Nottingham Prognostic Index

The **Nottingham prognostic index** (NPI) is used to determine prognosis following surgery for [breast cancer](https://en.wikipedia.org/wiki/Breast_cancer).[[1]](https://en.wikipedia.org/wiki/Nottingham_Prognostic_Index#cite_note-:1-1)[[2]](https://en.wikipedia.org/wiki/Nottingham_Prognostic_Index#cite_note-2) Its value is calculated using three [pathological](https://en.wikipedia.org/wiki/Pathological) criteria: the size of the [tumour](https://en.wikipedia.org/wiki/Tumour" \o "Tumour); the number of involved [lymph nodes](https://en.wikipedia.org/wiki/Lymph_node); and the [grade](https://en.wikipedia.org/wiki/Grading_(tumors)) of the [tumour](https://en.wikipedia.org/wiki/Tumour" \o "Tumour).[[1]](https://en.wikipedia.org/wiki/Nottingham_Prognostic_Index#cite_note-:1-1) It is calculated to select patients for adjuvant treatment.

Calculation[[edit](https://en.wikipedia.org/w/index.php?title=Nottingham_Prognostic_Index&action=edit&section=1)]

The index is calculated using the formula:[[3]](https://en.wikipedia.org/wiki/Nottingham_Prognostic_Index#cite_note-:0-3)

NPI = [0.2 x S] + N + G

Where:

* S is the size of the index lesion in centimetres[[3]](https://en.wikipedia.org/wiki/Nottingham_Prognostic_Index" \l "cite_note-:0-3)
* N is the node status: 0 nodes = 1, 1-3 nodes = 2, >3 nodes = 3[[3]](https://en.wikipedia.org/wiki/Nottingham_Prognostic_Index#cite_note-:0-3)
* G is the grade of tumour: Grade I =1, Grade II =2, Grade III =3[[3]](https://en.wikipedia.org/wiki/Nottingham_Prognostic_Index#cite_note-:0-3)

Interpretation[[edit](https://en.wikipedia.org/w/index.php?title=Nottingham_Prognostic_Index&action=edit&section=2)]

|  |  |
| --- | --- |
| **Score** | **5-year survival**[[4]](https://en.wikipedia.org/wiki/Nottingham_Prognostic_Index#cite_note-4) |
| >/=2.0 to </=2.4 | 93% |
| >2.4 to </=3.4 | 85% |
| >3.4 to </=5.4 | 70% |
| >5.4 | 50% |

#### Primary tumour (T)

* **TX**: primary tumour cannot be assessed
* **T0**: no evidence of primary tumour
* **Tis (DCIS)**: [ductal carcinoma in situ](https://radiopaedia.org/articles/ductal-carcinoma-in-situ?lang=gb)
* **Tis (Paget)**: [Paget disease of the nipple](https://radiopaedia.org/articles/paget-disease-breast?lang=gb) not associated with invasive carcinoma or ductal carcinoma in situ
* **T1**: ≤20 mm in greatest dimension
  + **T1mi**: ≤​1 mm
  + **T1a**: >1 mm but ≤​5 mm
  + **T1b**: >5 mm but ≤​10 mm
  + **T1c**: >10 mm but ≤​20 mm
* **T2**: >20 mm but ≤50 mm in greatest dimension
* **T3**: >50 mm in greatest dimension
* **T4**: any size with direct extension to chest wall and/or skin (but not invasion of dermis alone)
  + **T4a**: chest wall extension (but not invasion of pectoralis muscle alone)
  + **T4b**: skin oedema (including peau d'orange), ipsilateral macroscopic satellite nodules, and/or ulceration
  + **T4c**: both T4a and T4b
  + **T4d**: [inflammatory carcinoma](https://radiopaedia.org/articles/inflammatory-carcinoma-of-the-breast?lang=gb)

