UNDERSTANDING YOUR PATHOLOGY RESULTS

BREAST CANCER NOW

The research & care charity

CONTENTS

ABOUT THIS BOOKLET

This booklet tells you about breast cancer pathology results and may help you think about questions to ask your treatment team.

The information given in pathology results comes from tests done on tissue removed from the body.

Breast cancer pathology results help your treatment team decide which treatments might work best for you.

On page 6 is a simple summary table of information commonly found in pathology results and what it means.

Your pathology results may include medical terms you're not familiar with. You'll also find a list of some common terms, along with their definitions, on page 24.

WHAT ARE PATHOLOGY RESULTS?

Pathology is the area of medicine that looks at how disease affects the body's cells and tissues.

If you have had a biopsy to diagnose breast cancer or you have had breast cancer surgery, the tissue removed will be looked at under a microscope by a doctor called a pathologist. Tests may also be done on the tissue to get more information.

The results give details about the breast cancer that helps determine the treatment you're offered.

Waiting for your results

Most people feel anxious waiting for their results. How long you wait depends on the type of biopsy or surgery you had and where you're being treated.

Results usually take between one and two weeks. Some tests take longer than others and may be done in a different hospital to the one where you're being treated. Occasionally pathologists get a second opinion about the results which can also delay them.

Getting your results

Your specialist or breast care nurse should be able to tell you when your results will be ready.

When you first get your results, you may find it hard to take everything in.

It can help to bring a relative or close friend with you to the appointment.

If you're told anything you do not understand, ask your specialist or breast care nurse to explain.

You can also call the Breast Cancer Now Helpline on 0808 800 6000 to help you understand the results.

PATHOLOGY REPORTS

Each time you have tissue removed, it's looked at under a microscope and a report is written by a pathologist.

A report will be written if you have:

- A biopsy – removal of a sample of tissue
- Breast-conserving surgery – removal of the cancer and an area of normal breast tissue around it, sometimes called a lumpectomy or wide local excision
- A mastectomy – removal of all the breast tissue usually including the nipple area

You can ask for a copy of your pathology report to read through with a member of your breast care team or later in your own time.

The amount of detail in each report will depend on what tissue was removed and how much. Not all reports include the same amount of information. For example, a report after a biopsy will not contain all the information that's in a report after surgery.

You may need to wait for all your reports to come back before a full treatment plan can be decided.

All the information in pathology results is considered together when deciding which treatments to offer you and their likely benefits. No one piece of information should be looked at on its own – it always needs to be related to all your other results.

What's in a pathology report?

Not all pathology reports look the same. The layout and terms used vary between hospitals. However, most follow this structure.

General information

This will include your name, date of birth and hospital number, your specialist's name and the date of your surgery or biopsy.

Clinical information

This is the information given to the pathologist about the tissue removed, such as which breast it came from and where it was in the breast.

Features of the breast tissue before it's looked at under a microscope

This section may include information about:

- The overall size, weight and appearance of the tissue
- How it was prepared to be looked at under the microscope

Features of the cancer seen under a microscope

This section of the report describes various features, which are explained in more detail in this booklet.

Summary of the main points

This will often be a list at the beginning or end of the report.

INFORMATION ABOUT YOUR BREAST CANCER

The table on these pages is a simple summary of information commonly found in pathology results.

You'll find more detailed information on the following pages.

Information	What it means
Type of breast cancer	There's more than one type of breast cancer. The type you have depends on what the cancer looks like under a microscope.
How big the cancer is	The size of the cancer is usually given in millimetres (mm).
How fast the cancer is growing	Breast cancers can grow at different speeds. Some cancers grow more quickly, others more slowly.
If all the cancer has been removed	During surgery, the cancer is removed along with an area of normal breast tissue around it. This is to try to make sure no cancer is left behind.
If the cancer has spread under the arm	Breast cancer can be found when it's only inside the breast or sometimes when it has spread from your breast to the glands under your arm. The glands under the arm are called lymph nodes.
What's helping the cancer grow	Sometimes hormones and other substances found naturally in your body can help your cancer grow. Tests will be done to find out what might be helping your breast cancer grow.
Other information about your breast cancer	Your treatment team may do other tests on the cancer. They will explain what the tests are and why they would like you to have them.

