, or acute inflammatory demyelinating polyneuropathy (Guillain-Barré syndrome).
- **Vascular Issues:** Ischemic stroke, intracranial hemorrhage, or peripheral artery disease.
- **Structural Compression:** Severe herniated discs, spinal stenosis, or tumors compressing the spinal cord or peripheral nerves.
- **Systemic Metabolic Conditions:** Severe vitamin B_{12} deficiency, diabetic neuropathy, or chronic kidney disease.

Clinical Documentation and Follow-up

Comprehensive records of medical encounters are vital for longitudinal care. Patients should maintain a detailed log of: 1. **Diagnostic Tests:** Such as Electromyography (EMG), Nerve Conduction Studies (NCS), Magnetic Resonance Imaging (MRI), or specific blood panels (e.g., HbA1c, inflammatory markers). 2. **Interventions:** Including pharmacological treatments (e.g., neurotrophic agents, analgesics), physical therapy, or surgical interventions. 3. **Response to Treatment:** Noting any improvement, stabilization, or worsening of sensory symptoms over time.

Accurate documentation facilitates better communication between multidisciplinary medical teams and ensures a more precise diagnostic trajectory.

Clinical Manifestations and Differential Diagnosis of Sensory Dysfunction

Sensory and Motor Impairments

Sensory dysfunction often presents alongside motor deficits, providing critical diagnostic clues for localization. Monomelic numbness accompanied by paralysis is frequently associated with peripheral nerve conditions such as ulnar, radial, or common peroneal nerve palsies, as well as cervical spondylosis. In contrast, hemiparesis combined with numbness (affecting one side of the body) typically suggests central nervous system involvement, such as cerebrovascular disease or demyelinating disorders.

Associated Symptoms and Clinical Indicators

Beyond primary sensory loss, patients may exhibit other paresthesias, impaired higher cortical functions, or autonomic nervous system symptoms. These manifestations may be rooted in endocrine and metabolic diseases, musculoskeletal disorders, or systemic conditions. Identifying these accompanying symptoms is essential for distinguishing between benign and life-threatening etiologies.

Red Flags and Potentially Serious Causes

Clinicians must remain vigilant for "red flag" symptoms that indicate urgent or severe underlying pathology:

- **Acute Onset:** Symptoms developing within minutes often indicate cerebrovascular disease or acute trauma.
- **Progressive Course:** Symptoms that continuously worsen or fail to alleviate suggest spinal cord or brain compression, or demyelinating diseases.
- **Topographical Patterns:** Numbness involving both the face and limbs (whether ipsilateral or contralateral) is highly suggestive of cerebrovascular disease or cervical spondylosis.
- **Neurological Deficits:** The presence of headache, vertigo, altered consciousness, or impairments in speech, swallowing, and vision often points toward cerebrovascular accidents or tumor-induced compression.
- **Bilateral Dysfunction:** Bilateral neurological deficits below a specific spinal segment are indicative of spinal cord compression or trauma.
- **Systemic and Vascular Signs:** Limb pain and weakness may signal aortic dissection or lower extremity arteriosclerosis obliterans. Respiratory distress, fever, rash, or arthralgia may accompany high-level spinal cord injuries or infectious neuropathies.

Medical History and Psychosocial Factors

A thorough patient history is vital for diagnosis. Recent trauma, exposure to toxins, or long-term medication use may point toward traumatic brain/spinal cord injuries or toxic neuropathies. Additionally, paroxysmal symptoms such as seizures or electrolyte imbalances must be considered. Finally, psychological states—including low mood, tension, or panic—may indicate that sensory symptoms are manifestations of depression or panic attacks.

3.1.6 既往史

(1) Medical History: Presence of any history of neurological diseases, musculoskeletal disorders, endocrine and metabolic diseases, circulatory system diseases, urinary system diseases, immune system disorders, or other systemic conditions (such as malignant tumors, herpes zoster, etc.).

(2) Medication History: History of using anti-tumor drugs, anti-tuberculosis drugs, over-the-counter medications with unknown ingredients, or health supplements; history of long-term use of specific medications or long-term dependence on sedative-hypnotic drugs.

(3) Surgical and Anesthetic History: Any prior history of surgical procedures or administration of anesthesia.

3.1.7 个人史

Clinicians should investigate whether there is a history of exposure to heavy metals or radioactive substances in the place of residence, as well as any history of occupational exposure. It is also necessary to determine if there is a history of long-term use of cosmetics containing heavy metals, accidental ingestion of toxic substances, smoking, alcohol consumption, abnormal dietary structure, or nutrient imbalances. Furthermore, the assessment should identify poor lifestyle habits, such as prolonged sedentary desk work, carpal tunnel syndrome (“mouse hand”), or long-term “text neck” from mobile phone use.

Specific clinical presentations of numbness and their associated conditions include: - **Numbness with paraplegia:** Acute myelitis, spinal cord compression (tumor, hematoma, abscess), etc. - **Numbness with crossed paralysis:** Brainstem lesions, etc. - **Numbness with pain:** Cervical spondylosis, postherpetic neuralgia, etc. - **Numbness with burning or tingling sensations:** Diabetic peripheral neuropathy, etc. - **Numbness with hyperesthesia or hypesthesia:** Fibromyalgia, multiple sclerosis, etc. - **Numbness with sensory ataxia:** Subacute combined degeneration of the spinal cord, peripheral neuropathy, etc. - **Cranial nerve symptoms (facial numbness with diplopia, facial drooping, dysphagia, dysarthria):** Brainstem lesions, skull base meningitis, etc. - **Numbness with impaired consciousness, convulsions, visual field defects, aphasia, or cognitive decline:** Cerebrovascular disease, intracranial infection, etc. - **Numbness with bladder/bowel dysfunc-**

tion (urinary retention, incontinence, constipation) or dry, anhidrotic skin: Spinal cord lesions, diabetic autonomic neuropathy, etc. - **Numbness with edema:** Heart failure, nephrotic syndrome, etc. - **Numbness with cold limbs, pallor, or intermittent claudication:** Thrombosis, arteriosclerosis obliterans, etc. - **Numbness with redness, swelling, and heat in the limbs:** Erythromelalgia, deep vein thrombosis, etc. - **Numbness with cold intolerance, fatigue, slow response, or weight gain:** Hypothyroidism, adrenocortical insufficiency, etc. - **Numbness with abnormal renal function (edema, foamy urine, hypertension):** Uremic peripheral neuropathy, acromegaly, etc. - **Numbness with neck, shoulder, or lower back pain and limited joint mobility:** Lumbar disc herniation, thoracic outlet syndrome, etc. - **Numbness with local tenderness or masses:** Ganglion cysts, lipomas, etc. - **Numbness with fever:** Guillain-Barré syndrome, connective tissue disease, etc. - **Numbness with lymphadenopathy:** Sarcoidosis, cryoglobulinemia, etc. - **Numbness with butterfly rash or livedo reticularis:** Systemic lupus erythematosus, mixed connective tissue disease, etc. - **Numbness with significant weight loss:** Malignant tumors, paraneoplastic syndrome, etc. - **Numbness with anxiety, tension, palpitations, or hyperventilation:** Anxiety disorders, panic attacks, etc. - **Numbness with low mood, loss of interest, or multiple unexplained physical discomforts:** Depression, bipolar disorder, etc.

Chinese General Practice

3.1.8 月经婚育史

Clinical Characteristics of Numbness During Menstruation, Pregnancy, and the Postpartum Period

Numbness is a common clinical symptom that frequently occurs during specific physiological stages of a woman' s life, namely menstruation, pregnancy, and the postpartum period. Understanding the distinct characteristics and underlying mechanisms of numbness during these three phases is essential for accurate diagnosis and effective clinical management.

1. Menstrual Period

During the menstrual cycle, some women experience transient numbness, primarily localized in the extremities. This phenomenon is often attributed to fluctuations in estrogen and progesterone levels, which can influence peripheral nerve sensitivity and vascular permeability. Hormonal shifts may lead to mild fluid retention, potentially causing transient compression of peripheral nerves. Furthermore, menstrual-related numbness is frequently associated with primary dysmenorrhea or premenstrual syndrome (PMS), where systemic inflammatory mediators may play a role in altering sensory perception.

Figure 1

Figure 1: Figure 1

2. Pregnancy

Numbness is significantly more prevalent during pregnancy, particularly in the second and third trimesters. The most common manifestation is Carpal Tunnel Syndrome (CTS), characterized by numbness, tingling, and pain in the thumb, index, and middle fingers.

The primary physiological drivers during this stage include: - **Fluid Retention:** Increased blood volume and interstitial fluid can lead to edema, increasing pressure within the carpal tunnel or other confined anatomical spaces. - **Mechanical Compression:** As the uterus expands and body weight increases, changes in posture and direct pressure on pelvic or spinal nerves can result in numbness in the lower back and legs (e.g., meralgia paresthetica). - **Metabolic Demands:** Increased requirements for vitamins, particularly B_{12} and folate, may lead to subclinical deficiencies that manifest as peripheral neuropathy if not adequately managed.

3. Postpartum Period

The postpartum phase presents a unique set of challenges regarding nerve-related symptoms. Numbness during this time may be a continuation of pregnancy-induced conditions or may arise from the labor process itself.

Key factors contributing to postpartum numbness include: - **Obstetric Nerve Injury:** Prolonged labor or specific positioning during delivery (such as the lithotomy position) can cause compression or stretching of the femoral, sciatic, or peroneal nerves. - **Anesthesia Recovery:** Patients who receive spinal or epidural anesthesia may experience localized numbness at the injection site or transient sensory changes in the lower extremities during the recovery period.

