Genetic Testing for Cancer Survivors: What You Need to Know

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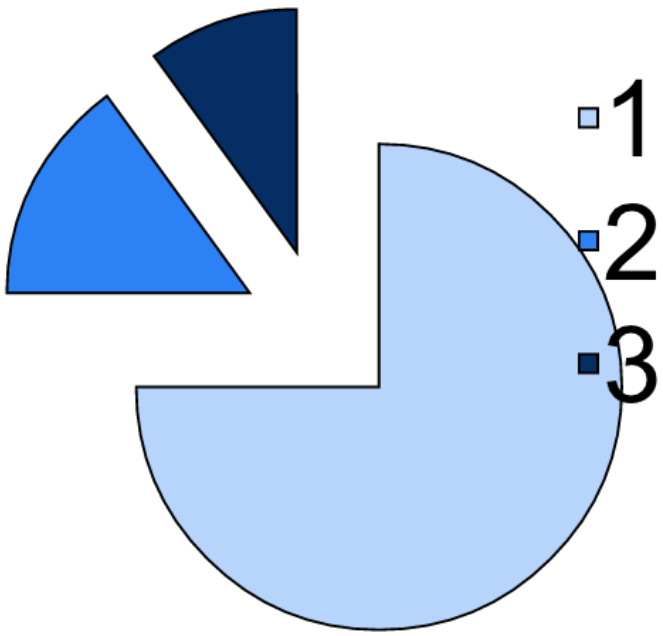
You Need to Know

All cancer is genetic,

but not all cancer is hereditary….

All Cancer is Genetic, Not All Cancer is Inherited



70-80%
Sporadic

15-20%
Familial

5-10%
Hereditary

- Hereditary cancers are caused by altered genes that make someone susceptible to developing cancer.
- These alterations are passed down from generation to generation.
- Genetic testing can help determine if an individual carries these changes.

Outline of Presentation

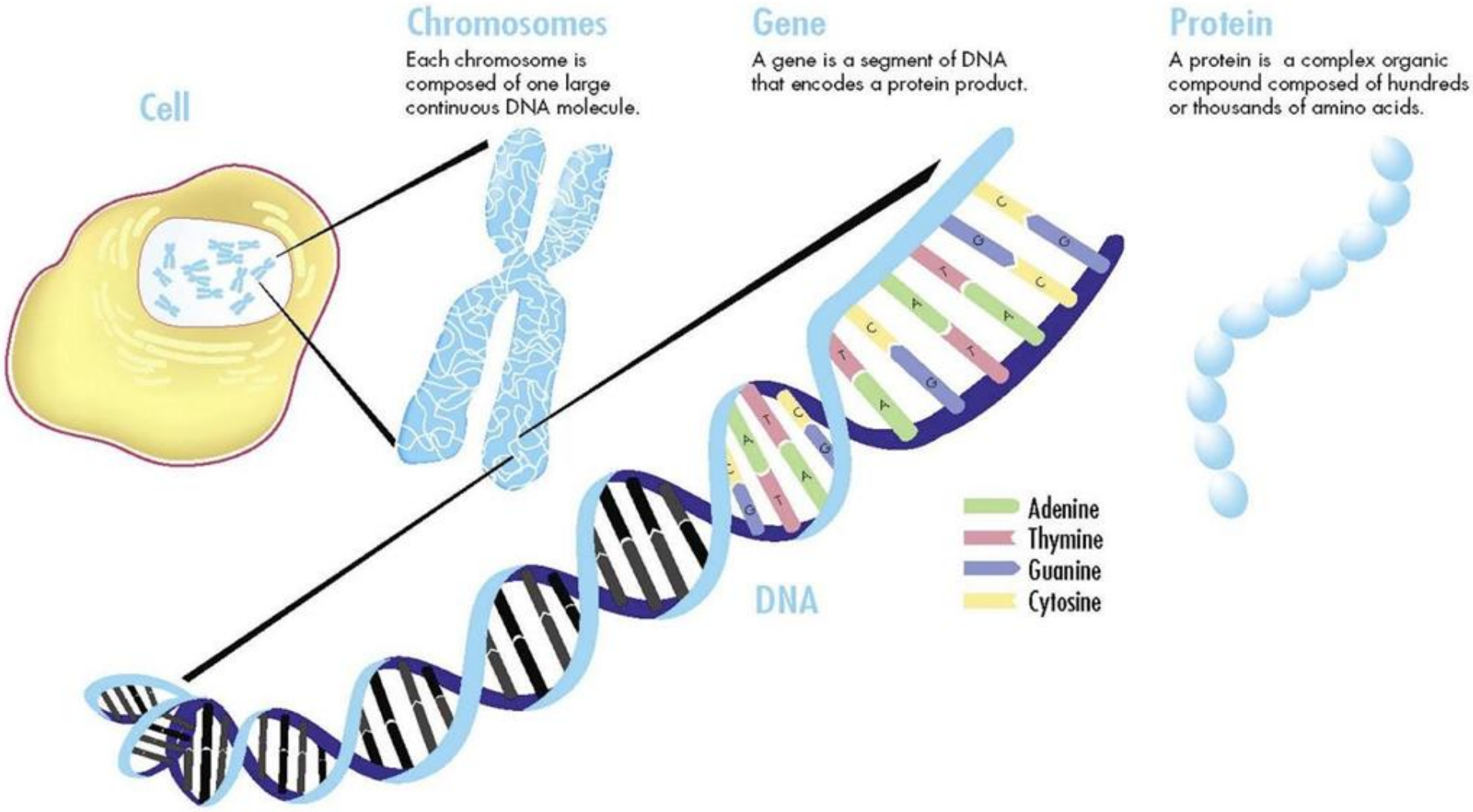
- Basic Genetics
- What is Genetic Counselling?
- A Genetic Counselling Tool: The Family Tree
- Cancer Genetics
- Case examples

