

The First Step to Diagnosing WHIM Syndrome Is Suspecting It

WHIM syndrome is a rare, combined primary immunodeficiency and a chronic neutropenic disorder, named for the manifestations of:

Warts | **H**ypogammaglobulinemia | **I**nfections | **M**yelokathexis

Less than 1 in 4 patients with WHIM syndrome present with all 4 manifestations.

The onset, severity, duration, and frequency of WHIM syndrome symptoms and potential resulting complications can be variable.²

Prevalence of Manifestations, Laboratory Findings, and Associated Complications^{2,3}

Classic WHIM Manifestations*

Warts 40%

Hypogammaglobulinemia 65%

Infections 92%

Myelokathexis[†] ~100%

WHIM syndrome is heterogeneous, and only 23% of patients will typically present with the full tetrad of key manifestations.²

Frequent Laboratory Findings*

Neutropenia 98%

Lymphopenia 88%

Monocytopenia

Exact prevalence unknown

WHIM syndrome should be suspected in any case of chronic neutropenia with lymphopenia and/or monocytopenia.⁴

Multisystemic Complications*

Sepsis

13%

Resulting from bacterial meningitis and bacteremia

End-organ damage

20%

Bronchiectasis and hearing loss

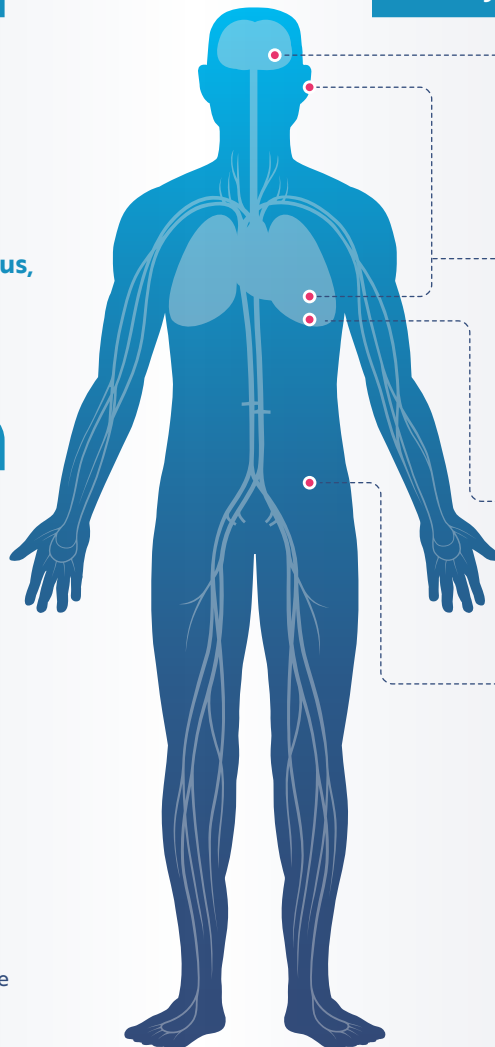
Pneumonia

63%

Cancer

30%

Estimated overall risk by age 40, including HPV- and EBV-associated malignancies[‡]



*Based on analysis of n=66 patients, as described in Geier et al.

[†]Includes leukopenia in cases where bone marrow biopsy was not performed.

[‡]Based on analysis of n=60 patients, as described in Beaussant Cohen et al.



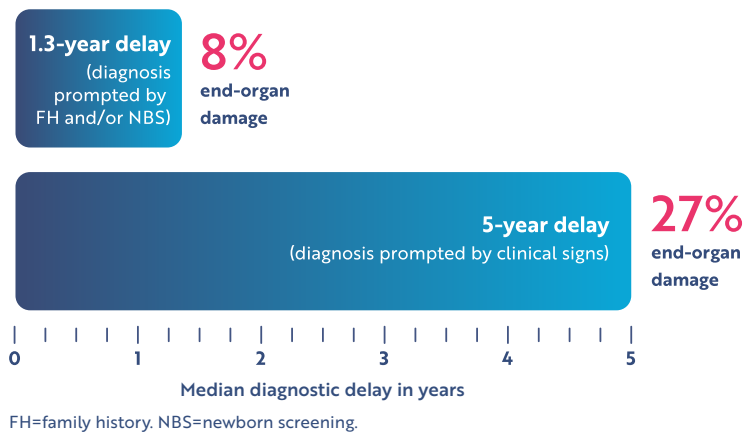
Suspect your patient might have WHIM?
Connect with an X4 Diagnostic Liaison to learn more.