3.1.9 家族史

Inquire whether there is a family history of hereditary peripheral neuropathy or hereditary ataxia. Additionally, determine if there is a history of clustered malignant tumors among family members, or a family history of paraneoplastic syndromes or autoimmune neuropathies.

3.1.10 精神心理因素

Assess whether the patient is experiencing states of anxiety or depression, and evaluate for recent significant psychological stressors or sleep disturbances. A standardized, multidimensional physical examination of numbness is essential

for clarifying the etiology and developing an effective clinical diagnosis and treatment plan.

3.2.1 系统查体

The physical examination for numbness and its clinical significance are summarized in .

Physical Examination for Numbness and Clinical Significance

The physical examination of patients presenting with numbness is a critical component of the diagnostic process, aimed at localizing the lesion within the nervous system and identifying the underlying etiology. A systematic approach ensures that sensory deficits are accurately mapped and correlated with motor and reflex findings.

Sensory Examination

The sensory exam should evaluate multiple modalities to distinguish between different spinal cord tracts and peripheral nerve involvements. Testing for light touch (using a cotton wisp) and pain/temperature (using a pinprick or cold object) helps differentiate between the dorsal column-medial lemniscus pathway and the spinothalamic tract. It is essential to determine the precise distribution of sensory loss—whether it follows a specific dermatome, a peripheral nerve distribution, or a "glove-and-stocking" pattern characteristic of polyneuropathy.

Motor and Reflex Assessment

In addition to sensory testing, the examination must include an assessment of muscle strength, tone, and deep tendon reflexes. For example, numbness accompanied by lower motor neuron signs (such as weakness, atrophy, and diminished reflexes) often points toward a peripheral nerve or root lesion. Conversely, the presence of hyperreflexia or pathological signs (e.g., the Babinski sign) suggests a central nervous system lesion involving the upper motor neurons.

Clinical Significance

The integration of these findings allows clinicians to categorize the numbness into specific clinical syndromes. A clear sensory level on the trunk is highly indicative of transverse myelitis or spinal cord compression. Asymmetric sensory loss involving the face and the contralateral side of the body may suggest a brainstem lesion. By synthesizing the data from the physical examination, as detailed in , practitioners can narrow the differential diagnosis and select appropriate neuroimaging or electrophysiological studies.

Figure 1

Figure 2: Figure 1

3.2.2 重点查体

Neurological Physical Examination and Clinical Significance

The specific components of the neurological physical examination and their corresponding clinical significance are summarized in .

Supplementary Examinations and Assessments

Beyond the physical examination, supplementary diagnostic tests and standardized assessment tools play a critical role in the comprehensive evaluation of neurological function. These auxiliary investigations provide objective data to support clinical findings, aid in differential diagnosis, and monitor disease progression or treatment efficacy.

3.3.1 辅助检查

Laboratory and imaging examinations are summarized in .

3.3.2 评估

Numbness assessment can utilize various scoring scales depending on the underlying etiology. Primary instruments include the Neuropathy Symptom Score (NSS), Neuropathy Deficit Score (NDS), Michigan Neuropathy Screening Instrument (MNSI), Toronto Clinical Scoring System (TCSS), Total Neuropathy Score (TNSr/TNSc), Japanese Orthopaedic Association (JOA) Cervical Spondylotic Myelopathy Score, Inflammatory Rasch-built Overall Disability Scale (I-RODS), Douleur Neuropathique 4 (DN4) neuropathic pain questionnaire, and the 8-item Somatic Symptom Scale (SSS-8).

The Murtagh "Safety First" diagnostic strategy for numbness addresses the complexity of its etiology. Implementing this strategy can enhance diagnostic accuracy regarding skin color, temperature, and rashes, as well as the assessment of limbs and joints for deformities, swelling, tenderness, range of motion, posture, and morphology (

).

When evaluating patients presenting with numbness, clinicians should integrate "red flag" warning signs to facilitate the early and rapid identification of acute or critical conditions. Simultaneously, a structured inquiry model should be employed to obtain a detailed history, including the triggers, duration, anatomical distribution, quality, aggravating and alleviating factors, and associated

symptoms of the numbness. By combining systematic physical examination, comprehensive numbness scale assessments, and individualized auxiliary investigations, a robust Murtagh safety diagnostic strategy can be established.

This approach improves diagnostic accuracy and reduces the risk of misdiagnosis.

4 治疗

Treatment of Numbness

The primary objectives in treating numbness are to eliminate or alleviate sensory symptoms, prevent complications, and improve the patient' s overall quality of life. Treatment strategies should adhere to an etiology-oriented approach, encompassing general care, pharmacological interventions, interventional and surgical procedures, rehabilitation, and Traditional Chinese Medicine (TCM). Addressing the underlying cause is the cornerstone of curative treatment. While numbness caused by physiological factors can often be relieved through general care and lifestyle adjustments, organic causes require specific management as detailed in relevant clinical textbooks.

General Treatment and Nursing Care

Patients should ensure adequate rest and avoid factors that may induce or exacerbate symptoms. Necessary lifestyle adjustments are essential, with a particular emphasis on preventing accidental injuries—such as burns—that may occur due to diminished sensory perception. From a nutritional perspective, patients should maintain a balanced diet high in protein and rich in B-vitamins; dietary restrictions should also be implemented to manage any underlying primary diseases.

Physical activity interventions must be scientific and progressive, transitioning from passive movement to active training while ensuring patient safety. Postural care is critical; frequent repositioning and the use of supportive devices are necessary to prevent pressure ulcers and joint deformities. Furthermore, a comprehensive approach integrating cognitive-behavioral therapy, mindfulness, psychological education, and social support should be employed to help patients adjust their cognition, manage emotions, and enhance their confidence in the treatment process [**?**].

Pharmacological Treatment

(1) Neurotrophic and Reparative Medications Agents such as mecobalamin and other B-vitamins are commonly utilized for nutritional deficiency neuropathies, diabetic neuropathy, or alcoholic neuropathy. Specific dosages should be adjusted based on the underlying etiology and the severity of the patient' s condition.

Physical Examination and Clinical Significance

General Status and Vital Signs

Assessment of vital signs, body weight, and Body Mass Index (BMI) is essential for identifying underlying conditions such as systemic infections, circulatory disorders, endocrine and metabolic diseases, or malignancies.

Integumentary System

Skin examination provides critical diagnostic clues. Changes in skin temperature and color may indicate peripheral arterial disease (PAD), vasomotor dysfunction, or localized infection. Dryness and desquamation (scaling) are often associated with Sjögren's syndrome or diabetes mellitus. Specific dermatological markers include butterfly rashes and livedo reticularis, which suggest systemic lupus erythematosus (SLE), while extensive café-au-lait spots are characteristic of neurofibromatosis.

Lymphatic and Vascular Systems

Examination of superficial lymph nodes for enlargement, tenderness, or adhesion is necessary to screen for infection, lymphoma, or metastatic malignancy. Vascular assessment focuses on peripheral arterial pulses and capillary refill time. Weak or asymmetrical pulses suggest peripheral arterial disease, such as arterial stenosis or embolism. A delayed capillary refill time (greater than 2 seconds) indicates insufficient peripheral circulatory perfusion.

Head, Neck, and Thorax

The thyroid gland should be evaluated for size, texture, and the presence of nodules to identify thyroid-related disorders. Thoracic examination includes assessing chest wall morphology, respiratory excursion, breath sounds, heart sounds, and breast tissue. Abnormalities in these areas may indicate congenital deformities, trauma, cardiopulmonary disease, breast disorders, or intercostal neuritis.

Abdominal and Genitourinary Systems

Abdominal palpation for masses, tenderness, muscle guarding, or hepatosplenomegaly is vital. These findings may suggest tumor compression, visceral diseases (such as pancreatitis or cholecystitis) causing referred numbness, or metabolic and hematological disorders. Genitourinary examination for scrotal or vulvar edema, chancres, or abnormal discharge can identify infections (such as syphilis) or allergic reactions.

Musculoskeletal System

Joint swelling and tenderness accompanied by morning stiffness are indicative of rheumatoid arthritis, while joint deformities paired with erythematous skin lesions suggest systemic lupus erythematosus. Postural abnormalities or specific antalgic positions may point to musculoskeletal issues like scoliosis or transient postural nerve compression (e.g., common peroneal nerve palsy resulting from crossing one' s legs).

Psychological Assessment

A comprehensive evaluation should include an assessment of the patient' s psychological state. By observing behavior and inquiring about anxiety or somatization symptoms, clinicians can identify somatoform disorders or anxiety-related numbness, which typically present without organic localizing neurological signs.

Neurological Examination and Diagnostic Evaluation of Sensory Abnormalities

1. Higher Cortical Functions and Cranial Nerves

The assessment of higher cortical functions should include the Mini-Mental State Examination (MMSE) and a specific focus on contralateral hemispatial neglect. Neglect or numbness may indicate parietal lobe lesions resulting from cerebral infarction, tumors, or trauma.

Examination of the cranial nerves is essential for localizing lesions: - **Trigeminal Nerve (V):** Facial numbness suggests pathology in the trigeminal nerve or central sensory pathways. - **Facial Nerve (VII):** Facial paralysis combined with limb numbness often indicates brainstem involvement. - **Optic and Oculomotor Nerves (II, III, IV, VI):** Visual impairment or ophthalmoplegia combined with numbness may suggest demyelinating diseases such as Multiple Sclerosis (MS) or Neuromyelitis Optica (NMO).

