

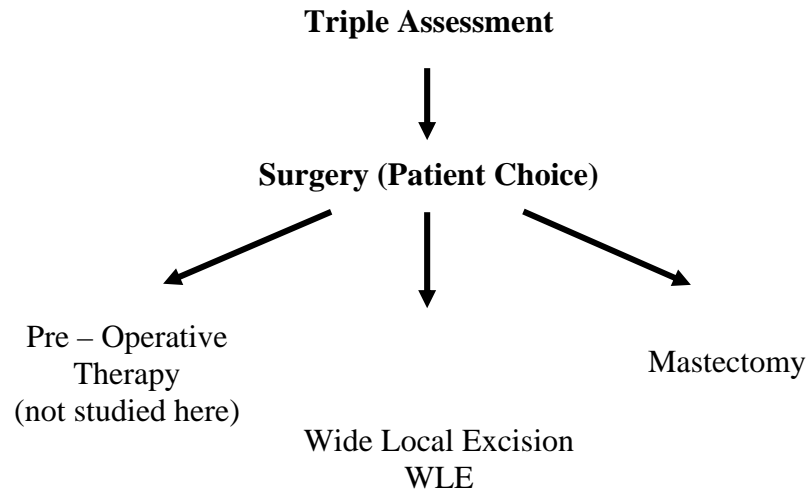
Christie Hospital: Breast Cancer Management Guidelines Decision Model

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Process and decision models representing the Christie Hospital guidelines for breast cancer treatment.

Christies Hospital: Breast Cancer Management Guidelines Decision Model

Basic Process Model



During breast surgery, either WLE or mastectomy a level III clearance or axillary sampling (4+ nodes removed) is performed.

Treatment is decided based on the outcome of results from surgery.

Breast Radiotherapy

Treatment Options

BRT1 No breast radiotherapy

BRT2 Breast radiotherapy

Variables Used for Decision

Breast Surgery	WLE, Mastectomy
Tumour Size	In cm
Excision (completeness)	Complete, Incomplete (deep margin)
Histopathological Grade	I, II, III

Christies hospital have identified a group of patients where the risk of local recurrence without radiotherapy (XRT) is low. They say giving XRT in this low risk group would only benefit a minority of patients but clearly gives inconvenience, discomfort and a small risk of morbidity to the majority. Omitting XRT will not prejudice the

patients chance of survival. Careful follow-up will allow most recurrences to be detected early and further breast conserving surgery to be used at the time of relapse. Avoiding radiotherapy after breast conserving surgery is an option in certain selected patients, who meet the following criteria:

Screen detected, post-menopausal, path node negative, tumour size < 1 cm, Not grade III, no lobular cancers, no extensive DCIS, clear margins, patient consent, ability to attend for annual mammography, Tamoxifen if ER positive.