SCAN ME [WhatifitsWHIM.com](https://www.whatifitswhim.com)



Early Diagnosis of WHIM Syndrome is Essential

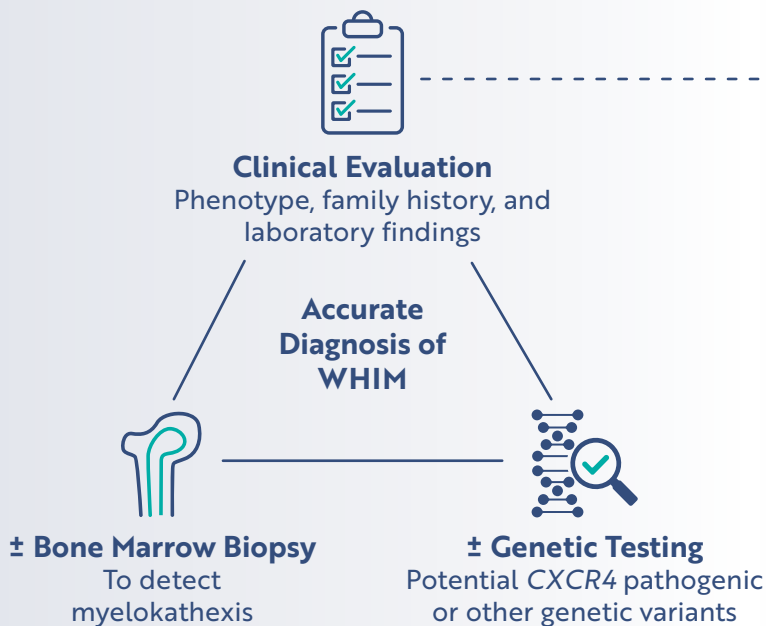
Incidence of End-Organ Damage Based on Diagnostic Delay²



- In a retrospective analysis, earlier diagnosis and treatment resulted in fewer hospitalizations and lower incidence of end-organ damage, including bronchiectasis and hearing loss.²
- An early, definitive WHIM diagnosis can help inform and guide patient management, improve outcomes, and may help reduce potential antibiotic resistance and long-term complications.^{2,5}

WHIM Syndrome 3-Point Diagnosis

Clinical evaluation, bone marrow biopsy and/or genetic testing can help inform a WHIM syndrome diagnosis²



Phenotype and Patient/Family History^{2,6}

Frequent Infections

- Recurrent sinopulmonary and upper respiratory tract infections
- History of frequent childhood ear infections
- Subcutaneous abscesses
- Absence of classic opportunistic infections

Recalcitrant Warts

- Consistent presence of HPV warts
- Anogenital warts
- Resistance to therapy

Laboratory Findings^{2,4}

Neutropenia

- ANC ≤ 1000 cells/ μ L (elevated during infection but low with recovery)

Lymphopenia

- ALC < 1500 cells/ μ L (age appropriate)

Monocytopenia

Hypogammaglobulinemia

- Low circulating levels of IgG, IgA, and/or IgM

References: 1. Dale DC, Firkin F, Bolyard AA, et al. Results of a phase 2 trial of an oral CXCR4 antagonist, mavoxixafor, for treatment of WHIM syndrome. *Blood*. 2020;136(26):2994-3003. 2. Geier CB, Ellison M, Cruz R, et al. Disease progression of WHIM syndrome in an international cohort of 66 pediatric and adult patients. *J Clin Immunol*. 2022;42(8):1748-1765. 3. Beausant Cohen S, Fenneteau O, Plouvier E, et al. Description and outcome of a cohort of 8 patients with WHIM syndrome from the French Severe Chronic Neutropenia Registry. *Orphanet J Rare Dis*. 2012;7:71. 4. Badolato R, Donadieu J; WHIM Research Group. How I treat warts, hypogammaglobulinemia, infections, and myelokathexis syndrome. *Blood*. 2017;130(23):2491-2498. 5. Kawai T, Malech HL. WHIM syndrome: congenital immune deficiency disease. *Curr Opin Hematol*. 2009;16(1):20-26. 6. Heusinkveld LE, Majumdar S, Gao JL, McDermott DH, Murphy PM. WHIM syndrome: from pathogenesis towards personalized medicine and cure. *J Clin Immunol*. 2019;39(6):532-556.



SCAN ME

Order no-cost genetic testing to diagnose or rule out WHIM syndrome through **Path4Ward**

© 2023 X4 Pharmaceuticals, Inc. All rights reserved. X4NM-US-000-2300022 (v1.0)