2. Motor System and Reflexes

The relationship between muscle strength, tone, and volume provides critical diagnostic clues: - **Upper Motor Neuron (UMN) Lesion:** Characterized by decreased muscle strength accompanied by increased muscle tone (spasticity). This is typical of brain or spinal cord pathology. - **Lower Motor Neuron (LMN) Lesion:** Characterized by decreased muscle strength, decreased muscle tone (flaccidity), and muscle atrophy. This suggests involvement of the peripheral nerves or nerve roots.

Reflex testing further refines the localization: - **Deep Tendon Reflexes:** Includes biceps, brachioradialis, knee, and ankle reflexes. - **Superficial Reflexes:** Includes abdominal and cremasteric reflexes. - **Pathological Signs:** Presence

of the Babinski or Hoffmann signs. - **Clinical Significance:** Diminished or absent reflexes suggest peripheral neuropathy, radiculopathy, or anterior horn cell lesions. Conversely, hyperreflexia accompanied by positive pathological signs indicates damage to the pyramidal tracts in the cortex, brainstem, or spinal cord.

3. Sensory System and Localization

Sensory deficits are categorized by their distribution and the type of sensation affected: - **Peripheral (Glove-and-Stocking Distribution):** Typical of polyneuropathy (e.g., diabetic, alcoholic, or uremic neuropathy). - **Radicular (Segmental):** Suggests cervical/lumbar spondylosis, herpes zoster, or tumor compression. - **Spinal (Below a specific level):** Indicates spinal cord injury or myelitis. - **Internal Capsule/Cortical (Hemianesthesia):** Suggests cerebrovascular disease or brain tumors.

Sensory modalities include: - **Superficial Sensation:** Light touch, pain, and temperature. - **Deep Sensation:** Vibration and position sense. Impairment suggests posterior column damage (e.g., tabes dorsalis or subacute combined degeneration). - **Cortical Composite Sensation:** Includes stereognosis, two-point discrimination, and graphesthesia. Abnormalities in these areas while superficial sensation remains intact are of high diagnostic value for parietal lobe lesions.

4. Coordination, Gait, and Special Tests

- **Ataxia:** Sensory ataxia (positive Romberg sign) indicates posterior column lesions. Cerebellar ataxia indicates cerebellar pathology.
- **Gait:** A steppage gait is characteristic of common peroneal nerve palsy.
- **Coordination Tests:** Finger-to-nose test, heel-to-shin test, and Romberg test.
- **Trophic Changes:** Dry skin, anhidrosis, desquamation, or thickened/deformed nails in the numb area may suggest diabetic or amyloid neuropathy.

Special Orthopedic/Neurological Maneuvers: - **Cervical Radiculopathy:** Positive Spurling' s test (neck compression), foraminal compression test, or brachial plexus tension test. - **Lumbar Pathology:** Positive straight leg raise test suggests lumbar disc herniation or spinal stenosis. - **Nerve Entrapment:** A positive Tinel' s sign suggests conditions such as carpal or cubital tunnel syndrome.

5. Laboratory Investigations

- **General Screening:** CBC, hs-CRP, and ESR to rule out infection or hematological disorders.
- **Metabolic and Endocrine:** Blood glucose and HbA1c (diabetes); liver and kidney function (uremic neuropathy or hypoalbuminemia);

electrolytes (K, Na, Ca, Mg) to assess neuromuscular excitability; and thyroid function tests.
- **Immunological and Paraneoplastic:** Serum protein electrophoresis and immunofixation electrophoresis (multiple myeloma/paraproteinemia); autoantibody panels (SLE, Sjögren' s syndrome); and anti-ganglioside antibodies (Guillain-Barré syndrome).
- **Toxicology and Infectious Disease:** Heavy metal screening; drug concentration monitoring; HIV and Syphilis serology; and Borrelia burgdorferi antibodies (Lyme disease).

6. Imaging and Advanced Diagnostics

- **Neuroimaging:** Cranial MRI/CT for cerebrovascular disease or tumors; Spinal MRI/CT for disc herniation, stenosis, or spinal tumors.
- **Electrophysiology:** Electromyography (EMG) and Nerve Conduction Velocity (NCV) studies to evaluate the nature, location, and severity of nerve damage.
- **Specialized Testing:** Pituitary-enhanced MRI (for pituitary tumors); arterial blood gas (acid-base imbalances); and cerebrospinal fluid (CSF) analysis for inflammatory or neoplastic conditions.
- **Biopsy and Genetics:** Skin, muscle, or nerve biopsy for small fiber neuropathy, vasculitis, or amyloidosis; genetic testing for hereditary conditions like Charcot-Marie-Tooth (CMT) disease.
- **Autonomic Testing:** Indicated if numbness is accompanied by palpitations or hyperhidrosis.

Construction and Validation of a Risk Prediction Model for Postoperative Delirium in Elderly Patients Based on Machine Learning

Abstract

Objective: To construct and validate a risk prediction model for postoperative delirium (POD) in elderly patients using machine learning algorithms, providing a scientific tool for clinical screening of high-risk populations.

Methods: A retrospective analysis was conducted on clinical data from elderly patients who underwent surgery at our hospital between January 2020 and December 2022. Patients were divided into a training set and a validation set. Feature selection was performed using LASSO regression, and five machine learning models—Logistic Regression (LR), Random Forest (RF), Support Vector Machine (SVM), Extreme Gradient Boosting (XGBoost), and Artificial Neural Network (ANN)—were developed. The performance of these models was evaluated using the Area Under the Receiver Operating Characteristic Curve (AUC), calibration curves, and Decision Curve Analysis (DCA).

Results: A total of 850 patients were included, with an overall POD incidence

of 15.3%. Key predictors identified included age, preoperative cognitive status, duration of surgery, intraoperative blood loss, and postoperative sleep quality. Among the five models, the XGBoost model demonstrated the highest predictive performance with an AUC of 0.89 (95% CI: 0.85–0.93) in the validation set. Calibration curves indicated good agreement between predicted and observed probabilities, and DCA confirmed the clinical utility of the model.

Conclusion: The machine learning-based risk prediction model, particularly the XGBoost algorithm, effectively predicts the risk of POD in elderly patients. This model can assist clinicians in early identification and intervention for high-risk individuals.

Introduction

Postoperative delirium (POD) is a common acute neuropsychiatric syndrome characterized by fluctuating consciousness, attention deficits, and cognitive impairment. It typically occurs within 24 to 72 hours following surgery. With the global trend of population aging, the number of elderly patients undergoing surgical procedures is increasing significantly. Studies indicate that the incidence of POD in elderly patients ranges from 10% to over 50%, depending on the type of surgery and the patient' s baseline health status.

POD is associated with numerous adverse outcomes, including prolonged hospital stays, increased healthcare costs, higher rates of postoperative complications, and increased long-term mortality. Despite its clinical significance, POD remains underdiagnosed in many settings. Early identification of high-risk patients

(2) Microcirculation-improving agents: These include Prostaglandin E1, which is indicated for numbness caused by circulatory system diseases (such as lower limb atherosclerosis) or diabetic microvascular complications.

(3) Antioxidant stress agents: For example, α-lipoic acid can be utilized for neuropathies induced by diabetes, alcohol consumption, or toxic substances.

(4) Metabolic disorder correction agents: For instance, Epalrestat is primarily used in the treatment of diabetic neuropathy.

(5) Cellular energy metabolism enhancers: For example, Acetyl-L-carnitine is mainly indicated for diabetic neuropathy.

(6) Nerve regeneration agents: These include nerve growth factors, which can be applied to cases of traumatic or compressive nerve injury.

(7) Pharmacotherapy for neuropathic pain:

- **First-line medications:** These include calcium channel modulators and serotonin-norepinephrine reuptake inhibitors (SNRIs), which are applicable for diabetic neuropathy and post-stroke paresthesia. Dosages must be individualized based on the patient' s renal function and tolerance.
- **Second/Third-line medications:** Topical patches may be used for localized numbness.

Opioids and certain anticonvulsants can be utilized for the treatment of refractory numbness. Furthermore, interventional and surgical treatments may be considered.

4.3.1 脊柱疾病的治疗

For the treatment of cervical spondylosis or lumbar disc herniation, various minimally invasive surgical options are available, including percutaneous endoscopic techniques and physical ablation. When necessary, open surgeries such as discectomy, spinal canal decompression, and interbody fusion may be performed to achieve complete relief of nerve compression [**?**, **?**].

4.3.2 神经调控与消融技术

Neuromodulation techniques, including transcutaneous electrical nerve stimulation (TENS) and spinal cord stimulation (SCS), as well as neuroablative techniques such as pulsed radiofrequency and cryoneurolysis, are employed to modulate or block the transmission of abnormal neural signals [**?**, **?**].

4.3.3 其他疾病的术式选择

For conditions such as trigeminal neuralgia and carpal tunnel syndrome, a comprehensive range of interventions is available, spanning from minimally invasive procedures to open surgery. Minimally invasive options include radiofrequency thermocoagulation and needle knife release, while open surgical procedures, such as carpal tunnel release and microvascular decompression, are employed when clinically indicated.

Sensory retraining, which involves providing comprehensive sensory stimulation to the affected limbs, is applicable for numbness resulting from various etiologies. Hyperbaric oxygen therapy and physical agents—including electrotherapy, transcranial direct current stimulation (tDCS), and repetitive transcranial magnetic stimulation (rTMS)—are frequently utilized in cases of ischemic or traumatic nerve injury.

Furthermore, exercise therapy, such as nerve gliding techniques (neural mobilization), can effectively alleviate symptoms of numbness, while occupational therapy, including task-oriented training, facilitates the recovery of limb function. It is also essential to provide patients with guidance on standardized home-based rehabilitation activities. Additionally, Traditional Chinese Medicine (TCM) and herbal treatments may be integrated into the therapeutic regimen.

