

## Noonan Syndrome and Related Conditions Gene Panel, Varies

**Test ID:** NSRGG

### Useful for:

- Providing a genetic evaluation for patients with a personal or family history suggestive of Noonan syndrome, Noonan syndrome with multiple lentigines, Noonan syndrome with loose anagen hair, cardiofaciocutaneous syndrome, Costello syndrome, Baraitser-Winter syndrome, Legius syndrome, and related conditions
- Establishing a diagnosis of Noonan syndrome, Noonan syndrome with multiple lentigines, Noonan syndrome with loose anagen hair, cardiofaciocutaneous syndrome, Costello syndrome, Baraitser-Winter syndrome, Legius syndrome, and related conditions

### Genetics Information:

- This test utilizes next-generation sequencing to detect single nucleotide and copy number variants in 20 genes associated with Noonan syndrome and related conditions: *ACTB*, *ACTG1*, *BRAF*, *CBL*, *HRAS*, *KRAS*, *LZTR1*, *MAP2K1*, *MAP2K2*, *MRAS*, *NRAS*, *PPP1CB*, *PTPN11*, *RAF1*, *RIT1*, *RRAS2*, *SHOC2*, *SOS1*, *SOS2*, and *SPRED1*. See Method Description for additional details.
- Identification of a disease-causing variant may assist with diagnosis, prognosis, clinical management, familial screening, and genetic counseling for Noonan syndrome, Noonan syndrome with multiple lentigines, Noonan syndrome with loose anagen hair, cardiofaciocutaneous syndrome, Costello syndrome, Baraitser-Winter syndrome, Legius syndrome, and related conditions

### Reflex Tests:

Test ID	Reporting Name	Available Separately	Always Performed
CULFB	Fibroblast Culture for Genetic Test	Yes	No
CULAF	Amniotic Fluid/Culture/Genetic Test	Yes	No
MATCC	Maternal Cell Contamination, B	Yes	No

### Testing Algorithm:

#### For prenatal specimens only:

- If amniotic fluid (nonconfluent cultured cells) is received, amniotic fluid culture/genetic test will be added at an additional charge.
- If chorionic villus specimen (nonconfluent cultured cells) is received, fibroblast culture for genetic test will be added at an additional charge.
- For any prenatal specimen that is received, maternal cell contamination testing will be performed at an additional charge.

## Methods:

Sequence Capture and Targeted Next-Generation Sequencing followed by Polymerase Chain Reaction (PCR) and Sanger Sequencing

## Reference Values:

An interpretive report will be provided.

## Specimen Requirements:

**Patient Preparation:** A previous bone marrow transplant from an allogenic donor will interfere with testing. Call 800-533-1710 for instructions for testing patients who have received a bone marrow transplant.

### Submit only 1 of the following specimens:

<b>Specimen Type:</b>	<b>Whole blood</b>
<b>Preferred:</b>	Lavender top (EDTA) or yellow top (ACD)
<b>Acceptable:</b>	Any anticoagulant
<b>Specimen Volume:</b>	3 mL
<b>Collection Instructions:</b>	1. Invert several times to mix blood 2. Send whole blood specimen in original tube. <b>Do not aliquot.</b>
<b>Specimen Stability Information:</b>	Ambient (preferred)/Refrigerated
<b>Minimum Volume:</b>	1 mL

**Due to the complexity of prenatal testing, consultation with the laboratory is required for all prenatal testing.** Prenatal specimens can be sent Monday through Thursday and must be received by 5 p.m. Central time on Friday in order to be processed appropriately.

<b>Specimen Type:</b>	<b>Amniotic fluid</b>
<b>Container/Tube:</b>	Amniotic fluid container
<b>Specimen Volume:</b>	20 mL
<b>Specimen Stability Information:</b>	Refrigerated (preferred)/Ambient
<b>Additional Information:</b>	1. If amniotic fluid or nonconfluent cultures are received, CULAF / Culture for Genetic Testing, Amniotic Fluid will be added and charged separately. For any prenatal specimen that is received, maternal cell contamination studies will be added and charged separately. 2. <b>All prenatal specimens must be accompanied by a maternal blood specimen;</b> order MATCC / Maternal Cell Contamination, Molecular Analysis, Varies on the maternal specimen.

<b>Specimen Type:</b>	<b>Chorionic villi</b>
<b>Container/Tube:</b>	15-mL tube containing 15 mL of transport media

**Specimen Volume:** 20 mg

**Specimen Stability Information:** Refrigerated

**Additional Information:**

1. If nonconfluent cultures are received, CULFB / Fibroblast Culture for Biochemical or Molecular Testing will be added and charged separately. For any prenatal specimen that is received, maternal cell contamination studies will be added and charged separately.
2. **All prenatal specimens must be accompanied by a maternal blood specimen;** order MATCC / Maternal Cell Contamination, Molecular Analysis, Varies on the maternal specimen.