How it can affect treatment	Find out more
There are lots of ways breast cancer can be treated. You'll be offered the best treatment for you based on your type of breast cancer.	Page 8
The size may affect the type of operation you have, and whether you need other treatments as well.	Page 10
If your cancer is growing quickly, you are more likely to be offered chemotherapy.	Page 13
If it looks like not all the cancer was removed, you may need another operation to remove more of your breast.	Page 14
If the cancer has spread to the lymph nodes under the arm, you may be offered more surgery or radiotherapy to this area. Some people will be offered chemotherapy.	Page 17
Depending on the test results, you may be offered hormone therapy or targeted therapy drugs.	Page 19
The results of these tests will help your treatment team decide which treatments are best for you.	Page 21

TYPE OF BREAST CANCER

There are many different types of breast cancer. The type you have depends on what the cancer cells look like under a microscope.

Breast cancer can be invasive or non-invasive (also called 'in situ').

Most breast cancers are invasive. This means they have the potential to spread to other areas of the body. It does not mean the cancer has or will spread, just that it's a possibility.

Non-invasive breast cancers have not yet developed the ability to spread either within the breast or to another part of the body.

Often there are areas of both invasive and non-invasive breast cancer at the same time, and the report will include information about both.

Invasive breast cancer of no special type

Most breast cancers are this type.

The terms no special type (NST) or not otherwise specified (NOS) are used because when the cancer is looked at under a microscope it has no features that stand out as a particular type. You may also hear it called invasive ductal breast cancer.

For more information see our booklet **Invasive breast cancer (no special type)**.

Other types of invasive breast cancer

Other breast cancers are known as 'special' types.

When these cancer cells are looked at under a microscope, some have certain features that identify them as a particular type.

These types of breast cancer include:

- Invasive lobular
- Paget's disease of the breast
- Tubular
- Cribriform
- Mucinous
- Medullary
- Papillary
- Invasive micropapillary
- Malignant phyllodes
- Metaplastic

They are mostly treated in the same way as invasive breast cancer of no special type.

Sometimes there are areas of no special type and special type at the same time.

We have information about all the types of breast cancer listed above on our website **breastcancernow.org**

Ductal carcinoma in situ (DCIS)

This is an early type of non-invasive breast cancer. It's sometimes called pre-invasive or intraductal. For more information see our **Ductal carcinoma in situ (DCIS)** booklet.

How the type of cancer affects treatment options

The treatment your team recommends will depend on the type of breast cancer you have, along with other features of your cancer.

Our booklet **Treating primary breast cancer** has more information on this.