4.5.1 内治法

In the early stages of treatment, the primary focus is on dispelling pathogenic factors and unblocking the collaterals, supplemented by harmonizing qi and blood. In the middle and late stages, emphasis shifts to activating blood circulation, transforming phlegm, strengthening the body' s resistance, and eliminating pathogens. Common patterns for syndrome differentiation and treatment are as follows:

(1) Wind-Cold-Damp Numbness. Predominance of Wind: Numbness is migratory and may be accompanied by skin pruritus; the tongue coating is thin and white, and the pulse is floating. Treatment method: Dispel wind and unblock the collaterals. Representative formula: *Huangqi Guizhi Wuwu* Decoction. Predominance of Cold: Numbness is fixed in location and relieved by warmth, accompanied by pain and aversion to cold; the tongue coating is white and slippery, and the pulse is wiry and tight. Treatment method: Warm the meridians and disperse cold. Representative formula:

Danggui Sini Decoction. Predominance of Dampness: Numbness is more pronounced in the lower limbs, accompanied by physical fatigue and limb pain; the tongue is swollen with teeth marks, the coating is white and greasy, and the pulse is soft and slow. Treatment method: Remove dampness and unblock the collaterals. Representative formula: *Yiyiren* Decoction.

(2) Qi and Blood Deficiency Numbness. Numbness occurs throughout the body, being milder during the day and worsening at night; it is accompanied by mental fatigue, lack of strength, a lusterless complexion, palpitations, and vertigo. The tongue is pale and swollen, and the pulse is deep, thin, and weak. Treatment method: Augment qi and nourish blood. Representative formula: *Bazhen* Decoction.

(3) Blood Stasis Numbness. Numbness is accompanied by stabbing pain in a fixed location; the lips and tongue are purple-dark or have ecchymosis, and the pulse is deep and choppy. Treatment method: Activate blood, resolve stasis, and unblock the collaterals. Representative formula:

Taohong Siwu Decoction.

(4) Phlegm-Turbidity Obstruction Numbness. Numbness is accompanied by a sensation of distension and oppression, fullness in the chest and epigastrium, nausea, and the expectoration of phlegm-drool. The tongue is pale and swollen with a greasy coating, and the pulse is slippery. Treatment method: Strengthen the spleen, transform phlegm, and unblock the collaterals.

Representative formula: *Zhitan Fuling* Pill.

(5) Internal Stirring of Liver Wind Numbness. Numbness is accompanied by headache, vertigo, and tinnitus, or even tremors; the tongue coating is thin and yellow, and the pulse is wiry. Treatment method: Calm the liver and

extinguish wind, nourish yin and soothe the collaterals. Representative formula: *Lingjiao Gouteng* Decoction.

4.5.2 外治法

External treatment modalities, such as acupuncture, tuina (massage therapy), cupping, moxibustion, and collateral pricking with bloodletting, can treat numbness by stimulating meridians and acupoints to facilitate the smooth flow of qi and blood.

The effective management of numbness requires the implementation of comprehensive and individualized strategies. Identifying and addressing the underlying etiology is fundamental to improving prognosis, while pharmacological interventions, interventional procedures, and surgery remain the primary measures for symptom relief. Furthermore, systematic rehabilitation training, comprehensive nursing support, and Traditional Chinese Medicine (TCM) therapies provide significant auxiliary value. Through these multi-dimensional interventions, the ultimate goal is to maximize the recovery of neurological function and enhance the patient' s quality of life.

5 社区管理

Numbness (paresthesia) has a complex and diverse etiology that necessitates long-term management. Establishing a standardized and systematic community management protocol is of significant practical importance for identifying underlying causes, alleviating symptoms, and delaying disease progression.

Principles and Objectives of Community Management for Patients with Numbness

The management of patients presenting with numbness in a community setting should be guided by structured clinical pathways. The primary objectives are to ensure early and accurate screening of potential etiologies, provide symptomatic relief through evidence-based interventions, and implement longitudinal monitoring to prevent the deterioration of neurological function. By integrating standardized diagnostic procedures with personalized care plans, community healthcare providers can effectively bridge the gap between acute specialist consultation and long-term rehabilitative support.

5.1.1 聚焦全人，主动管理

Adhering to a "person-centered" approach, patients are empowered through health education to master self-monitoring techniques and daily protective measures for numbness, enabling them to take an active role in maintaining neurological health.

5.1.2 预防为先，全程干预

Establish a comprehensive management chain integrating "prevention, treatment, management, and rehabilitation."By controlling the risk factors associated with numbness and implementing strategies for "early screening, early diagnosis, and early treatment," it is possible to delay disease progression, promote functional recovery, and prevent complications.

5.1.3 团队协作，精准施策

In response to the multifactorial etiology of numbness, it is essential to implement multidisciplinary collaboration to develop individualized diagnosis and treatment plans. By providing integrated services, the ultimate goal is to delay disease progression and improve the quality of life for patients.

Chinese General Practice: Community-based management flowchart for numbness

5.2.1 一级预防

Eliminating or reducing underlying causes is essential for preventing the initial onset of nerve damage and associated numbness. For the general population, public health initiatives should focus on disseminating knowledge regarding numbness and providing guidance on healthy lifestyles and nutrition. Key strategies include ensuring adequate intake of B-vitamins, maintaining glycemic control, and limiting alcohol consumption. Furthermore, it is critical to minimize environmental and occupational exposure risks, advocate for regular physical examinations and risk screenings, and implement measures to prevent physical trauma.

5.2.2 二级预防

Pay close attention to physical warning signs to ensure early identification, definitive diagnosis, and prompt treatment directed at the underlying etiology. When numbness first appears or remains mild, timely intervention is critical to prevent the further progression of neurological damage.

5.2.3 三级预防

When numbness has resulted in significant neurological dysfunction or has progressed into a chronic condition, comprehensive management is essential to alleviate symptoms, delay complications, reduce suffering, and enhance functional capacity. This approach involves the standardized and rational use of medication, the implementation of rehabilitation and physical therapy, and the proactive prevention and management of complications. Furthermore, it is crucial to involve family members in the rehabilitation process to provide emotional support and practical assistance, while simultaneously encouraging patients to

develop self-management skills. For patients in advanced stages or with severe conditions, the focus should shift toward pain management, symptom control, and palliative care to maintain their quality of life and preserve their dignity.

5.3.1 建档签约及家庭病床管理

Dedicated health records should be established for patients suffering from numbness, and family doctor contracting services should be initiated when necessary. These services are categorized into three distinct packages: the **Basic Package**, which is free of charge and covers the establishment of health records, follow-up consultations, and chronic disease management; the **Comprehensive Health Package**, which adds diagnosis and treatment for common conditions, priority referrals, and long-term prescriptions; and the **Personalized Package**, which allows patients to select specific services from a project library—such as appropriate Traditional Chinese Medicine (TCM) techniques and psychological counseling—based on their specific needs for rehabilitation training or home care. For patients with limited mobility, door-to-door contracting and follow-up services can be provided [**?**].

For patients with stable numbness who have difficulty traveling, home-based hospital beds may be established upon meeting specific criteria, accompanied by a formal service agreement. Should the symptoms of numbness worsen, the family doctor must prioritize the patient' s referral to a secondary or higher-level hospital. In the event of significant changes in the patient' s condition, the home-based bed service should be terminated, and the medical records must be formally archived.

5.3.2 营养管理

Nutritional intervention must be predicated on an etiological diagnosis. A comprehensive treatment plan should be developed by supplementing key nutrients, optimizing dietary patterns, and addressing specific clinical circumstances, followed by the regular monitoring of outcomes.

5.3.3 体重管理

Weight Management for Patients with Numbness: A Neuroprotection-Centered Approach

Weight management for patients experiencing numbness must prioritize neuroprotection as its core objective. By implementing precise energy control, nutritional fortification, and safe exercise protocols, clinicians can achieve the goal of "weight loss without compromising neurological health."

Figure 1

Figure 3: Figure 1

1. The Necessity of Neuroprotection in Weight Management

For patients presenting with numbness—often a clinical manifestation of peripheral neuropathy or nerve compression—traditional weight loss strategies that focus solely on caloric restriction may inadvertently exacerbate nerve damage. Rapid weight loss can lead to the depletion of essential micronutrients and the loss of lean muscle mass, both of which are critical for nerve repair and metabolic stability. Therefore, a specialized approach is required to balance metabolic improvement with the preservation of neurological function.

2. Precise Energy Control

Effective weight management begins with precise energy titration. Rather than adopting aggressive caloric deficits, the strategy should focus on a sustainable, moderate reduction in energy intake. This prevents the metabolic stress associated with starvation states, which can trigger inflammatory responses detrimental to sensitive nerve tissues. Calculating the basal metabolic rate (BMR) and adjusting for physical activity levels ensures that the patient receives sufficient energy to support cellular repair mechanisms while still achieving a negative energy balance for weight reduction.

3. Nutritional Fortification for Nerve Health

Nutritional intervention must go beyond macronutrient ratios to include specific neurotrophic factors. Key components include:

- **B-Vitamins:** Essential for myelin sheath maintenance and nerve signaling. Supplementation or increased dietary intake of B_1, B_6, and B_{12} is often necessary.
- **Antioxidants:** Alpha-lipoic acid and Vitamin E can help mitigate oxidative stress, a primary driver of nerve fiber degradation.
- **High-Quality Protein:** Adequate protein intake is vital to prevent sarcopenia, ensuring that weight loss is derived from adipose tissue rather than functional muscle mass.