What is Genetic Testing?

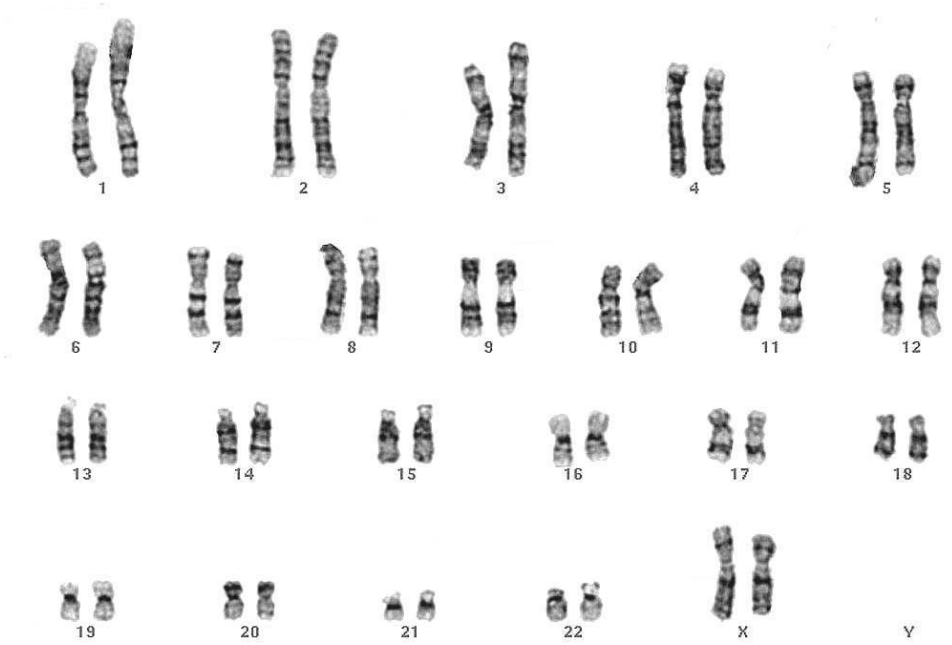
- Genetic testing is a type of medical test that identifies changes in chromosomes, genes, or proteins. The results of a genetic test can confirm or rule out a suspected genetic condition or help determine a person's chance of developing or passing on a genetic disorder. More than 1,000 genetic tests are currently in use, and more are being developed.

Basic Genetic Information

Basic Genetics



Our Genetic Information



Genetics & Health

- Genetic conditions happen because of mutations (changes) in a person's DNA (genetic information)
- Mutations are passed down through families (inherited)
- Some mutations can happen by accident at the time of conception and are said to be 'de novo' or new in that person
- When a person or family has a genetic condition, it is important to provide support to help understand and adapt to the diagnosis

What is a Genetic Counsellor?

- Health care professional with a specialized Masters degree in genetic counselling or human genetics
- Experience in medical genetics and counselling
- Work as a part of a healthcare team
- Come from a variety of backgrounds: biology, genetics, health sciences, nursing, public health, psychology and more!

What is Genetic Counselling?