#### Regional lymph node (N)

##### Clinical (cN)

* **cNX**: regional nodes cannot be assessed (e.g., previously removed)
* **cN0**: no evidence of nodal metastasis (by imaging or clinical examination)
* **cN1**: metastasis to mobile ipsilateral level I/II [axillary lymph nodes](https://radiopaedia.org/articles/axillary-lymph-nodes-1?lang=gb)
  + **cN1mi**: micrometastases (larger than 0.2 mm but none larger than 2.0 mm)
* **cN2**: metastasis to fixed/matted ipsilateral level I/II axillary lymph nodes or to ipsilateral [internal mammary artery lymph nodes](https://radiopaedia.org/articles/intramammary-lymph-nodes?lang=gb) alone
  + **cN2a**: metastasis to fixed/matted ipsilateral level I/II axillary lymph nodes
  + **cN2b**: metastasis to ipsilateral internal mammary lymph nodes alone without axillary lymph node metastases
* **cN3**: metastasis to ipsilateral infraclavicular (level III axillary) lymph nodes or to ipsilateral internal mammary lymph nodes and level I/II axillary lymph nodes or to ipsilateral supraclavicular lymph nodes
  + **cN3a**: metastasis to ipsilateral infraclavicular (level III axillary) lymph nodes
  + **cN3b**: metastasis to ipsilateral internal mammary lymph nodes and level I/II axillary lymph nodes
  + **cN3c**: metastasis to ipsilateral supraclavicular lymph nodes

##### Pathologic (pN)

* **pNX**: regional nodes cannot be assessed (e.g. not removed or previously removed)
* **pN0**: no evidence of nodal metastasis or isolated tumour cells only
  + **pN0(i+)**: isolated tumour cells only (malignant cell clusters no larger than 0.2 mm)
  + **pN0(mol+)**: positive molecular findings by reverse transcriptase polymerase chain reaction (RT-PCR) but no isolated tumour cells detected
* **pN1**: micrometastases, metastasis to 1-3 [axillary lymph nodes](https://radiopaedia.org/articles/axillary-nodes), or clinically negative internal mammary nodes with metastases by sentinel lymph node biopsy
  + **pN1mi**: micrometastases (larger than 0.2 mm but none larger than 2.0 mm)
  + **pN1a**: metastases in 1-3 axillary lymph nodes, with at least one metastasis larger than 2.0 mm
  + **pN1b**: metastases, excluding isolated tumour cells, in ipsilateral internal mammary sentinel nodes
  + **pN1c**: both pN1a and pN1b
* **pN2**: metastasis in 4-9 axillary lymph nodes, or clinically positive internal mammary nodes with absence of axillary lymph node metastases
  + **pN2a**: metastasis in 4-9 axillary lymph nodes, with at least one metastasis larger than 2.0 mm
  + **pN2b**: metastasis to ipsilateral internal mammary lymph nodes by imaging with or without microscopic confirmation, with pathologically negative axillary lymph nodes
* **pN3**: metastasis to 10 or more axillary lymph nodes; infraclavicular (level III axillary) lymph nodes; clinically positive ipsilateral internal mammary lymph nodes in presence of positive level I/II lymph nodes; more than 3 axillary lymph nodes and positive sentinel lymph node biopsy in clinically negative internal mammary lymph nodes; or in supraclavicular lymph nodes
  + **pN3a**: metastasis to 10 or more axillary lymph nodes, with at least one metastasis larger than 2.0 mm or metastasis to infraclavicular (level III axillary) lymph nodes
  + **pN3b**: pN1a or pN2a in the presence of cN2b (positive internal mammary lymph nodes by imaging) or pN2a in the presence of pN1b
  + **pN3c**: metastasis to ipsilateral supraclavicular lymph nodes

#### Distant metastases (M)

* **M0**: no clinical or radiographic evidence of distant metastases
  + cM0(i+): no clinical or radiographic evidence of distant metastases but positive tumour cells or <0.2 mm depositions detected microscopically or by molecular techniques in circulating blood, bone marrow, or other nonregional nodal tissue in a patient without signs or symptoms of metastasis
* **cM1**: distant metastases present by clinical or radiographic detection
* **pM1**: histologically proven metastasis in distant organs or deposits >0.2 mm in nonregional lymph nodes

NB: The MX category is no longer used, it was removed in the 6th edition of the TNM system, if presence of metastases is not known the cancer is assigned M0 5.