**Specimen Type:** **Confluent cultured cells**

**Container/Tube:** T-25 flask

**Specimen Volume:** 2 Flasks

**Collection Instructions:** Submit confluent cultured cells from another laboratory.

**Specimen Stability Information:** Ambient (preferred)/Refrigerated

**Additional Information:**

1. For any prenatal specimen that is received, maternal cell contamination studies will be added and charged separately.
2. **All prenatal specimens must be accompanied by a maternal blood specimen;** order MATCC / Maternal Cell Contamination, Molecular Analysis, Varies on the maternal specimen

**Note:**  
Specimen preferred to arrive within 96 hours of collection.

**Specimen Stability Information:**

Specimen Type	Temperature	Time	Special Container
Varies	Varies		

**Ordering Guidance:**

- Customization of this panel and single gene analysis for any gene present on this panel are available. For more information see CGPH/ Custom Gene Panel, Hereditary, Next-Generation Sequencing, Varies.
- Targeted testing for familial variants (also called site-specific or known mutations testing) is available for the genes on this panel. See FMTT / Familial Mutation, Targeted Testing, Varies. To obtain more information about this testing option, call 800-533-1710.

**Additional Testing Requirements:**  
**All prenatal specimens must be accompanied by a maternal blood specimen;** order MATCC / Maternal Cell Contamination, Molecular Analysis, Varies on the maternal specimen as **this must be a different order number than the prenatal specimen.**

**Cautions:****Clinical Correlations:**

- Test results should be interpreted in the context of clinical findings, family history, and other laboratory data. Misinterpretation of results may occur if the information provided is inaccurate or incomplete.
- If testing was performed because of a clinically significant family history, it is often useful to first test an affected family member. Detection of a reportable variant in an affected family member would allow for more informative testing of at-risk individuals.
- To discuss the availability of additional testing options or for assistance in the interpretation of these results, contact the Mayo Clinic Laboratories genetic counselors at 800-533-1710.

**Technical Limitations:**

- Next-generation sequencing may not detect all types of genomic variants. In rare cases, false-negative or false-positive results may occur. The depth of coverage may be variable for some target regions; assay performance below the minimum acceptable criteria or for failed regions will be noted. Given these limitations, negative results do not rule out the diagnosis of a genetic disorder. If a specific clinical disorder is suspected, evaluation by alternative methods can be considered.
- There may be regions of genes that cannot be effectively evaluated by sequencing or deletion and duplication analysis as a result of technical limitations of the assay, including regions of homology, high guanine-cytosine (GC) content, and repetitive sequences. Confirmation of select reportable variants will be performed by alternate methodologies based on internal laboratory criteria.
- This test is validated to detect 95% of deletions up to 75 base pairs (bp) and insertions up to 47 bp. Deletions-insertions (delins) of 40 or more bp, including mobile element insertions, may be less reliably detected than smaller delins.

**Deletion/Duplication Analysis:**

- This analysis targets single and multi-exon deletions/duplications; however, in some instances single exon resolution cannot be achieved due to isolated reduction in sequence coverage or inherent genomic complexity. Balanced structural rearrangements (such as translocations and inversions) may not be detected.
- This test is not designed to detect low levels of mosaicism or to differentiate between somatic and germline variants. If there is a possibility that any detected variant is somatic, additional testing may be necessary to clarify the significance of results.
- Genes may be added or removed based on updated clinical relevance. For detailed information regarding gene specific performance and technical limitations, see Method Description or contact a laboratory genetic counselor.
- If the patient has had an allogeneic hematopoietic stem cell transplant or a recent blood transfusion, results may be inaccurate due to the presence of donor DNA. Call Mayo Clinic Laboratories for instructions for testing patients who have received a bone marrow transplant.

**Reclassification of Variants:**

- At this time, it is not standard practice for the laboratory to systematically review previously classified variants on a regular basis. The laboratory encourages healthcare providers to contact the laboratory at any time to learn how the classification of a particular variant may have changed over time.

**Variant Evaluation:**

- Evaluation and categorization of variants are performed using published American College of Medical Genetics and Genomics and the Association for Molecular Pathology recommendations as a guideline.<sup>(1)</sup> Other gene-specific guidelines may also be considered. Variants are classified based on known, predicted, or possible pathogenicity and reported with interpretive comments detailing their potential or known significance. Variants classified as benign or likely benign are not reported.
- Multiple in silico evaluation tools may be used to assist in the interpretation of these results. The accuracy of predictions made by in silico evaluation tools is highly dependent upon the data available for a given gene, and periodic updates to these tools may cause predictions to change over time. Results from in silico evaluation tools should be interpreted with caution and professional clinical judgment.
- Rarely, incidental or secondary findings may implicate another predisposition or presence of active disease. Incidental findings may include, but are not limited to, results related to the sex chromosomes. These findings will be carefully reviewed to determine whether they will be reported.

**CPT Code:**

81442

88233-Tissue culture, skin, solid tissue biopsy (if appropriate)

88240-Cryopreservation (if appropriate)

88235-Amniotic fluid culture (if appropriate)

81265-Maternal cell contamination (if appropriate)

**Day(s) Performed:** Varies

**Report Available:** 28 to 42 days

**Questions**

Contact Michelle Rath, Laboratory Resource Coordinator at 800-533-1710.