- Providing information about genetic conditions to individuals who are affected by or at-risk for genetic conditions
- Providing supportive counselling to families, serve as patient advocates, and refer individuals and families to community support services
- Discussing genetic testing options so that informed choices can be made
- Serving as educators and resource people for other health care professionals and for the general public

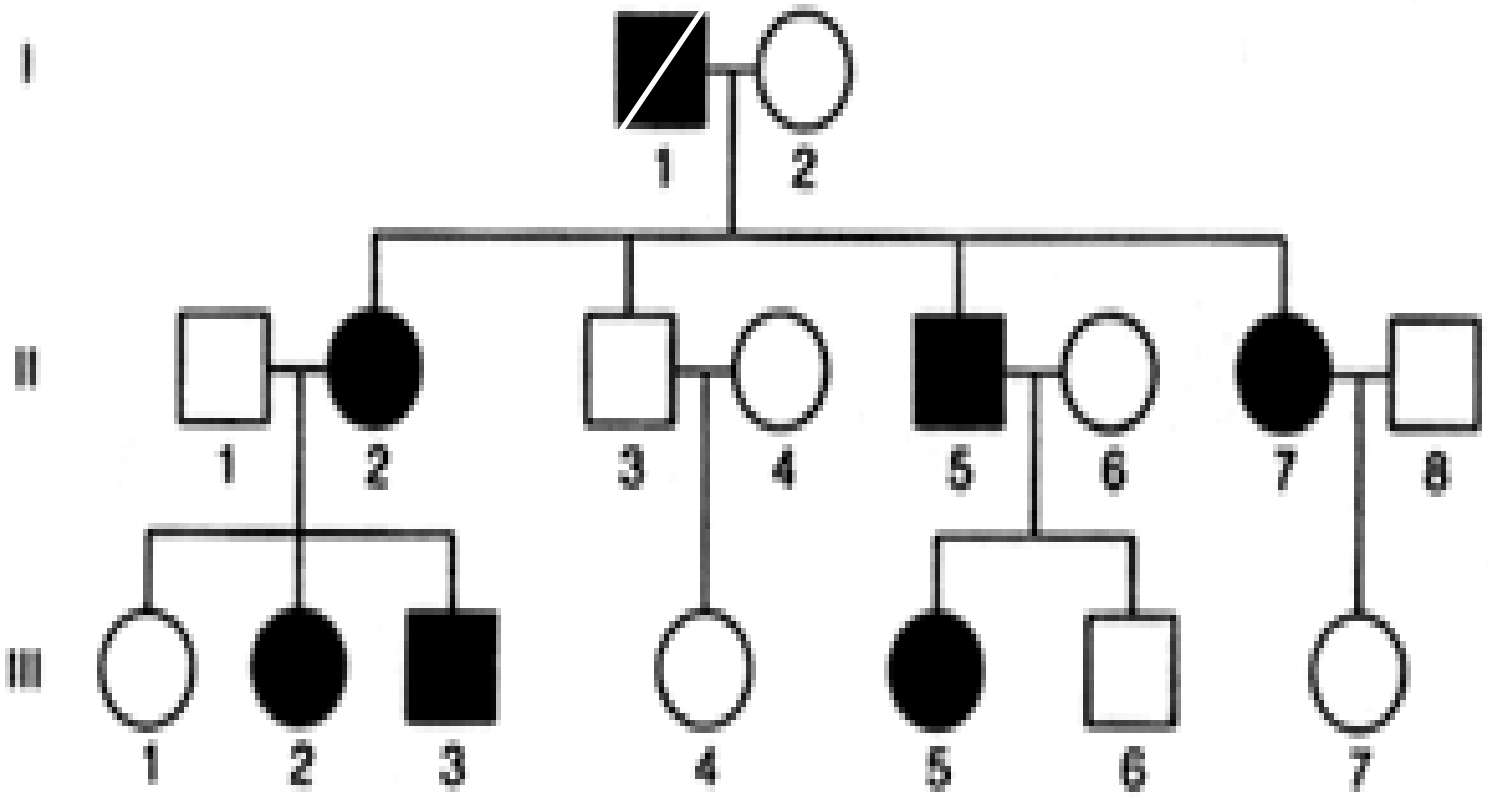

KNOW YOUR FUTURE
PALMISTRY
TAROT CARDS
DNA SCREENING
J. Harris

Who May Benefit From Genetic Counselling?