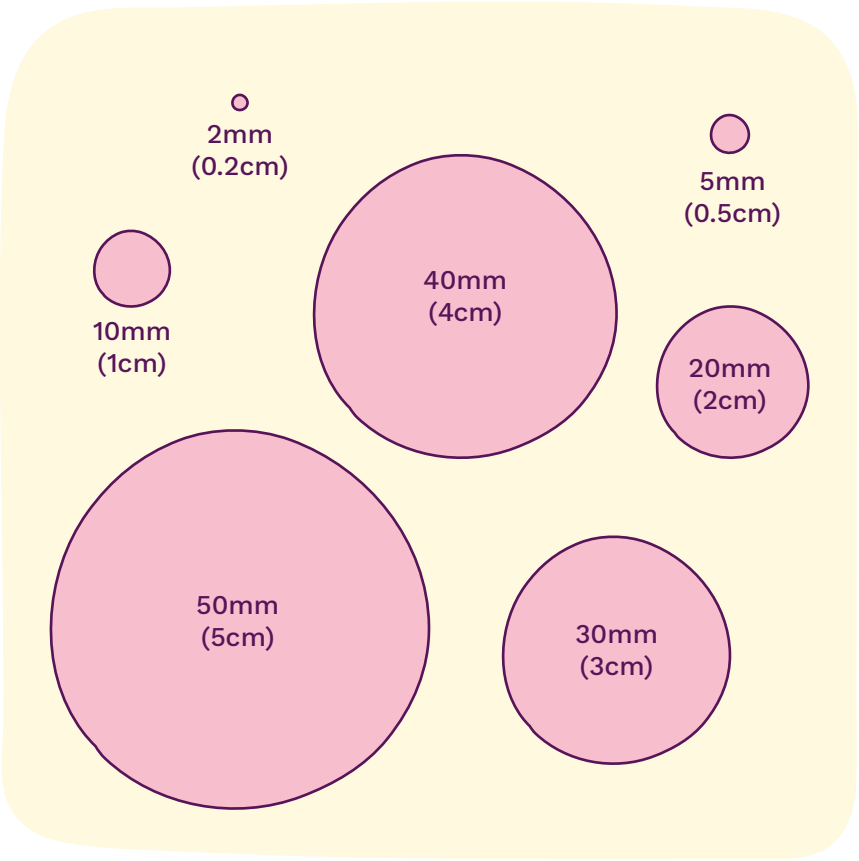
SIZE OF THE BREAST CANCER

The size of the breast cancer is measured at its widest point, usually in millimetres (mm).

One inch equals about 25mm or 2.5 centimetres (cm).

If DCIS and invasive breast cancer are found together, the results will tell you their combined size, called 'whole tumour size'. However, only details of the invasive breast cancer will be used by your treatment team to look at treatment options and your prognosis (outlook).

Size in millimeters and centimeters



While in general smaller cancers may have a better outcome, size does not always give the whole picture and is just one part of the overall results.

A small cancer can be fast growing while a larger cancer may be slow growing, or it could be the other way around.

The illustration on page 10 gives an indication of size in millimetres and centimetres

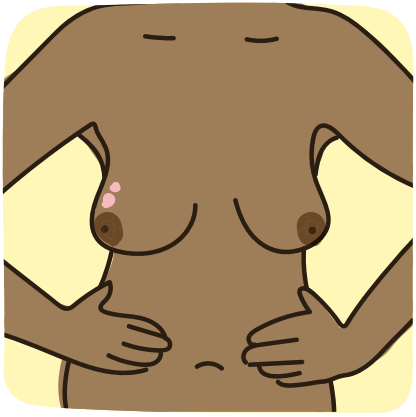
Is there more than one area of cancer?

Your pathology results usually say whether there's only one area of cancer or more than one area.

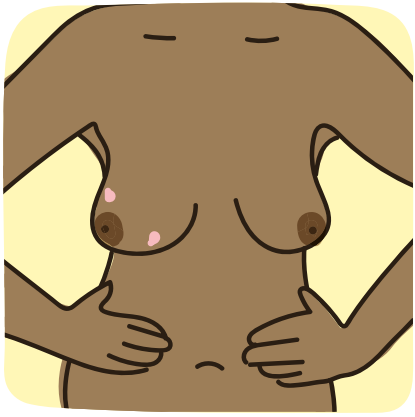
If there's more than one area of breast cancer, each area is measured.

If there's more than one area of breast cancer in the same quarter of the breast, it may be called multi-focal. If there's more than one area of breast cancer in different quarters of the breast, it may be called multi-centric.

More than one area of cancer



Multi-focal breast cancer



Multi-centric breast cancer

If you had chemotherapy or hormone therapy before surgery

Sometimes chemotherapy or hormone therapy are given before surgery, for example to shrink a larger cancer.

After surgery, the tissue is checked. Your pathology report will tell you the size of any cancer still present. On the report this is sometimes called the residual size of the cancer.

How much breast cancer remains will indicate the response to the treatment you had before surgery. This is called the pathological response:

- Complete pathological response means no remaining cancer
- Partial response means only some of the cancer remains
- No evidence of response means the cancer is the same or bigger than before the chemotherapy or hormone therapy

How size affects treatment options

The size of the cancer in relation to your breast size, as well as its position in the breast, may affect what operation you're offered.

If you have a larger cancer in relation to your breast size, your treatment team may recommend a mastectomy to remove all the breast tissue. Or they may suggest chemotherapy to try to shrink the cancer before surgery.

With smaller cancers it's often possible to have breast-conserving surgery, also called wide local excision or lumpectomy. This is where only the cancer and a margin (border) of normal breast tissue surrounding it are removed.