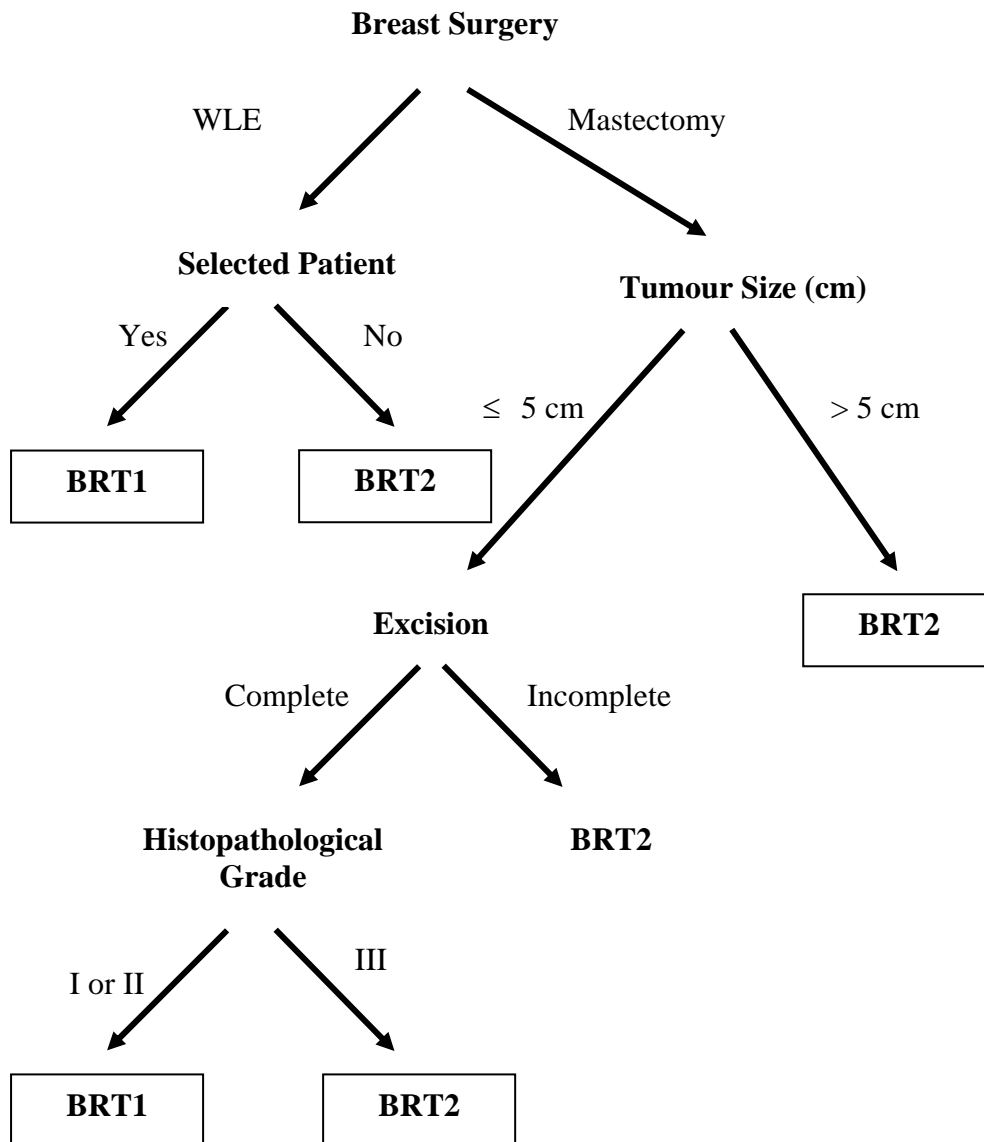
Only a minority of patients (< 10 %) will meet these criteria. The remainder will still require radiotherapy after surgery to minimise the risk of local recurrence.

More variables can now be added to the above list in order to be able to identify these patients.

Cancer detection	Screen-detected, Non screen-detected
Menopausal Status	Pre, Peri, Post
Post-Op Node Status (Path)	Negative, Positive
Histological Type	Tubular, Colloid, Ductal, Lobular, Mixed, Metaplastic, NOS (No specific type)
Extensive DCIS	Yes, No
Clear Margins	Yes, No
Patient Consent	Yes, No
Patient able to attend annual mammography?	Yes, No
ER Status	Negative, Positive
Receiving Tamoxifen	Yes, No

To simplify the decision tree and the rules, this group of patients will be named "Selected Patient" with a "yes" and "no" and will fit all the above criteria.

