NBN

The *NBN* gene is a tumor suppressor gene. Tumor suppressor genes slow down cell division, repair DNA mistakes, or tell cells when to die. When they don't work properly, cells can grow out of control, which can lead to cancer. The primary role of *NBN* is coordinating a response to damaged DNA so it can be repaired. *NBN* works together with other genes, specifically *MRE11A*, *RAD50*, and *ATM*.

Like most genes, each person has two copies of the *NBN* gene: one inherited from each parent. A mutation in a single *NBN* gene inherited from either parent is known to increase risk of breast and prostate cancer over a lifetime.

In very rare cases, a person can inherit two *NBN* mutations, one from each parent. This causes a condition called Nijmegen breakage syndrome (NBS), which is associated with increased risk for childhood cancers, as well as physical and intellectual disabilities.

How common are mutations in the *NBN* gene?

Mutations in the *NBN* gene are rare—the exact frequency is not yet known. Studies to establish the frequency of *NBN* mutations are ongoing.

How mutations in this gene impact risk

Women

If a woman has a mutation in the *NBN* gene, her chance of developing breast cancer is greater than that of the average US woman. This does not mean that she has a diagnosis of cancer or that she will definitely develop cancer in her lifetime.

Cancer by age 95	Average US woman[1]	With *NBN* mutation
Breast	12%	Elevated (20-36%)[2,3]

Elevated: Risk is increased, but further research may clarify the exact risk figure.

[1] Surveillance, Epidemiology, and End Results (SEER) Program, National Cancer Institute. 2010-2012. DevCan software (http://surveillance.cancer.gov/devcan) V 6.7.0, Accessed June 2015.
[2] Zhang G, Zeng Y, Liu Z, Wei W. Significant association between Nijmegen breakage syndrome 1 657del5 polymorphism and breast cancer risk. *Tumour Biol.* 2013 Oct;34(5):2753-7.
[3] Zhang B, Beeghly-Fadiel A, Long J, Zheng W. Genetic variants associated with breast-cancer risk: comprehensive research synopsis, meta-analysis, and epidemiological evidence. *Lancet Oncol.* 2011 May;12(5):477-88.

Men

If a man has a mutation in the *NBN* gene, his chance of developing prostate cancer is greater than that of the average US man. This does not mean that he has a diagnosis of cancer or that he will definitely develop cancer in his lifetime.

Cancer by age 95	Average US man[1]	With *NBN* mutation
Prostate	14%	Elevated[4]

Elevated: Risk is increased, but further research may clarify the exact risk figure.

Screening guidelines

Below is a summary of screening guidelines from the NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) established by experts at the National Comprehensive Cancer Network (NCCN).[5] They are for individuals with a mutation in the *NBN* gene. If you have a mutation in this gene, your healthcare provider may use these NCCN Guidelines® to help create a customized screening plan for you.

Women

Breast cancer[6]

- **Starting at age 40:** Your provider may discuss mammogram and breast MRI with contrast every year.

Men

Prostate cancer

- Currently, there are no prostate cancer screening guidelines from the National Comprehensive Cancer Network (NCCN) specific to *NBN* mutation carriers. Your provider may discuss earlier or more frequent screening or referral to a specialist.

[4] Cybulski C, Górski B, Debniak T, et al. NBS1 is a prostate cancer susceptibility gene. *Cancer Res.* 2004 Feb 15;64(4):1215-9.
[5] Referenced with permission from the NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Genetic/Familial High-Risk Assessment: Breast and Ovarian V.1.2017. © National Comprehensive Cancer Network, Inc 2016. All rights reserved. Accessed September 27, 2016. To view the most recent and complete version of the guideline, go online to NCCN.org. NATIONAL COMPREHENSIVE CANCER NETWORK®, NCCN®, NCCN GUIDELINES®, and all other NCCN Content are trademarks owned by the National Comprehensive Cancer Network, Inc.
[6] National Comprehensive Cancer Network. Genetic/Familial High-Risk Assessment: Breast and Ovarian. *NCCN Guidelines Version 1.2017.* Available at www.nccn.org. Published September 2016. National Comprehensive Cancer Network. Breast Cancer Screening and Diagnosis. NCCN Guidelines Version 1.20162015. Available at www.nccn.org. Published July 20162015.

Useful resources

FORCE
Providing support, education, research, and resources for survivors and people at increased risk of cancer due to an inherited mutation or family history of cancer.
www.facingourrisk.org

Kintalk
An educational and family communication site for individuals and their families with hereditary cancer conditions.
www.kintalk.org

Susan G. Komen
Dedicated to reducing deaths from breast cancer by funding breast cancer research, ensuring access to care through community programs worldwide and supporting public health policies that help people facing breast cancer.
www.komen.org/

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