Your treatment team will decide whether to recommend chemotherapy depending on the size and other features of the breast cancer, and whether the lymph nodes are affected (see page 17).

Generally, people with breast cancers greater than 2cm are more likely to be offered chemotherapy. This is because larger cancers may have been there longer before being found and so may have had more chance to spread.

For more information read our **Chemotherapy for breast cancer** booklet.

GRADE OF THE BREAST CANCER

Breast cancers are given a grade according to how different the cancer cells are to normal breast cells and how quickly they are growing.

This is different to the cancer stage, which you can read more about on our website.

Invasive breast cancer

There are three grades of invasive breast cancer:

- Grade 1 – looks most like normal breast cells and is usually slow growing
- Grade 2 – looks less like normal cells and is growing faster
- Grade 3 – looks different to normal breast cells and is usually fast growing

Sometimes the grade given to a cancer after a biopsy can change after surgery. This is because after surgery there's more tissue for the pathologist to look at, which can give them more detailed information about the cancer.

How grade affects treatment options

People with grade 3 breast cancers are more likely to be offered chemotherapy. This is to help destroy any cancer cells that may have spread as a result of the cancer being faster growing.

For more information see our **Chemotherapy for breast cancer** booklet.

Ductal carcinoma in situ (DCIS)

There are three grades of DCIS, usually called low, intermediate and high.

For more information, see our booklet **Ductal carcinoma in situ (DCIS)**.

Ki67

Ki67 is a protein found in cells. The higher the levels, the faster the cells are dividing and growing.

Ki67 is not always included in pathology results. If it is, the report will say what percentage of the breast cancer cells test positive for Ki67. Usually, less than 10% is considered low, 10–20% is medium and more than 20% is high.

The higher the score, the faster the cells are dividing and growing.

Has the breast cancer been completely removed?

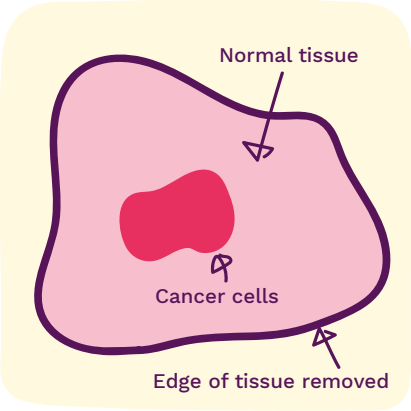
During surgery, it's important that the cancer is removed with an area of normal tissue around it. This is done to try to ensure no cancer cells have been left behind.

Your pathology results will say how close the cancer cells are to the edges of the area of tissue that was removed.

This is called the surgical margin:

- Negative or clear margins mean no cancer cells were seen at the outer edge of the tissue removed
- Positive margins mean the cancer cells are very close to, or reach, the edge of the tissue

Surgical margins



Negative margins **Positive margins**

Your pathology report will give the distance of the cancer to the margins around it (the front and back, top, bottom and sides).

Words you may see in your report include superior (top), inferior (bottom), medial (towards the middle), lateral (towards the edge), superficial/anterior (front) and posterior/deep (back).

Different hospitals will have their own guidelines as to how large the margin of clear, normal tissue should be. It's usually a minimum of 1mm around an invasive cancer.

How margins affect treatment options

If you have negative or clear margins, you are unlikely to need more surgery to the breast.

If you have positive or close margins, you may need to have another operation to take out more tissue. This may involve more breast-conserving surgery, but sometimes means having a mastectomy to ensure all the cancer has been removed.

ARE THERE CANCER CELLS IN THE LYMPH OR BLOOD VESSELS?

The breast contains blood vessels and other tiny tubes called lymph vessels.

If breast cancer cells spread into these vessels, it's called lymphovascular invasion. This increases the chances of the breast cancer spreading to somewhere else in the body.

The pathology results will say if any lymphovascular invasion has been seen in the tissue removed during surgery.

Having lymphovascular invasion is different from having breast cancer in the lymph nodes (see page 17).

How cancer in the lymph or blood vessels affects treatment options

People with lymphovascular invasion may be offered treatments such as chemotherapy or radiotherapy.