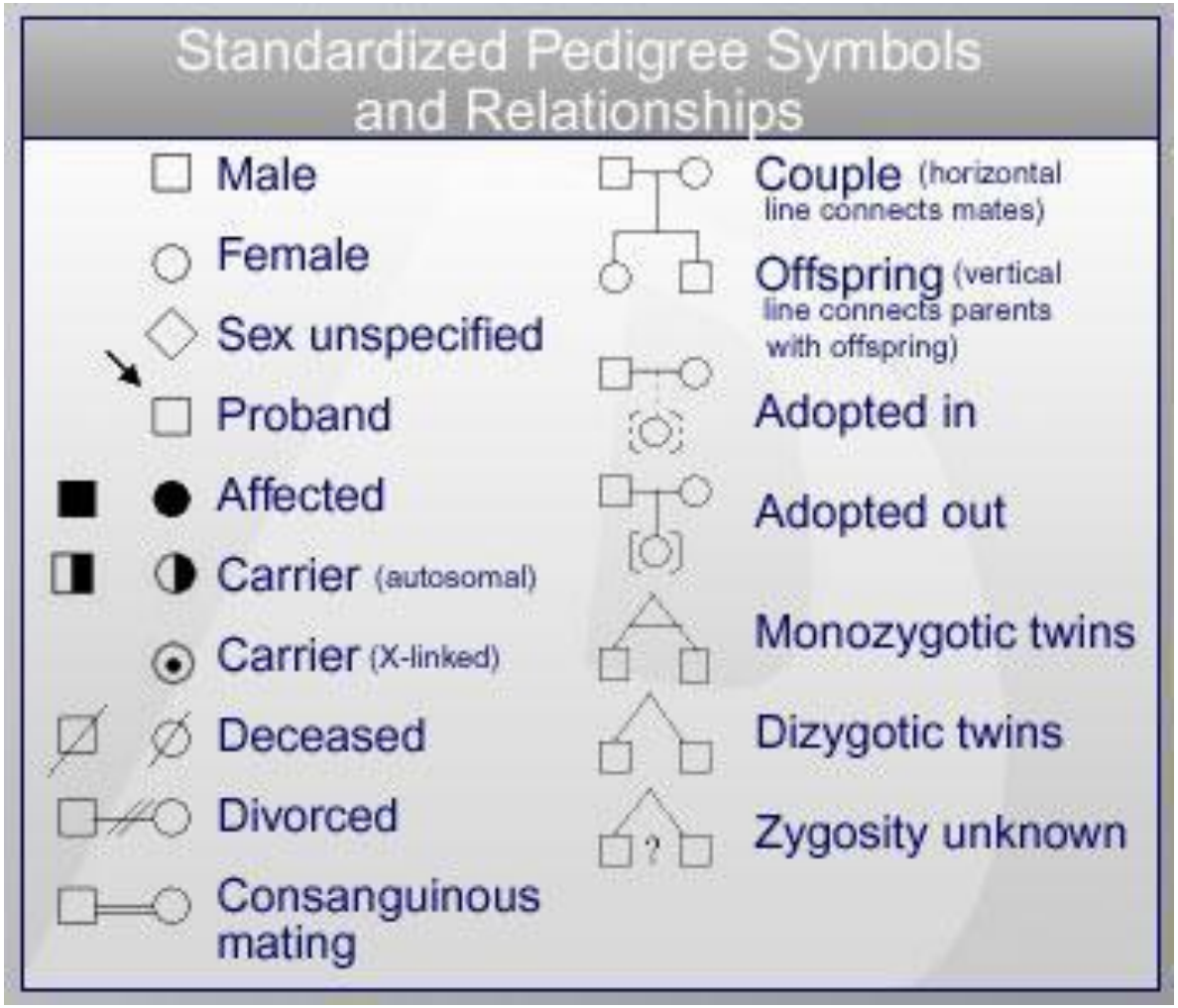
- Individuals with a personal or family history of a condition that may be hereditary
- A person who has characteristics (e.g. physical features, intellectual disability) which may be suggestive of a genetic condition
- A woman with a prenatal screening test or ultrasound revealing an increased risk for the baby to have a genetic condition