Decision Tree for Breast Radiotherapy



Breast Radiotherapy Rules

BRT1: No Breast Radiotherapy

(IF Breast Surgery = WLE
AND
Selected Patient = Yes)

OR

(If Breast Surgery = Mastectomy
AND
Excision = Complete
AND
Histopathological Grade = I OR II)

BRT2: Breast Radiotherapy

(IF Breast Surgery = WLE
AND
Selected Patient = No)

OR

(IF Breast Surgery = Mastectomy
AND
Tumour Size > 5 cm)

OR

(IF Breast Surgery = Mastectomy
AND
Tumour Size \leq 5 cm
AND
Excision = Incomplete)

OR

(IF Breast Surgery = Mastectomy
AND
Tumour Size \leq 5 cm
AND
Excision = Complete
AND
Histopathological Grade = III)

Axillary Radiotherapy (this is unclear)

Treatment Options

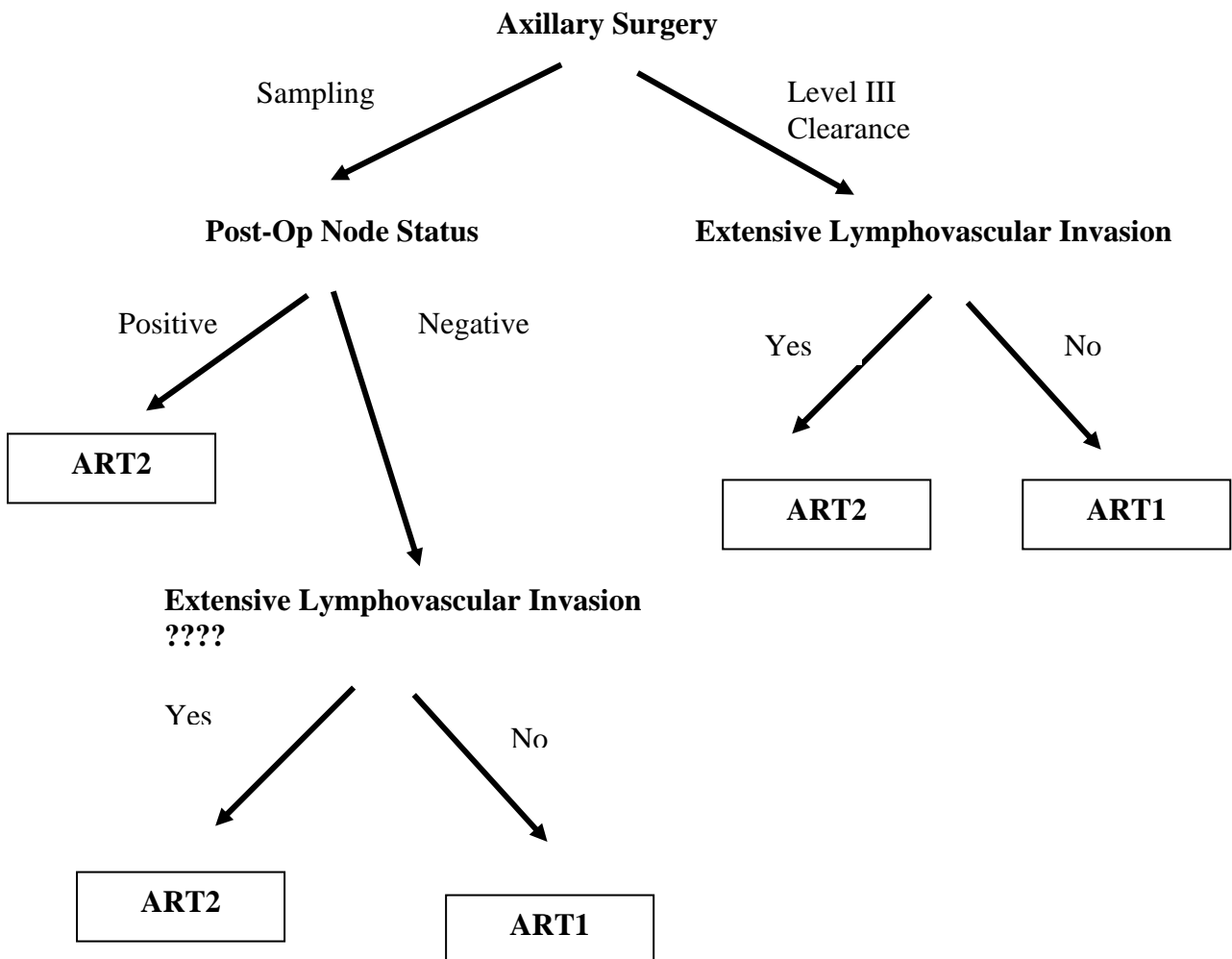
ART1: No Axillary Radiotherapy

ART2: Axillary Radiotherapy

Variables Used for Decision

Axillary Surgery	Sampling (4+), Level III Clearance
Post-Op Node Status	Positive, Negative
Extensive Lymphovascular Invasion	Yes, No