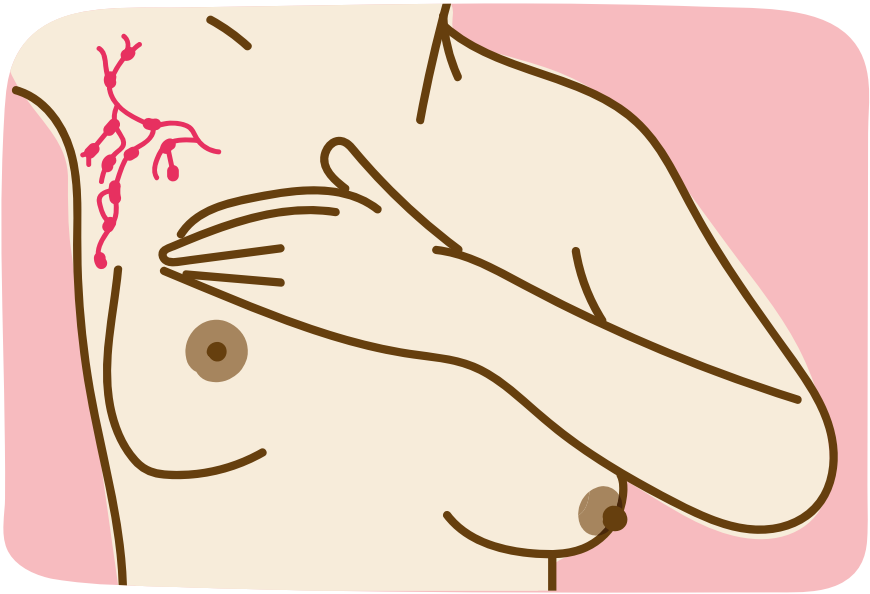
For more information about chemotherapy or radiotherapy see our booklets **Chemotherapy for breast cancer** and **Radiotherapy for primary breast cancer**.

ARE THERE BREAST CANCER CELLS IN THE LYMPH NODES?

If you have invasive breast cancer, your treatment team will usually want to check if any of the lymph nodes under the arm contain cancer cells.

The number of nodes we have here varies from person to person.

Lymph nodes under the arm



You may have one or a few lymph nodes removed for testing. This is called a sentinel lymph node biopsy and is usually done at the same time as your cancer surgery, although it may be done as an operation before your breast surgery.

Some people will have all the lymph nodes removed. This is known as a lymph node clearance or axillary node clearance (the axilla is the armpit).

The pathology results will say how many lymph nodes were removed during surgery and how many contain breast cancer cells. For example, 2/10 means 2 out of the 10 lymph nodes removed had cancer cells inside them.

Negative or positive lymph nodes

Negative lymph nodes mean the nodes tested do not contain cancer cells or contain very few cancer cells (known as isolated tumour cell clusters or ITCs).

Positive lymph nodes mean there are cancer cells in the nodes.

Generally, the more positive lymph nodes there are, the more likely the cancer may have or could spread somewhere else in the body.

If cancer cells are found in the tissue surrounding the lymph nodes, it is called extra-capsular or extranodal spread.

If there's only a very tiny area of breast cancer (0.2mm–2mm) in the lymph nodes, this is called micrometastasis.

If you had chemotherapy or hormone therapy before surgery, the results will tell you if there's any evidence of cancer in the lymph nodes and, if so, if there are signs it has responded to the treatment.

How cancer cells in the lymph nodes affect treatment options

If cancer cells were seen in the nodes removed during a sentinel lymph node biopsy, you may be offered more treatment to the underarm. This may involve surgery to remove more lymph nodes or radiotherapy to the underarm.

Whether you are offered further treatment will depend on how many lymph nodes are affected, how much they are affected and what other treatment you are having.

For more information about radiotherapy see our **Radiotherapy for primary breast cancer** booklet.

Generally, people with lymph node positive breast cancer are more likely to be offered chemotherapy to help destroy any remaining cells, either in the nodes or elsewhere in the body.

For more information read our **Chemotherapy for breast cancer** booklet.

If you have micrometastases or isolated tumour cell clusters in your lymph nodes, you're unlikely to need any further treatment to the underarm.

ARE HORMONES HELPING THE CANCER TO GROW?