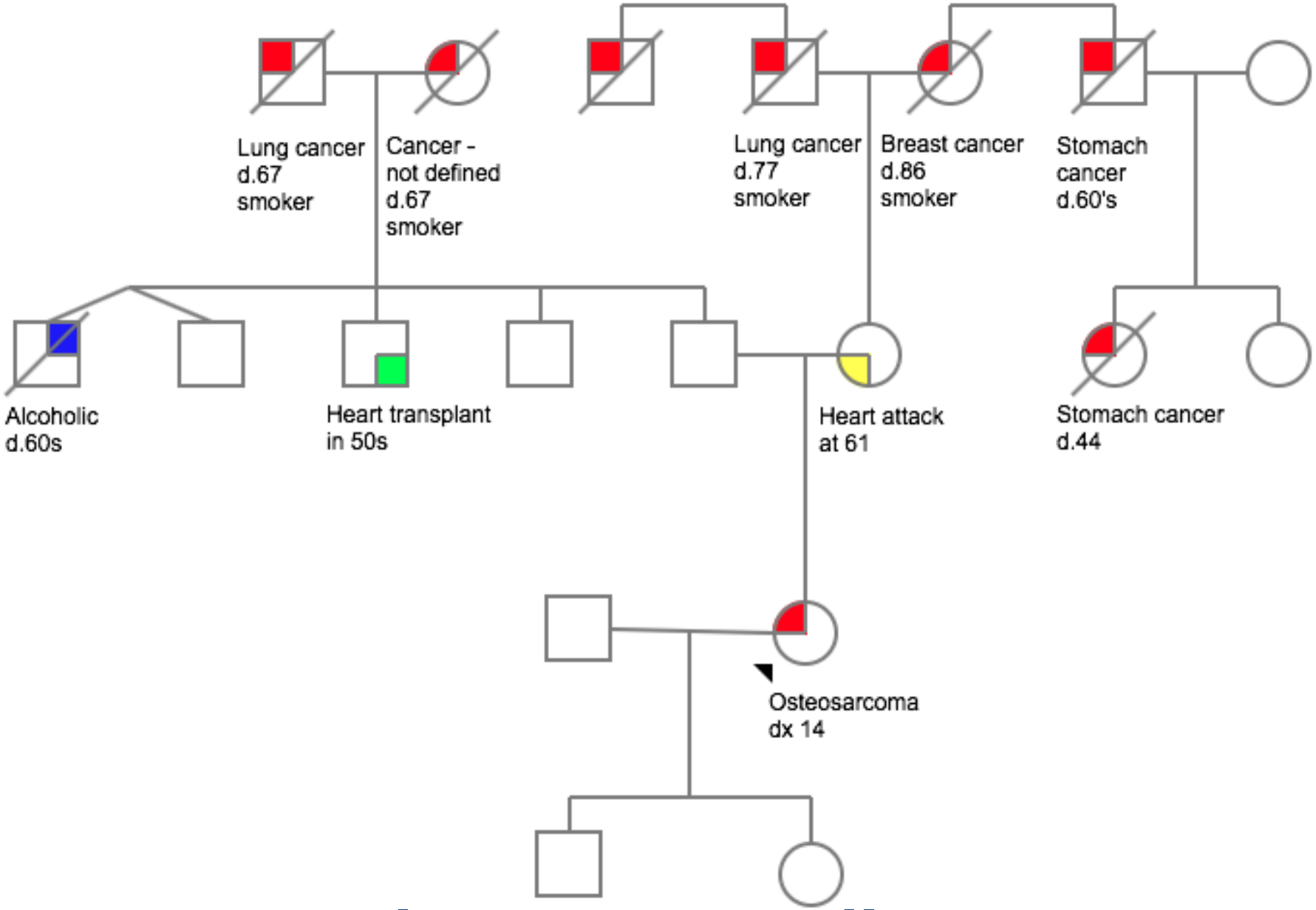
Tools For Genetic Counselling: Family Tree