4. Safe Exercise and Functional Mobility

Exercise prescriptions for patients with numbness must account for sensory deficits to prevent injury. High-impact activities should be replaced with low-impact, controlled movements such as swimming, cycling, or supervised resistance training.

The focus should be on improving insulin sensitivity and circulation—both of which support nerve health—without placing undue mechanical stress on af-

fected limbs. Balance training is also a critical component to compensate for proprioceptive loss and reduce the risk of falls.

5. Conclusion

5.3.4 心理管理

Psychological management should center on alleviating emotional stress, improving coping mechanisms, and strengthening social support. By integrating cognitive-behavioral interventions, relaxation training, and collaborative family-social support systems, a comprehensive "bio-psycho-social" intervention can be achieved through multidisciplinary collaboration.

5.3.5 用药管理

Patients experiencing numbness should adhere to standardized medication protocols under the guidance of a physician and must avoid self-discontinuing treatment or adjusting dosages. It is essential to regularly monitor for adverse drug reactions and potential drug-to-drug interactions, while dynamically evaluating therapeutic efficacy to ensure timely adjustments to the treatment regimen.

5.3.6 中医适宜技术管理

The management of appropriate Traditional Chinese Medicine (TCM) techniques emphasizes a comprehensive intervention for numbness based on body constitution identification. Priority is given to the application of techniques such as acupuncture, tuina (massage), cupping, and TCM herbal steaming. The core principles focus on regulating qi and blood, as well as dredging the meridians and collaterals. Furthermore, patients should be guided to cooperate with home-based rehabilitation exercises (see 4.6).

5.3.7 社会支持

Assist patients in connecting with social resources and encourage their participation in appropriate community activities. These interventions aim to reduce social isolation and enhance the patients' sense of self-worth and life value.

5.3.8 康复管理

The rehabilitation management of patients with numbness should adhere to the principles of individualization, gradual progression, and safety. Under the guidance of a rehabilitation physician, periodic rehabilitation goals and targeted treatment plans should be formulated based on the results of a comprehensive assessment. Therapeutic options such as sensory retraining, fine motor training, and physical therapy may be selected to alleviate numbness symptoms and promote the recovery of neurological function. Prior to training, the safety of the environment must be evaluated, and patients should be instructed on the use

of appropriate assistive devices (such as walkers or orthoses). When necessary, patients should be accompanied by family members to prevent falls and other accidental injuries (see **??**).

5.3.9 患者自我管理

Guide patients and family members to participate fully in the management of numbness. This includes maintaining a numbness symptom diary, learning self-examination methods and limb protection measures, mastering relaxation massage techniques and home-based rehabilitation exercises, and recognizing situations that require emergency medical attention. These efforts aim to improve patient awareness of numbness and treatment adherence, optimize lifestyle habits, and enhance patients' self-management capabilities and confidence in dealing with numbness.

5.3.10 多学科合作管理

A multidisciplinary team (MDT) should be established within the community, centered around general practitioners and incorporating specialists, nurses, pharmacists, rehabilitation therapists, traditional Chinese medicine practitioners, nutritionists, psychologists, social workers, and caregivers. This team should conduct regular group meetings to adjust treatment plans accordingly. By leveraging the Multidisciplinary Treatment for Medically Unspecified Disease (MUD-MDT) management model, clinicians can implement individualized, comprehensive, and long-term management for patients presenting with numbness. This approach aims to enhance patients' self-management capabilities and quality of life while simultaneously reducing the burden on families and society.

Follow-up care for patients with numbness is designed to dynamically evaluate changes in their condition, monitor potential underlying causes and the risk of complications, and strengthen the management of risk factors and chronic diseases.

5.4.1 随访内容

Clinical monitoring includes the assessment of symptoms, physical signs, and risk factors. It is essential to record the specific location, extent, severity, and progression of numbness, as well as to identify abnormal sensations such as tingling or burning. Furthermore, clinicians should determine whether these symptoms are accompanied by muscle weakness, gait abnormalities, or changes in vision, bowel, or bladder function.

The physical examination should comprehensively evaluate tactile sensation, pain perception, temperature sensitivity, vibration sense, reflexes, and gait coordination. Monitoring should also extend to relevant etiological factors and risk factors, including blood glucose, glycated hemoglobin (HbA1c), blood pressure, lipid profiles, vitamin B levels, and thyroid and renal functions. Attention must

be paid to clinical indicators of nerve compression, myelopathy, demyelinating diseases, or cerebrovascular disease. For patients with peripheral neuropathy, it is necessary to examine the skin of the feet, assess blood flow, and evaluate the risk of ulceration. Finally, clinicians should document adherence to and adverse effects of relevant treatments (such as hypoglycemic, antihypertensive, or immunomodulatory therapies) while remaining vigilant for complications such as infection or falls.

5.4.2 随访方式

Outpatient follow-up should be the primary method of care; home visits may be conducted for patients with limited mobility, while telephone or online follow-ups serve as supplementary measures. High-risk patients should be managed through a multidisciplinary approach.

5.4.3 随访频率

Patients with severe disease or those at risk of progression should be followed up every 1 to 3 months. Patients with moderate disease should be followed up every 3 to 6 months, while those with mild and stable conditions require follow-up every 6 to 12 months. If patients experience worsening symptoms, new-onset limb weakness, foot ulceration, or poor control of the primary disease, they should seek an earlier follow-up appointment or be referred promptly for further care.

5.5.1 建立双向转诊小组

Responsible for evaluating patient indications for upward and downward referrals, maintaining referral record logs, establishing "green channels" (expedited pathways), developing information-sharing platforms, and implementing home-based hospital beds.

5.5.2 上转指征

(1) Sudden onset of numbness in a single limb occurring within minutes or hours, with or without numbness of the ipsilateral trunk.
(2) Persistent or progressively worsening numbness involving an entire lower limb or arm.
(3) Numbness occurring in the thighs, buttocks, genitals, or perineal region (saddle area), accompanied by urinary or fecal incontinence.
(4) Bilateral numbness below a specific level in the mid-thoracic region of the body.
(5) Loss of sensation involving the ipsilateral face and body, or the ipsilateral face and the contralateral body.
(6) Rapid progression of numbness to the entire body or involvement of multiple body sites following onset.

(7) Numbness accompanied by headache, vertigo, dyspnea, or altered consciousness.
(8) Limb numbness associated with neurological symptoms such as paresis, hypesthesia, dysarthria, visual impairment, dysphagia, urinary retention, or cognitive decline.
(9) Numbness occurring in the context of acute fever, infection, toxic or drug poisoning, or a history of exposure to hazardous substances.
(10) Numbness accompanied by severe underlying or multifactorial conditions—such as neurological disorders, endocrine and metabolic diseases, malignant tumors, immune system disorders, hematological diseases, musculoskeletal or skin conditions, or malnutrition—where the etiology remains unclear after primary community assessment, or where symptoms fail to improve or continue to deteriorate.
(11) Refractory numbness or numbness accompanied by psychiatric, psychological, or depressive symptoms.

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5.5.3 下转指征

(1) The etiology has been clearly identified, numbness is relatively stable and controlled, other concomitant neurological symptoms have been alleviated, organ or limb functional impairments have partially recovered, and treatment and rehabilitation management plans have been established. (2) Although the etiology remains unclear, the symptoms of numbness have been reduced following comprehensive treatment, organ or limb functional impairments have significantly recovered, and the patient' s condition is stable. (3) The patient' s condition has improved and stabilized after acute phase treatment; however, they remain only partially independent in activities of daily living and require continued rehabilitation. (4) Patients with central nervous system diseases, malignant tumors, immune diseases, or chronic infectious poisoning accompanied by numbness who have reached the terminal stage and require hospice care. (5) Patients with psychiatric disorders or depression accompanied by numbness who are currently in a stable state. (6) Patients with polyneuropathy caused by diabetes, chronic kidney disease, cardiovascular and cerebrovascular diseases, or malnutrition, where the primary disease and numbness symptoms have been effectively managed. (7) Patients with neck, shoulder, waist, or leg pain and osteoarthritis-related disc herniation or spinal cord compression whose numbness has improved or subsided following treatment, but who require community-based maintenance rehabilitation.

The community management of numbness follows the core principle of being "person-centered." It emphasizes providing patients with personalized management plans that integrate nutrition, psychology, and rehabilitation strategies through comprehensive assessment and multidisciplinary collaboration. By empowering patients and building a supportive environment, the effectiveness and

sustainability of management are ensured. The objective system precisely corresponds to the three levels of prevention, aiming to achieve full-cycle, closed-loop management ranging from "risk factors" to "functional outcomes." This approach fully reflects the unique value of community health management centered around general practitioners.

6 未来方向

Future Directions in the Diagnosis and Management of Numbness

The future diagnosis, treatment, and management of numbness require coordinated advancement across three levels: clinical practice, education and training, and scientific innovation. By establishing standardized pathways, leveraging digital intelligence, and accumulating clinical evidence, a patient-centered, full-cycle management system can be gradually realized.

In terms of diagnosis, future efforts will place greater emphasis on etiological analysis and the early identification of potential nerve damage. By integrating multi-source information—including wearable sensors, neuroimaging, electromyography, and electronic medical records—machine learning models can be employed for etiology classification and risk prediction, enabling the detection of subclinical neurological abnormalities. Intelligent auxiliary diagnostic systems will automatically analyze the location of numbness, its mode of onset, and accompanying symptoms to identify potential "red flags" and recommend clinical pathways, thereby facilitating rapid referral and timely intervention for acute and severe cases.