Some breast cancers use oestrogen in the body to help them to grow. These are known as oestrogen receptor positive or ER+ breast cancers.

Invasive breast cancers are tested to see if they are ER+ using tissue from a biopsy or after surgery.

Tests will also be done to see if your breast cancer is stimulated by another hormone called progesterone. If it is, it's called progesterone receptor positive or PR+.

If breast cancer doesn't have oestrogen receptors, it's called oestrogen receptor negative or ER-. If it doesn't have progesterone receptors, it's called progesterone receptor negative or PR-.

Pathology results often give a score to show the amount of hormone receptors on the cancer cell and the proportion of cancer cells with receptors.

The most likely scores you'll see in the results are the Quick or Allred score (between 0 and 8) or the H score (between 0 and 300). For both of these, the higher the scores, the more ER+ or PR+ the breast cancer is.

The percentage of cells with hormone receptors is often given (from 0% to 100%). A score of more than 1% is considered hormone receptor positive.

How hormone receptors affect treatment options

A number of hormone therapies work in different ways to block the effect of oestrogen on cancer cells.

If your cancer is ER+, your specialist will discuss with you which hormone therapy they recommend.

The benefits of hormone therapy are less clear for people whose breast cancer is only progesterone receptor positive (PR+ and ER-). Very few breast cancers fall into this category, but if this is the case your specialist will discuss with you whether hormone therapy is appropriate.

For more information see our **Treating primary breast cancer** booklet and our booklets on individual hormone therapy drugs.

If your breast cancer is hormone receptor negative, hormone therapy will not be of any benefit to you.

HER2 LEVELS

Some breast cancer cells have a higher than normal level of a protein called HER2 on their surface, which helps them to grow. This is known as HER2 positive breast cancer.

Less than one in five invasive breast cancers are HER2 positive.

Generally, HER2 positive breast cancers are more likely to grow and spread faster than most types of HER2 negative breast cancers.

All invasive breast cancers are tested for HER2 levels. The results can sometimes take longer than the rest of the pathology results but are usually available between one and three weeks after your biopsy or surgery.

There are various tests to measure HER2 levels.

A test called IHC is usually done first. The results are reported as a score ranging from 0 to 3+:

- 0 or 1+ means HER2 negative
- 2+ is borderline
- 3+ means HER2 positive

Breast cancers with a borderline result (2+) are retested using a more specialised test. These include tests called FISH, CISH or DDISH. These tests usually give a result of HER2 positive or negative.

How HER2 levels affect treatment options

If your breast cancer is HER2 positive you will usually be advised to have chemotherapy and a targeted (biological) therapy such as trastuzumab or pertuzumab. Targeted therapies block the growth and spread of cancer.

If your cancer is HER2 negative, targeted therapies will not be of any benefit to you.

For more information see our **Trastuzumab** and **Pertuzumab** booklets.

GENOMIC ASSAYS (ALSO CALLED GENE EXPRESSION PROFILING OR GENE ASSAYS)

Genomic assays are tests which look at groups of genes found in breast cancer.

They help identify who is most likely to benefit from chemotherapy in addition to hormone therapy, and how likely the cancer is to return (recurrence).

Your team will use the test, along with other information about the breast cancer, to help decide what treatment to recommend.

Usually the tests are carried out on breast tissue removed during surgery and do not involve having any more tissue removed.

If your specialist has recommended you have hormone therapy before surgery, the test must be done on cancer tissue removed during a biopsy before you start hormone therapy.

The tests are usually done in a laboratory away from your hospital and the results are given separately from your pathology report.

Genomic assays are not suitable for everyone. They are usually considered if the breast cancer is invasive, oestrogen receptor positive (see page 19), HER2 negative (see page 20) and lymph node negative (see page 17). They may also be considered for people with no more than three positive lymph nodes.

If any of these tests could be of benefit to you, your treatment team should discuss this with you.

Examples of genomic assay tests include the following.

EndoPredict

This test predicts how likely the cancer is to spread somewhere in the body within ten years in people who will be taking hormone therapy for at least five years.

The result, called the EPclin Risk score, is reported as low or high risk.

Most people with a low risk score won't need chemotherapy.

Chemotherapy is recommended for most people with a high risk score.