#### Stage groups

##### AJCC Anatomic Stage Groups

Anatomic stage groups are used alone only if biomarker tests are not available:

* **stage 0**
  + Tis, N0, M0
* **stage IA**
  + T1, N0, M0
* **stage IB**
  + **​**[T0, T1], N1mi, M0
* **stage IIA**
  + [T0, T1], N1, M0
  + T2, N0, M0
* **stage IIB**
  + T2, N1, M0
  + T3, N0, M0
* **stage IIIA**
  + [T0, T1, T2], N2, M0
  + T3, [N1, N2], M0
* **stage IIIB**
  + T4, [N0, N1, N2], M0
* **stage IIIC**
  + [Any T], N3, M0
* **stage IV**
  + [Any T], [Any N], M1

##### Clinical prognostic stage

Clinical prognostic stage applies to all patients who have the requisite information, which includes histologic grade for invasive cancers (Nottingham modification of the Scarff-Bloom-Richardson system) and expression status of the human epidermal growth factor receptor 2 (HER2/neu), oestrogen receptor (ER), and progesterone receptor (PR):

* **stage 0**
  + anatomic stage 0
    - any grade, any HER2/ER/PR status
* **stage IA**
  + anatomic stage IA or IB
    - G1 or G2
      * HER2+, ER±, PR±
      * HER2-, ER+, PR±
      * HER2-, ER-, PR+
    - G3
      * HER2+, ER±, PR±
      * HER2-, ER+, PR+
* **stage IB**
  + anatomic stage IA or IB
    - G1, G2, or G3
      * HER2-, ER-, PR-
    - G3
      * HER2-, ER+, PR-
      * HER2-, ER-, PR+
  + anatomic stage IIA
    - G1 or G2
      * HER2±, ER+, PR+
    - G3
      * HER2+, ER+, PR+
  + anatomic stage IIB
    - G1, G2, or G3
      * HER2+, ER+, PR+
* **stage IIA**
  + anatomic stage IIA
    - G1
      * HER2±, ER+, PR-
      * HER2±, ER-, PR±
    - G2
      * HER2±, ER+, PR-
      * HER2+, ER-, PR+
      * HER2+, ER-, PR-
    - G3
      * HER2+, ER+, PR-
      * HER2+, ER-, PR±
      * HER2-, ER+, PR+
  + anatomic stage IIB
    - G1
      * HER2+, ER+, PR-
      * HER2+, ER-, PR+
      * HER2-, ER+, PR+
    - G2
      * HER2+, ER+, PR-
      * HER2+, ER-, PR+
      * HER2-, ER+, PR+
  + anatomic stage IIIA
    - G1 or G2
      * HER2±, ER+, PR+
* **stage IIB**
  + anatomic stage IIA
    - G2
      * HER2-, ER-, PR-
    - G3
      * HER2-, ER+, PR-
      * HER2-, ER-, PR±
  + anatomic stage IIB
    - G1
      * HER2+, ER-, PR-
      * HER2-, ER+, PR-
      * HER2-, ER-, PR±
    - G2
      * HER2+, ER-, PR-
      * HER2-, ER+, PR-
      * HER2-, ER-, PR+
    - G3
      * HER2+, ER+, PR-
      * HER2+, ER-, PR±
      * HER2-, ER+, PR+
  + anatomic stage IIIA
    - G3
      * HER2+, ER+, PR+
* **stage IIIA**
  + anatomic stage IIB
    - G3
      * HER2-, ER+, PR-
      * HER2-, ER-, PR+
  + anatomic stage IIIA
    - G1 or G2
      * HER2±, ER+, PR-
      * HER2±, ER-, PR+
      * HER2+, ER-, PR-
    - G3
      * HER2+, ER+, PR-
      * HER2+, ER-, PR±
      * HER2-, ER+, PR+
  + anatomic stage IIIB or IIIC
    - G1 or G2
      * HER2+, ER+, PR+
* **stage IIIB**
  + anatomic stage IIB
    - G2 or G3
      * HER2-, ER-, PR-
  + anatomic stage IIIA
    - G1 or G2
      * HER2-, ER-, PR-
    - G3
      * HER2-, ER+, PR-
      * HER2-, ER-, PR+
  + anatomic stage IIIB or IIIC
    - G1 or G2
      * HER2+, ER+, PR-
      * HER2+, ER-, PR±
      * HER2-, ER+, PR±
      * HER2-, ER-, PR+
    - G3
      * HER2+, ER±, PR±
      * HER2-, ER+, PR+
* **stage IIIC**
  + anatomic stage IIIA
    - G3
      * HER2-, ER-, PR-
  + anatomic stage IIIB or IIIC
    - G1 or G2
      * HER2-, ER-, PR-
    - G3
      * HER2-, ER+, PR-
      * HER2, ER-, PR±
* **stage IV**
  + anatomic stage IV
    - any grade, any HER2/ER/PR status

##### Pathological prognostic stage

Pathological prognostic stage applies to patients who are treated initially with surgery but not with neoadjuvant therapy.