Decision Tree for Breast Radiotherapy



Axillary Radiotherapy Rules

ART1: No Axillary Radiotherapy

(IF Axillary Surgery = Sampling
AND
Post-OP Node Status = Negative
AND
Extensive Lymphovascular Invasion = No)

OR

(IF Axillary Surgery = Level III Clearance
AND
Extensive Lymphovascular Invasion = No)

ART2: Axillary Radiotherapy

(IF Axillary Surgery = Sampling
AND
Post-OP Node Status = Positive)

OR

(IF Axillary Surgery = Level III Clearance
AND
Extensive Lymphovascular Invasion = Yes)

Selection of Adjuvant Systemic Treatment for Early Breast Cancer

Two decision models exist in the Christies guidelines, this must be checked.

Model 1

This risk grouping used in this model is explained below:

Variables Used to Determine Risk Group

Tumour Size	In cm
Histopathological Grade	I, II, III
Post-Op Node Status	Negative, 1-3, 4+

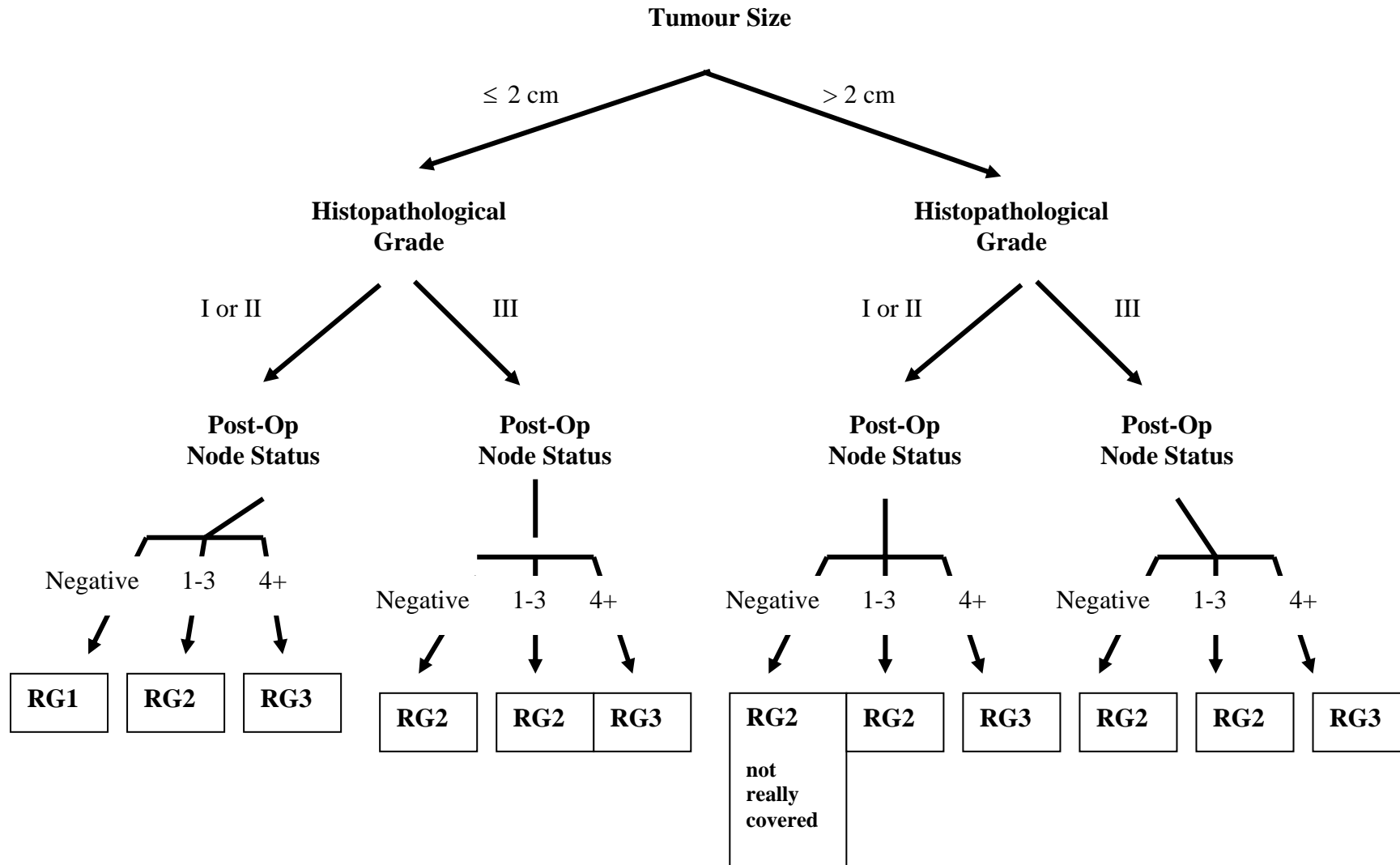
Risk Groups

RG1: Good

RG2: Intermediate

RG3: Poor or Very Poor

Decision Tree for Determining Risk Group



Rules for Determining Risk Group

RG1: Good

IF Tumour Size \leq 2 cm