Drawing a Pedigree



Pedigree Symbols





Drawing Your Family Tree

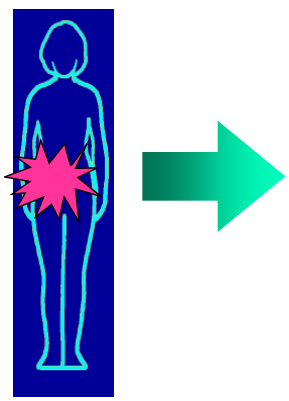
Cancer Genetics

Cancer Arises From Gene Mutations

Germline mutations

Parent Child

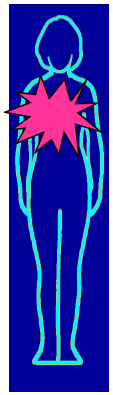
Mutation in egg or sperm



All cells affected in offspring

- Present in egg or sperm
- Are heritable
- Cause cancer family syndromes

Somatic mutations

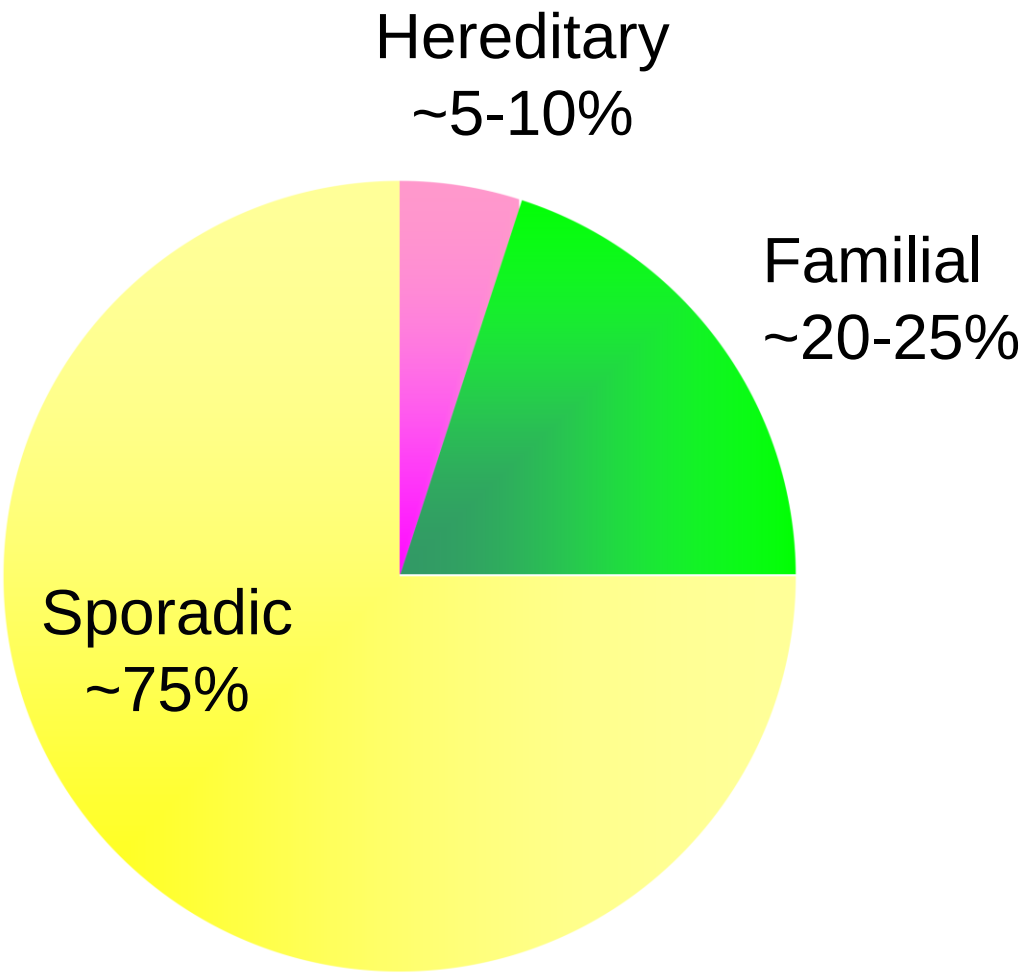


Somatic mutation

- Occur in non-germline tissues
- Are non-heritable

Who's at Risk?

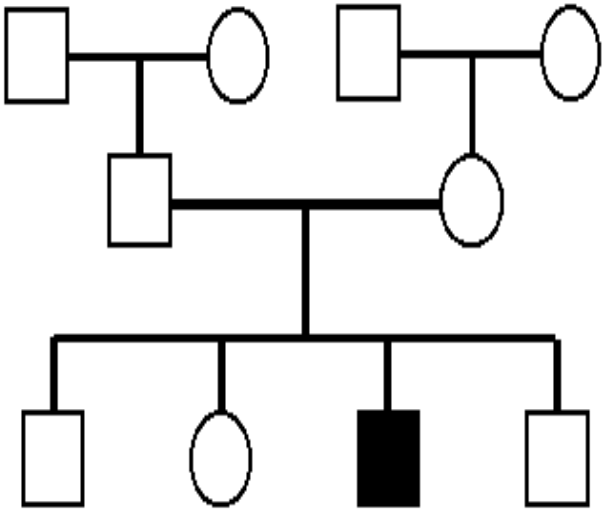
- Cancer is common in the population.
- The vast majority are sporadic in nature.



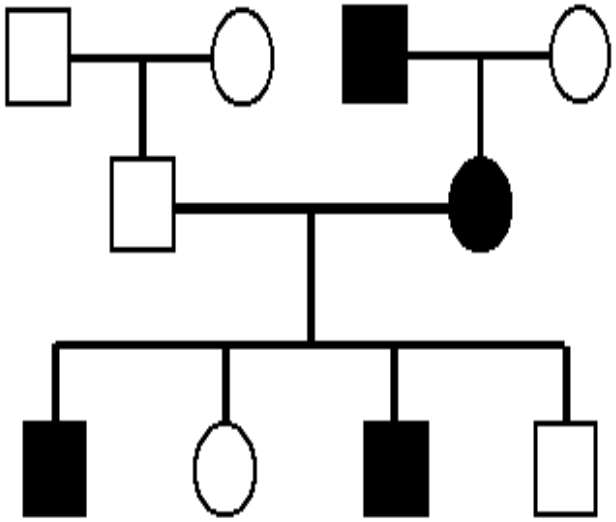
What makes a family history of cancer significant?