* **stage 0**
  + anatomic stage 0
    - any grade, any HER2/ER/PR status
* **stage IA**
  + anatomic stage IA or IB
    - G1
      * any HER2/ER/PR status
    - G2 or G3
      * any HER2/ER/PR status except HER2-, ER-, PR-
  + anatomic stage IIA
    - G1 or G2
      * HER2±, ER+, PR+
    - G3
      * HER2+, ER+, PR+
  + anatomic stage IIB
    - G1
      * HER2±, ER+, PR+
  + [T1 or T2], N0, M0
    - any grade, HER2-, ER+, PR±, OnctoypeDx genomic profile score less than 11
* **stage IB**
  + **​**anatomic stage IA or IB
    - G2 or G3
      * HER2-, ER-, PR-
  + anatomic stage IIA
    - G1
      * HER2±, ER+, PR-
      * HER2±, ER-, PR+
    - G2
      * HER2+, ER+, PR-
      * HER2+, ER-, PR+
    - G3
      * HER2-, ER+, PR+
  + anatomic stage IIB
    - G2
      * HER2±, ER+, PR+
    - G3
      * HER2+, ER+, PR+
  + anatomic stage IIIA
    - G1 or G2
      * HER2±, ER+, PR+
* **stage IIA**
  + **​**anatomic stage IIA
    - G1
      * HER2±, ER-, PR-
    - G2
      * HER2±, ER-, PR-
      * HER2-, ER+, PR-
      * HER2-, ER-, PR+
    - G3
      * HER2±, ER+, PR-
      * HER2±, ER-, PR±
  + anatomic stage IIB or IIIA
    - G3
      * HER2-, ER+, PR+
* **stage IIB**
  + **​​**anatomic stage IIB
    - G1 or G2
      * HER2±, ER+, PR-
      * HER2±, ER-, PR±
    - G3
      * HER2+, ER+, PR-
      * HER2±, ER-, PR+
      * HER2-, ER+, PR-
  + anatomic stage IIIA
    - G3
      * HER2-, ER+, PR+
* **stage IIIA**
  + **​**anatomic stage IIB
    - G3
      * HER2-, ER-, PR-
  + anatomic stage IIIA
    - G1
      * HER2±, ER+, PR-
      * HER2±, ER-, PR±
    - G2
      * HER2±, ER+, PR-
      * HER2±, ER-, PR+
      * HER2+, ER-, PR-
    - G3
      * HER2±, ER+, PR-
      * HER2±, ER-, PR+
      * HER2+, ER-, PR-
  + anatomic stage IIIB or IIIC
    - G1 or G2
      * HER2±, ER+, PR+
* **stage IIIB**
  + **​**anatomic stage IIIA
    - G2
      * HER2-, ER-, PR-
  + anatomic stage IIIB or IIIC
    - G1
      * HER2±, ER+, PR-
      * HER2±, ER-, PR±
    - G2
      * HER2±, ER+, PR-
      * HER2±, ER-, PR+
      * HER2+, ER-, PR-
    - G3
      * HER2+, ER±, PR±
      * HER2-, ER+, PR+
* **stage IIIC**
  + **​​**anatomic stage IIIA
    - G3
      * HER2-, ER-, PR-
  + anatomic stage IIIB or IIIC
    - G2
      * HER2-, ER-, PR-
    - G3
      * HER2-, ER+, PR-
      * HER2-, ER-, PR±
* **stage IV**
  + anatomic stage IV
    - any grade, any HER2/ER/PR status

#### Treatment and prognosis:

Estimated five year survival rates:

* **stage I**: ~87%
* **stage II**: ~75%
* **stage III**: ~46%
* **stage IV**: ~13%

#### See also