AND
Histopathological Grade = I OR II
AND
Post-Op Node Status = Negative

RG2: Intermediate

(IF Tumour Size \leq 2 cm
AND
Histopathological Grade = I OR II
AND
Post-Op Node Status = 1-3)

OR

(IF Tumour Size \leq 2 cm
AND
Histopathological Grade = III
AND
Post-Op Node Status = Negative)

OR

(IF Tumour Size \leq 2 cm
AND
Histopathological Grade = III
AND
Post-Op Node Status = 1-3)

OR

(IF Tumour Size $>$ 2 cm
AND
Histopathological Grade = I OR II
AND
Post-Op Node Status = 1-3)

OR

(IF Tumour Size $>$ 2 cm
AND
Histopathological Grade = III
AND
Post-Op Node Status = Negative)

OR

(IF Tumour Size > 2 cm
AND
Histopathological Grade = III
AND
Post-Op Node Status = 1-3)

RG3: Poor or Very Poor

IF Post-Op Node Status \geq 4, regardless of what the other variables are.

On the decision tree for determining risk group there is a group which is not covered by the guidelines, this need to be checked (it does appear to be RG2).

The rule is:

IF Tumour Size > 2 cm
AND
Histopathological Grade = I OR II
AND
Post-Op Node Status = Negative