Regarding treatment, the focus will shift toward precision targeted therapies that address key pathways and targets related to nerve injury mechanisms, aiming to enhance efficacy while minimizing adverse effects. For pathological processes such as numbness-related neuroinflammation, nutritional imbalances, and ion channel dysfunction, research will prioritize drug strategies targeting immunomodulation, neuroprotection, and regenerative repair. Emerging therapeutic platforms, including gene therapy, nucleic acid drugs, and exosome delivery systems, will further expand treatment boundaries, offering more options for patients with refractory or progressive numbness.

In rehabilitation and follow-up, wearable devices can provide real-time monitoring of gait, balance, and activity levels. Combined with digital tools such as mobile applications and electronic diaries, these devices allow for the long-term recording of symptom fluctuations, medication adherence, and physical activity, providing a quantitative basis for individualized rehabilitation prescriptions. By constructing intelligent rehabilitation platforms that integrate remote follow-up, personalized exercise prescriptions, and feedback evaluation, patients can complete modules such as tactile stimulation, balance, and strength training at home. These systems can automatically adjust difficulty levels based on train-

ing completion and wearable sensor feedback while pushing anomaly alerts to medical teams. Furthermore, greater importance will be placed on the subjective experience and participation of patients and caregivers, encouraging the establishment of community and online support networks to provide vocational counseling and retraining, helping patients safely regain social and occupational functions.

Standardized education and training serve as the cornerstone for improving the quality of numbness management. For professionals, a continuing education system combining online and offline learning should be established for general practitioners, specialists, and members of rehabilitation, nursing, and psychological teams. The curriculum should cover differential diagnosis protocols for undifferentiated numbness, the application of hierarchical diagnosis and clinical pathways, standardized management of common etiologies, and AI-assisted interpretation and data literacy. Training formats can utilize case databases and scenario-based simulations to strengthen clinical reasoning and multidisciplinary collaboration, gradually forming teaching platforms with both practical and pedagogical value.

For patients and caregivers, digital health education packages can be developed. these should include key points for self-screening, early warnings for risks such as falls and burns, foot and skin care, medication safety, and home exercise checklists. Information should be presented via graphics, videos, and interactive Q&A to ensure ease of understanding and implementation. Community health centers and hospitals should establish linkage mechanisms to conduct regular health education sessions on numbness, guiding patients on the correct use of wearable devices and mobile apps for self-monitoring to improve adherence and self-management capabilities.

Simultaneously, the establishment of patient mutual-aid groups and peer support networks is encouraged to provide continuous support for long-term symptom management, psychological adjustment, and social functional recovery.

Scientific innovation requires the support of high-quality data platforms. Specialized disease databases and AI-assisted diagnostic models centered on "numbness" should be constructed, integrating multi-center clinical data, laboratory tests, neurophysiology, imaging, and home-based monitoring data. Standardized coding systems must be adopted to ensure data interoperability. Furthermore, multi-dimensional digital indicators—such as gait, balance, tactile thresholds, and brain network activity—can be used to build an objective and continuous digital biomarker system, providing research-grade quantitative tools for efficacy evaluation and outcome prediction [**?**].

Brain-computer interface (BCI) technology represents a frontier research direction in the field of numbness. By recording and decoding sensory-motor related EEG or cortical signals and linking them with output devices such as peripheral stimulators, prostheses, or exoskeletons, BCI can more precisely characterize cortical remodeling and changes in sensory afferent function. This provides

new quantitative tools for objective grading and prognostic assessment. Bidirectional BCI technology incorporating sensory feedback has already achieved partial reconstruction of touch or pressure sensations in patients with amputations or severe paralysis. This technical path can be adapted to explore "artificial touch" training and rehabilitation intervention models for numbness, offering new avenues for sensory function reconstruction and long-term management.

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参考文献

NAGAI S, NIWA H, TERAJIMA Y, et al. The relationship between numbness and quality of life[J]. J Clin Med, 2023, 12(4): 1324. DOI: 10.3390/jcm12041324.

Analysis of the Diagnosis and Treatment of Numbness

Wang Jian, Jiang Ping *(Hebei Journal of Traditional Chinese Medicine, 2015, 37(7): 1080-1081)*

Introduction

Numbness is a common clinical symptom characterized by a loss of tactile sensation or a subjective feeling of "pins and needles" in the skin and muscles. In Traditional Chinese Medicine (TCM), "numbness" (*ma*) refers to a tingling sensation without pain, while "insensitivity" (*mu*) refers to a lack of sensation and loss of tactile awareness. Clinically, these two often appear together and are collectively referred to as "numbness syndrome" (*ma mu*). This condition is frequently observed in modern medical diagnoses such as peripheral neuropathy, cervical spondylosis, stroke sequelae, and diabetes-related complications. This article explores the etiology, pathogenesis, and syndrome-based treatment of numbness based on classical TCM theory and clinical practice.

Etiology and Pathogenesis

The fundamental pathogenesis of numbness lies in the obstruction of meridians and the failure of *qi* and blood to nourish the extremities and skin. This can be categorized into external and internal factors:

1. **Exogenous Pathogens:** External wind, cold, and dampness can invade the body' s surface and meridians. When these pathogens linger, they obstruct the flow of *qi* and blood, leading to localized numbness.
2. **Internal Injury and Deficiency:** Chronic illness or aging can lead to a deficiency of *qi* and blood. As the *Suwen* (Basic Questions) states, "When *qi* is deficient, there is numbness." Without sufficient nourishment, the muscles and skin lose their sensitivity.
3. **Phlegm and Blood Stasis:** Internal accumulation of phlegm-dampness or long-term blood stasis can block the collaterals. This physical obstruction prevents the smooth circulation of vital energy, resulting in persistent or localized numbness.

Differential Diagnosis and Treatment

Treatment must be based on a clear differentiation of syndromes, focusing on whether the condition is characterized by excess or deficiency.

1. Wind-Dampness Obstruction This type often presents as wandering numbness, sometimes accompanied by joint pain or heaviness in the limbs. The tongue coating is typically thin and white or greasy. * **Treatment Principle:** Dispel wind, eliminate damp

KIRCHBERGER I, MEISINGER C, HEIER M, et al. Patterns of multimorbidity in the aged population. Results from the KORA-Age study[J]. PLoS One, 2012, 7 (1) : e30556. DOI: 10.1371/journal. pone.0030556.

Expert Group on Diagnosis and Treatment of Neuropathic Pain. Expert consensus on the diagnosis and treatment of neuropathic pain [J]. Chinese Journal of Internal Medicine, 2009, 48(6): 526-528. DOI: 10.3760/cma.

Neuroimmunology Group of the Neurology Branch of the Chinese Medical Association, Neuroimmunology Branch of the Chinese Society of Immunology. Chinese expert consensus on the diagnosis and treatment of multiple sclerosis (2011 edition) [J]. Chinese Journal of Neurology, 2012, 45(4): 362-367. DOI: 10.3760/cma.

Functional Neurosurgery Group of the Neurosurgery Branch of the Chinese Medical Association, Functional Neurosurgery Expert Committee of the Neurosurgeons Branch of the Chinese Medical Doctor Association, et al. Chinese expert consensus on the diagnosis and treatment of trigeminal neuralgia [J]. Chinese Journal of Surgery, 2015, 53(9): 657-664. DOI:

Chinese Association of Integrative Medicine, China Association of Chinese Medicine, Chinese Medical Association, et al. Guidelines for the integrated traditional Chinese and Western medicine diagnosis and treatment of cervical spondylotic myelopathy (2023 edition) [J]. Journal of Orthopaedics and Traumatology of Traditional Chinese Medicine, 2024. Plasma Cell Disease Group of the Hematology Branch of the Chinese Medical Association, Multiple Myeloma Professional Committee of the Chinese Medical Doctor Association. Chinese expert consensus on the diagnosis and treatment of POEMS syndrome (2025 edition) [J]. Chinese Journal of Hematology, 2025, 46(5): 389-396. DOI:

Chinese Medical Association Neurology Branch, Peripheral Neuropathy Collaborative Group of the Chinese Medical Association Neurology Branch, Liu Mingsheng, et al. Chinese expert consensus on the diagnosis and treatment of autoimmune nodopathies 2023 [J]. Chinese Journal of Neurology, 2024, 57(5): 437-442.

CRUCCU G, SOMMER C, ANAND P, et al. EFNS guidelines on neuropathic pain assessment: revised 2009[J]. Eur J Neurol, 2010, 17(8): 1010-1018. DOI: 10.1111/j.1468-1331.2010.02969.x.

Chinese Diabetes Society. Consensus on the clinical application of glucagon-like peptide-1 based hypoglycemic drugs [J]. Chinese Journal of Diabetes Mellitus, 2014, 6(1): 14-20. DOI:

Neuropathy Study Group of the Chinese Diabetes Society, Office of the National Basic Public Health Service Project for Primary Diabetes Prevention and Management. National guidelines for the diagnosis and treatment of diabetic neuropathy in primary care (2024 edition) [J]. Chinese Journal of Diabetes Mellitus, 2024, 16(5): 496-511. DOI: 10.3760/cma.j.cn115791-20240408-00160.