Oncotype DX

This test predicts how likely the cancer is to come back after surgery and the likely benefit of having chemotherapy.

The result, called the recurrence score, is reported as a number between 0 and 100. The higher the score, the greater the risk of recurrence, and the more likely you are to benefit from chemotherapy.

Chemotherapy is usually recommended if you have:

- A score of 26 or above and you are over the age of 50
- A score of 16 or above and you are aged 50 or under

Prosigna

Prosigna predicts how likely the cancer is to spread somewhere in the body within ten years in people who will be taking hormone therapy for at least five years.

The test gives a score between 0 and 100. Based on this score and whether any lymph nodes under the arm are affected, the results are reported as low, intermediate or high risk.

Most people with a low risk score will not need chemotherapy.

Chemotherapy is usually recommended for people with a high risk score.

An intermediate risk score means the decision to have chemotherapy is less clear. Your specialist will discuss with you what they recommend and why.

QUESTIONS YOU MAY WANT TO ASK YOUR TREATMENT TEAM

You may find it helpful to discuss your results with your treatment team.

If there's anything in your pathology report that you don't understand, ask them to explain it to you.

- What type of breast cancer do I have?
- Is it invasive, non-invasive or both?
- What size is the cancer?
- Is there more than one area of cancer?
- What grade is the breast cancer?
- Has all the breast cancer been removed?
- Are there any signs of lymphovascular invasion?
- Has the cancer spread to the lymph nodes? If so, how many lymph nodes are affected?
- Is the breast cancer hormone receptor positive (ER+ or PR+)?
- Is the breast cancer HER2 positive (HER2+)?
- Is a genomic assay test suitable for me? If so, what test will I have?

COMMON BREAST CANCER PATHOLOGY TERMS EXPLAINED

Grade – how different the cancer cells are to normal breast cells and how quickly they are growing.

Invasive breast cancer – has the potential to spread to other areas of the body.

Isolated tumour cell clusters (ITCs) – when there's less than 0.2mm of breast cancer in the lymph nodes.

Ki67 – a protein found in cells. The higher the levels, the faster the cells are dividing and growing.

Lymphovascular invasion – when breast cancer cells spread into (invade) the lymph and blood vessels within the breast, and can be seen in these vessels under the microscope.

Micrometastasis – when there is between 0.2mm and 2mm of breast cancer in the lymph nodes.

Multi-centric – when there's more than one area of breast cancer in different quarters of the breast.

Multi-focal – when there's more than one area of breast cancer in one quarter of the breast.

Non-invasive breast cancer – has not yet developed the ability to spread either within the breast or to another part of the body.

NST (no special type) or NOS (not otherwise specified) – a breast cancer that has no features that stand out as a 'special' type.

Pathologist – a doctor who examines cells and tissue under a microscope.

Pathology – the branch of medicine that looks at how disease affects the body's cells and tissues.

Pathology report – the report written by the pathologist after they examine your tissue.

Primary breast cancer – has not spread beyond the breast or the lymph nodes under the arm.

Surgical margin – how close the cancer cells are to the edges of the whole area of tissue removed during surgery

HELP US TO HELP OTHERS

If you have found this information helpful, would you consider making a donation to support our care and research work? You can donate on our website **breastcancernow.org/donate**

NOTES

ABOUT THIS BOOKLET

Understanding your pathology results was written by Breast Cancer Now's clinical specialists, and reviewed by healthcare professionals and people affected by breast cancer.

For a full list of the sources we used to research it:
Email **health-info@breastcancernow.org**

You can order or download more copies from
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We welcome your feedback on this publication:
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BREAST CANCER NOW
The research & care charity

At Breast Cancer Now we're powered by our life-changing care. Our breast care nurses, expertly trained staff and volunteers, and award-winning information make sure anyone diagnosed with breast cancer can get the support they need to help them to live well with the physical and emotional impact of the disease.

We're here for anyone affected by breast cancer. And we always will be.

For breast cancer care, support and information, call us free on **0808 800 6000** or visit **breastcancernow.org**

Breast Cancer Now
Fifth Floor,
Ibex House,
42–47 Minories,
London EC3N 1DY
Phone: 0345 092 0800
breastcancernow.org

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