Selection of Adjuvant Systemic Treatment

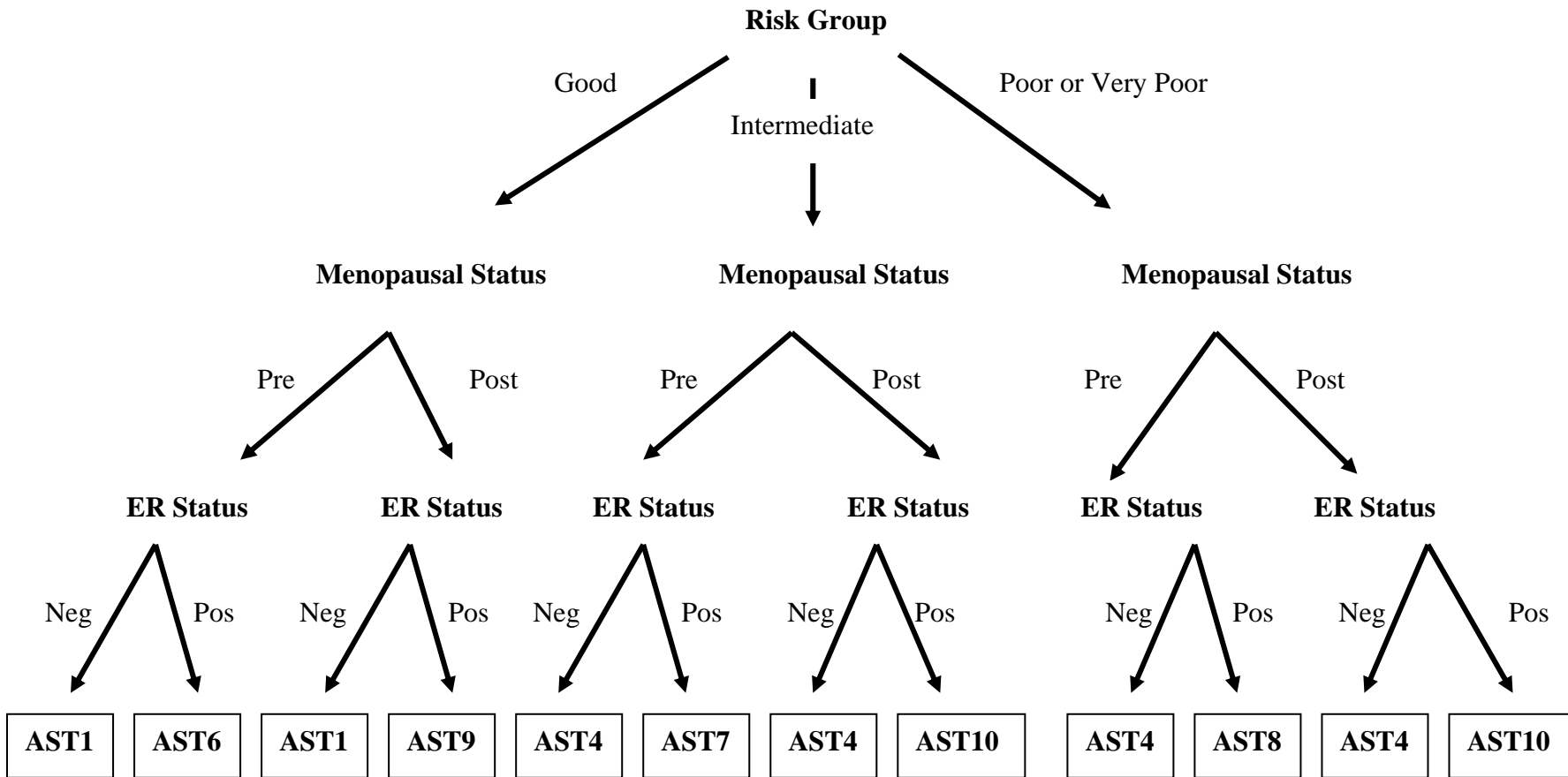
Treatment Options and Combinations

- AST1:** No adjuvant therapy
- AST2:** Tamoxifen
- AST3:** Ovarian Ablation
- AST4:** Chemotherapy
- AST5:** Arimidex (selected patients only – have not got criteria)
- AST6:** Tamoxifen or Ovarian Ablation - (AST2 or AST3)
- AST7:** Tamoxifen or Ovarian Ablation or Chemotherapy - (AST6 or AST4)
- AST8:** Chemotherapy and (Tamoxifen or Ovarian Ablation) - (AST4 and (AST6))
- AST9:** Tamoxifen or Arimidex – (AST2 or AST5)
- AST10:** (Chemotherapy and (Tamoxifen or Arimidex)) or (Tamoxifen or Arimidex) (AST4 and AST9) or AST9.