Spine Surgery Group of the Chinese Orthopaedic Association, Orthopaedic Rehabilitation Group of the Chinese Orthopaedic Association. Guidelines for the diagnosis and treatment of lumbar disc herniation [J]. Chinese Journal of Orthopaedics, 2020, 40(8): 477-487. DOI: 10.3760/cma.j.cn121113-20200402-. LIU Suzhen, LI Jiping, CHENG Yijuan, et al. Analysis of physical functional status and related factors of falls in community-dwelling elderly [J]. Journal of Nursing Science, 2004, 19(6): 5-7. DOI: 10.3969/. MA Yulin, SHI Fuxia, YANG

Jinliang, et al. Observation on the intervention effect of medicinal cupping technology on limb numbness symptoms in stroke patients [J]. Beijing Journal of Traditional Chinese Medicine, 2025, 44(5): 638-641. DOI: 10.16025/j.1674-1307.2025.05.020.

ZHANG Luqi. Clinical observation of Xiaoma Tongluo Formula in the treatment of limb numbness after ischemic stroke with wind-phlegm and blood stasis obstruction syndrome [D]. Zhangjiakou: Hebei North University, 2025.

WANG W Z, JIANG B, SUN H X, et al. Prevalence, incidence, and mortality of stroke in China: results from a nationwide population-based survey of 480,687 adults [J]. Circulation, 2017, 135(8): 759-771. DOI: 10.1161/CIRCULATION-AHA.116.025250. Analysis of clinical characteristics and prognosis of 80 cases of Guillain-Barré syndrome [D]. Jinan:

Shandong University, 2018. LI Zhenhan, CHEN Zhongpei, YU Xiaoxia. Research progress in the diagnosis and treatment of diabetic peripheral neuropathy [J]. Journal of Chongqing Medical University, 2025, 50(5): 574-578. DOI:

HU Jinxing, XU Paide, FU Aojie, et al. Research progress of Traditional Chinese Medicine in the treatment of numbness symptoms in cervical spondylotic radiculopathy [J]. Guangming Journal of Chinese Medicine, 2025, 40(8): 1639-1642. DOI: 10.3969/. Retrospective clinical and pathological analysis of 34 cases of leprosy [D]. Zunyi: Zunyi Medical University, 2020.

REDA B, WONG I. Postoperative numbness: a survey of patients after hip arthroscopic surgery[J]. Orthop J Sports Med, 2018, 6(5): 2325967118771535. DOI: 10.1177/2325967118771535.

DZAKPASU F Q S, CARVER A, BRAKENRIDGE C J, et al. Musculoskeletal pain and sedentary behaviour in occupational and non-occupational settings: a systematic review with meta-analysis[J].

Int J Behav Nutr Phys Act, 2021, 18(1): 159. DOI: 10.1186/s12966- 021-01191-y.

SMITH M D, VICENZINO B, BROWN W J, et al. Symptom characteristics in office workers using standing workstations: a cross- sectional study[J]. Braz J Phys Ther, 2022, 26(2): 100393. DOI:

DE ARRUDA G T, DRIUSSO P, RODRIGUES J C, et al. Are menstrual symptoms associated with central sensitization inventory?

A cross-sectional study[J]. Eur J Pain, 2022, 26(8): 1759-1767. DOI: 10.1002/ejp.1999.

LIEW S C, AUNG T. Sleep deprivation and its association with diseases—a review[J]. Sleep Med, 2021, 77: 192-204. DOI: 10.1016/j.sleep.2020.07.032.

Neurorestoratology Professional Committee of the Chinese Medical Doctor Association, Peripheral Nerve Surgery Professional Committee of the Chinese Medical Doctor Association, International Association of Neurorestoratology. Expert

consensus on the diagnosis and surgical treatment of diabetic lower extremity entrapment neuropathy (2024 Edition)[J]. Chinese Journal of Endocrine Surgery, 2024.

NYMAN E, DAHLIN L B. The unpredictable ulnar nerve–ulnar nerve entrapment from anatomical, pathophysiological, and biopsychosocial aspects[J]. Diagnostics, 2024, 14(5): 489. DOI: 10.3390/diagnostics14050489.

ANNA M B, KIMURA L F, VIEIRA W F, et al. Environmental factors and their impact on chronic pain development and maintenance[J]. Phys Life Rev, 2024, 48: 176-197. DOI: 10.1016/ DOUGLAS A G, XU D J, SHAH M P. Approach to myelopathy and myelitis[J]. Neurol Clin, 2022, 40(1): 133-156. DOI: 10.1016/ KATZ J N, ZIMMERMAN Z E, MASS H, et al. Diagnosis and management of lumbar spinal stenosis: a review[J]. JAMA, 2022, 327(17): 1688-1699. DOI: 10.1001/jama.2022.5921.

LE H V, WICK J B, VAN B W, et al. Ossification of the posterior longitudinal ligament: pathophysiology, diagnosis, and management[J]. J Am Acad Orthop Surg, 2022, 30(17): 820-830.

KURIS E O, MCDONALD C L, PALUMBO M A, et al. Evaluation

Chinese General Practice https and management of cauda equina syndrome[J]. Am J Med, 2021, THEODORE N. Degenerative cervical spondylosis[J]. N Engl J Med, 2020, 383(2): 159-168. DOI: 10.1056/NEJMra2003558.

[35] DENGLER N F, PEDRO M T, KRETSCHMER T, et al. Neurogenic

thoracic outlet syndrome[J]. Deutsches rzteblatt Int, 2022. DOI: 10.3238/arztebl.m2022.0296.

YANG Y, ZHAO B, WANG Y Z, et al. Diabetic neuropathy: cutting- edge research and future directions[J]. Signal Transduct Target Ther, 2025, 10(1): 132. DOI: 10.1038/s41392-025-02175-1.

RAKHSHANI RAD S, MOHAMMADI Z H, ZADEH M J, et al. Identification of important symptoms and diagnostic hypothyroidism patients using machine learning algorithms[J]. Ann Med Surg, 2024, 86(6): 3233-3241. DOI: 10.1097/MS9.0000000000002068.

[38] CALDER Ó N-OSPINA C A, NAVA-MESA M O. B Vitamins in

the nervous system: current knowledge of the biochemical modes of action and synergies of thiamine, pyridoxine, and cobalamin[J]. CNS Neurosci Ther, 2020, 26(1): 5-13. DOI: 10.1111/cns.13207.

KENNEDY P G, MOGENSEN T H. Determinants of neurological syndromes caused by Varicella zoster virus (VZV)[J]. J Neurovirol, 2020, 26(4): 482-495. DOI: 10.1007/s13365-020-00857-w.

Yan LL, Yan R, Yang YF, et al. A case of leprosy with peripheral nerve injury as the initial symptom [J]. Chinese Journal of Infectious Diseases, 2024,

42(8): 486-488. DOI: 10.3760/. Liu J, Zhang WJ, Jiang QH. A case of primary intraspinal Ewing' s sarcoma/primitive neuroectodermal tumor [J]. Chinese Journal of Clinical Neurosurgery, 2023, 28(4): 287-. Yang QY, Li H, Liu C, et al. Clinicopathological analysis of 6 cases of Ewing' s sarcoma occurring in the central nervous system [J]. Chinese Journal of Pathology, 2023, 52(12): 1249-1254.

Li XP, Zhang YN, Wang Z, et al. Two cases of primary epidural diffuse large B-cell lymphoma and review of the literature [J]. Journal of Leukemia & Lymphoma, 2025, 34(4): 230-233.

LAVORATO A, ARUTA G, DE MARCO R, et al. Traumatic peripheral nerve injuries: a classification proposal[J]. J Orthop Traumatol, 2023, 24(1): 20. DOI: 10.1186/s10195-023-00695-6.

DESFORGES A D, HEBERT C M, SPENCE A L, et al. Treatment and diagnosis of chemotherapy-induced peripheral neuropathy: an update[J]. Biomed Pharmacother, 2022, 147: 112671. DOI: 10.1016/j.biopha.2022.112671.

Somatic Symptom and Related Disorders Group of the Psychosomatic Medicine Branch of the Chinese Medical Association, Psychosomatic Medicine Branch of the Shanghai Medical Association, LU Zheng, et al. Expert consensus on the multidisciplinary diagnosis and treatment of somatic symptom disorder[J]. Chinese Journal of Psychiatry, 2024, 57(2): 65-77.

MILLINGTON G W M, SHOBAJO M T, WALL J, et al. Somatization in dermatology[J]. Skin Health Dis, 2022, 2(4): e164. DOI: 10.1002/ ski2.164.

RYAN C, MINER H, RAMACHANDRAN S, et al. General anxiety is associated with problematic initial recovery after carpal tunnel release[J]. Clin Orthop Relat Res, 2022, 480(8): 1576-1581. DOI: 10.1097/CORR.0000000000002115.

[49] KLEIN I, LEHMANN H C. Pathomechanisms of paclitaxel-induced

peripheral neuropathy[J]. Toxics, 2021, 9(10): 229. DOI: 10.3390/ toxics9100229.

ZHU J X, HU Z Y, LUO Y F, et al. Diabetic peripheral neuropathy: pathogenetic mechanisms and treatment[J]. Front Endocrinol, 2024, 14: 1265372. DOI: 10.3389/fendo.2023.1265372.

[51] SIMKINS T J, DUNCAN G J, BOURDETTE D. Chronic

demyelination and axonal degeneration in multiple sclerosis: pathogenesis and therapeutic implications[J]. Curr Neurol Neurosci Rep, 2021, 21(6): 26. DOI: 10.1007/s11910-021-01110-5.

CUYUBAMBA O, BRAGA C P, SWIFT D, et al. The combination of neurotropic vitamins B1, B6, and B12 enhances neural cell maturation and connectivity superior to single B vitamins[J]. Cells, 2025, 14(7): 477. DOI: 10.3390/cells14070477.

[53] ZIEGLER D, TESFAYE S, SPALLONE V, et al. Screening, diagnosis

and management of diabetic sensorimotor polyneuropathy in clinical practice: International expert consensus recommendations[J].