An unusually high number of affected closely related family members

Not Suspicious

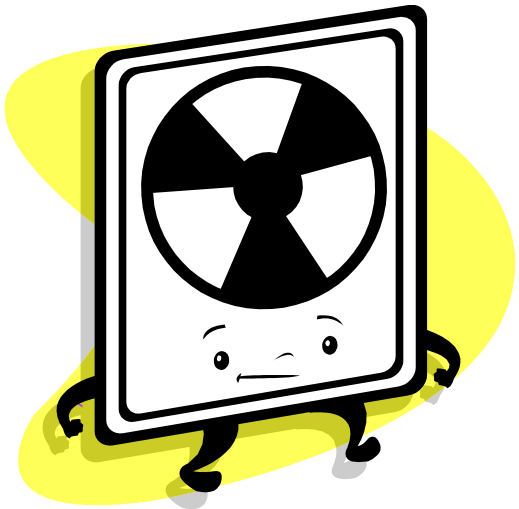


Suspicious



What makes a family history of cancer significant?

Absence of environmental factors



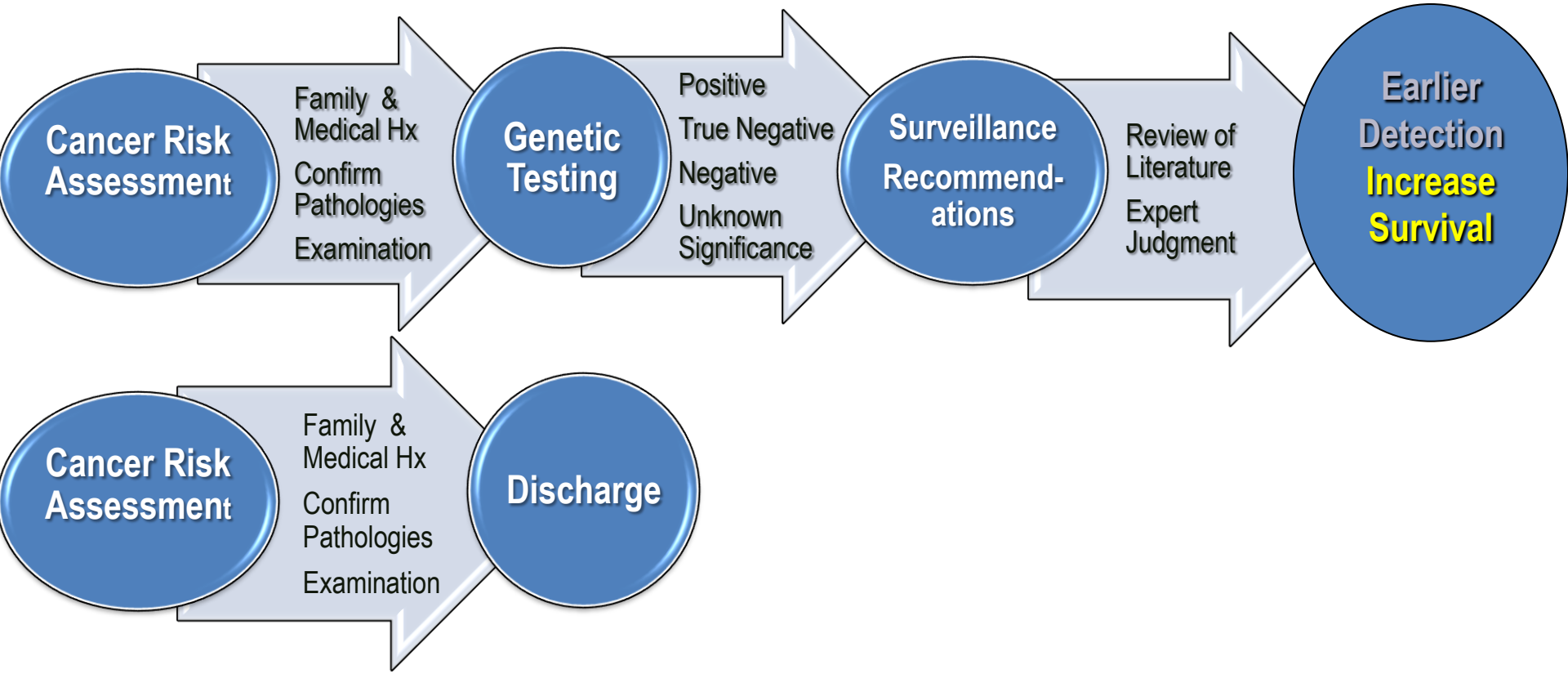
Radiation/TMT for initial primary

Lifestyle and Environmental

What makes a family history of cancer significant?