Variables Used for Selection of Treatment

Risk Group	Good (RG1), Intermediate (RG2), Poor or Very Poor (RG3)
Menopausal Status	Pre, Post
ER Status	Negative, Positive
Patient State	Fit, Not fit (for chemotherapy)

Model 1: Decision Tree for Selection of Adjuvant Systemic Treatment (Chemotherapy given only if patient is fit)



Rules for Determining Treatment Options

AST1: No adjuvant therapy

IF Risk Group = Good
AND
Menopausal Status = Pre OR Post
AND
ER Status = Negative

AST4: Chemotherapy

(IF Risk Group = Intermediate OR Poor/Very poor
AND
Menopausal Status = Pre
AND
ER Status = Negative)

OR

(IF Risk Group = Intermediate OR Poor/Very poor
AND
Menopausal Status = Post
AND
ER Status = Negative
AND
Patient State = Fit)

AST6: Tamoxifen or Ovarian Ablation - (AST2 or AST3)

IF Risk Group = Good
AND
Menopausal Status = Pre
AND
ER Status = Positive

AST7: Tamoxifen or Ovarian Ablation or Chemotherapy - (AST6 or AST4)

IF Risk Group = Intermediate
AND
Menopausal Status = Pre
AND
ER Status = Positive

AST8: Chemotherapy and (Tamoxifen or Ovarian Ablation) - (AST4 and (AST6))

IF Risk Group = Poor/Very poor

AND

Menopausal Status = Pre

AND

ER Status = Positive

AST9: Tamoxifen or Arimidex – (AST2 or AST5)

IF Risk Group = Good

AND

Menopausal Status = Post

AND

ER Status = Positive

AST10: (Chemotherapy and (Tamoxifen or Arimidex)) or (Tamoxifen or Arimidex)
(AST4 and AST9) or AST9.

(IF Risk Group = Intermediate OR Poor/Very poor

AND

Menopausal Status = Post

AND

ER Status = Positive

Model 2

This model uses the Nottingham Prognostic Index

Variables used for risk group

Pathological Tumour Size	In cm
Histopathological Grade	I, II, III
Post-Op Node Status	Negative, 1-3, 4+

The calculation for the index is carried out as usual.

Variables Used for Selection of Treatment

Risk Group	Low, Intermediate, High
Menopausal Status	Pre, Post
ER Status	Negative, Positive
PR Status	Negative, Positive
Patient State	Fit, Not fit (for chemotherapy)

Treatment Options and Combinations

- T1:** No adjuvant treatment
- T2:** Tamoxifen
- T3:** Ovarian Ablation
- T4:** Chemotherapy
- T5:** None or Tamoxifen (T1 or T2)
- T6:** Tamoxifen or Ovarian Ablation (T2 or T3)
- T7:** Chemotherapy and (Tamoxifen or Ovarian Ablation) (T4 or T6)
- T8:** Chemotherapy and Tamoxifen (T4 and T2)
- T9:** Tamoxifen or (Chemotherapy and Tamoxifen) (T4 or T8)

Rules for Determining Treatment Options

T1: No adjuvant therapy

IF Risk Group = Low
AND
Menopausal Status = Pre OR Post
AND
ER Status = Negative
AND
PR Status = Negative

T4: Chemotherapy alone

IF Risk Group = Intermediate OR High
AND
Menopausal Status = Pre or Post
AND
ER Status = Negative
AND
PR Status = Negative
AND
Patient State = Fit

T5: No adjuvant therapy or Tamoxifen

IF Risk Group = Low
AND
Menopausal Status = Pre OR Post
AND
(ER Status = Positive
OR
PR Status = Positive)

T7: Chemotherapy and (Tamoxifen or Ovarian Ablation)

IF Risk Group = Intermediate OR High
AND
Menopausal Status = Pre
AND
(ER Status = Positive
OR
PR Status = Positive)

T9: Tamoxifen or (Chemotherapy and Tamoxifen)

IF Risk Group = Intermediate OR High

AND

Menopausal Status = Post

AND

(ER Status = Positive

OR

PR Status = Positive)

AND

Patient State = Fit

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