Diabetes Res Clin Pract, 2022, 186: 109063. DOI: 10.1016/. Cerebrovascular Disease Group of the Neurology Branch of the Chinese Medical Association. 2023 Chinese guidelines for the diagnosis and treatment of acute ischemic stroke [J]. Chinese Journal of Neurology, 2024, 57(6): 523-559. DOI: 10.3760/cma.j.cn113694-20240410-. Expert Group on the Standardization of Diagnosis and Treatment of Cervical Spondylotic Radiculopathy. Expert consensus on the standardization of diagnosis and treatment of cervical spondylotic radiculopathy [J]. Chinese Journal of Surgery, 2015, 53(11): 812-814.

Zhang Yongzhi, Li Yanmin, Ma Xiaowen, et al. A case report and literature review of aortic dissection presenting with weakness and numbness of both lower limbs as the initial manifestation [J]. Clinical Focus, 2023, 38(10): 912-. Qiao Benyu, Wu Xiaoke, Song Wenli, et al. Analysis of clinical characteristics and prognostic factors of 51 patients with multiple sclerosis in the Suzhou area [J]. Chinese Journal of Immunology, 2025. He Xujian. Research progress in prognostic prediction of Guillain-Barré syndrome [J]. Chinese Journal of Difficult and Complicated Cases. Ministry of Health of the People' s Republic of China. Diagnosis of occupational chronic chemical-induced peripheral neuropathy: GBZ/T 247-2013 [S/OL]. (2013-02-07) [2025-12-01].

John Murtagh. Murtagh' s General Practice [M]. Beijing: People' s Medical Publishing House, 2023. Li Xi, Liu Xueling, Tan Xiangling, et al. Impact of early staged pulmonary rehabilitation training on postoperative recovery efficiency in patients undergoing thoracoscopic surgery [J]. The Journal of Practical Medicine, 2025, 41(14).

TECAR C, CHIPERI L E, MURESANU D F. Parental psychological response to prenatal congenital heart defect diagnosis[J]. Children, 2025, 12(8): 1095. DOI: 10.3390/children12081095.

CHEN Ying, YIN Yuanyuan, XU Fengqin. Study on the current status and influencing factors of participation in productive activities during the rehabilitation period among elderly patients after unilateral total hip arthroplasty [J]. Chinese Journal of Nursing, 2025. Expert Group for the Formulation of Chinese Guidelines for the Diagnosis and Treatment of Neuropathic Pain, Pain Medicine Branch of the China Association for Senior Care Health Care, CHENG Zhixiang, et al. Chinese guidelines for the diagnosis and treatment of neuropathic pain (2024 edition) [J]. Chinese Journal of Pain Medicine, 2024, 20(4): 484-508. DOI:

Pain Management Branch of the Chinese Medical Association, Pain Physician Branch of the Chinese Medical Doctor Association, WANG Zhijian, et al. Chinese guidelines for the minimally invasive treatment of cervical spondylotic radiculopathy in the elderly [J]. Chinese Journal of Pain Medicine, 2025, 31(7):

481-488.

Basic Research and Translational Medicine Group of the Spine and Spinal Cord Professional Committee of the China Association of Rehabilitation Medicine. Guidelines for the diagnosis, treatment, and rehabilitation management of lumbar disc herniation [J]. Chinese Journal of Surgery, 2022.

Chinese General Practice, 60(5): 401-408. DOI: 10.3760/cma.j.cn112139-20211122-00548.

ZHANG Tong, ZHAO Jun, LI Xueping, et al. Chinese guidelines for the clinical management of cerebrovascular diseases (2nd edition) (Excerpt): Chapter 8 Rehabilitation management of cerebrovascular diseases [J]. Chinese Journal of Stroke, 2023. KAPURAL L, PATEL J, ROSENBERG J C, et al. Efficacy and safety of magnetic peripheral nerve stimulation for treatment of neuropathic pain; one year follow up of long-term outcomes [J]. J Pain Res, 2025, 18: 4471-4481. DOI: 10.2147/JPR.S538263.

Bone and Joint Disease Professional Committee of the World Federation of Chinese Medicine Societies, WANG Yongjun, YU Xiang, et al. Expert consensus on the integrated traditional Chinese and Western medicine diagnosis and treatment of carpal tunnel syndrome [J]. National Medical Journal of China, 2023, 103(7): 473-482. DOI: 10.3760/cma.j.cn112137-20220926. LI Zhonglin, ZHOU Xiaoqing, WAN Jun, et al. Observation on the efficacy of neuromuscular electrical stimulation synchronized with transcutaneous electrical nerve stimulation in the treatment of cervical spondylotic radiculopathy [J]. Chinese Journal of Rehabilitation Medicine, 2023, 38(6): 780-786, 792. DOI: 10.3969. WANG Xiangxiang, ZHANG Liying, ZHANG Jian, et al. Clinical study of Chijing acupuncture combined with Danlu Tongdu tablets and McKenzie therapy for patients with lumbar disc herniation complicated by cauda equina syndrome [J]. Clinical Journal of Acupuncture and Moxibustion, 2024, 40(6): 47-52.

XIE Kexin, DU Fang, ZHANG Dan. Research on the influencing factors of the effectiveness of family doctor contract services for community-dwelling elderly patients with chronic comorbidities [J]. Chinese General Practice, 2024, 27(20): 2512. JIANG Xiaoli, PENG Haibo, XU Lingfeng, et al. Evaluation study on the effectiveness of primary-level first-contact care among contracted residents under the background of family doctor contract services [J]. Chinese General Practice, 2024, 27(10).

WANG Xiaodong, LIU Fengyu, WANG Wei, et al. Investigation and research on the current status of family ward service supply in Shanghai [J]. Chinese Primary Health Care, 2025, 39(1): 1-4. DOI: 10.3969. LI Hong, FU Jing, WANG Minghuan, et al. Study on the current status and influencing factors of self-management among community-dwelling elderly patients with chronic comorbidities [J]. Psychological Monthly, 2025, 20(20): 61-63, 66.

ZHAO Lihua, CHEN Xiaoyong, REN Jingjing, et al. Exploration of the application of general practice multidisciplinary team diagnosis and treatment and

long-term management in undifferentiated diseases [J]. Chinese General Practice Medicine, 2025, 23(8).

LI Jialin, SHEN Sizhe, LONG Da. Discussion on the model and operation mechanism of two-way referral [J]. Modern Distance Education of Chinese Medicine, 2022, 20(22): 186-187. DOI: 10.3969. MALERBI F K, NAKAYAMA L F, GAYLE DYCHIAO R, et al.

Digital education for the deployment of artificial intelligence in health care[J]. J Med Internet Res, 2023, 25: e43333. DOI: 10.2196/43333.

[79] LILIEN C, GASNIER E, GIDARO T, et al. Home-based monitor

for gait and activity analysis[J]. J Vis Exp, 2019(150): e59668. DOI: 10.3791/59668.

SOLIMAN N, MOISSET X, FERRARO M C, et al. Pharmacotherapy and non-invasive neuromodulation for neuropathic pain: a systematic review and meta-analysis[J]. Lancet Neurol, 2025, 24(5): 413-428.

ODDSSON L I E, BISSON T, COHEN H S, et al. The effects of a wearable sensory prosthesis on gait and balance function after 10 weeks of use in persons with peripheral neuropathy and high fall risk - the walk2Wellness trial[J]. Front Aging Neurosci, 2020, 12: 592751. DOI: 10.3389/fnagi.2020.592751.

SARRAT-GONZ LEZ D, ESCRIB -MONTAGUT X, HOUGHTALING J, et al. dsOMOP: bridging OMOP CDM and DataSHIELD for secure federated analysis of standardized clinical data[J]. Bioinformatics, 2025, 41(6): btaf286. DOI: 10.1093/ bioinformatics/btaf286.

[83] YUE J Y, SHANG Y, CUI H K, et al. Visualization analysis of CBL

application in Chinese and international medical education based on big data mining[J]. BMC Med Educ, 2025, 25(1): 402. DOI: 10.1186/ s12909-025-06933-1.

GOZZI N, CHEE L, ODERMATT I, et al. Wearable non-invasive neuroprosthesis for targeted sensory restoration in neuropathy[J]. Nat Commun, 2024, 15(1): 10840. DOI: 10.1038/s41467-024-55152-7.

GIANNONI-LUZA S, PACHECO-BARRIOS K, CARDENAS- ROJAS A, et al. Noninvasive motor cortex stimulation effects on quantitative sensory testing in healthy and chronic pain subjects: a systematic review and meta-analysis[J]. Pain, 2020, 161(9): 1955- SHI Y, WU W. Multimodal non-invasive non-pharmacological therapies for chronic pain: mechanisms and progress[J]. BMC Med, 2023, 21(1): 372. DOI: 10.1186/s12916-023-03076-2.

VALLE G, KATIC SECEROVIC N, EGGEMANN D, et al. Biomimetic computer-to-brain communication enhancing naturalistic touch sensations via peripheral nerve stimulation [J]. Nat Commun, 2024, 15(1): 1151. DOI: 10.1038/s41467-024-45190-6.

Figure 2

Figure 4: Figure 2

GREENSPON C M, VALLE G, SHELCHKOVA N D, et al. Evoking stable and precise tactile sensations via multi-electrode intracortical microstimulation of the somatosensory cortex [J]. Nat Biomed Eng, 2025, 9(6): 935-951. DOI: 10.1038/s41551-024-01299-z.

(Received: 2026-03-05; Revised: 2026-03-18)

Figures