- An unusually high number of affected closely related family members
- Types of Malignancies
- Presence of multifocal/bilateral cancers
- Multiple primary cancers in one individual
- Presence of non-malignant features
- Absence of environmental factors
- Earlier than typical age of onset

Genetic Counselling: Cancer Risk Assessment



Case Examples

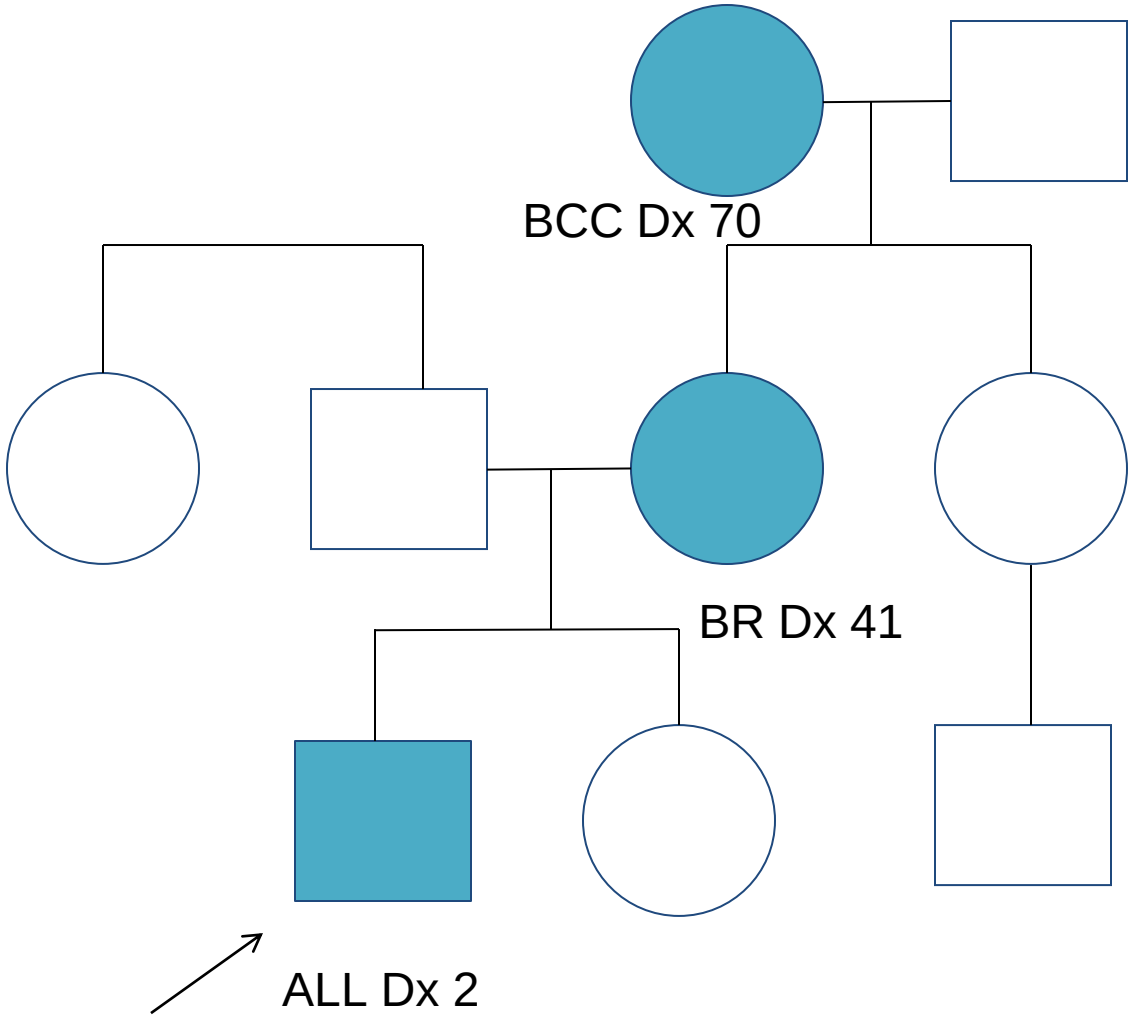
Case example 1

Child with ALL and family history of cancer. Mom interested in having more children. Please assess.

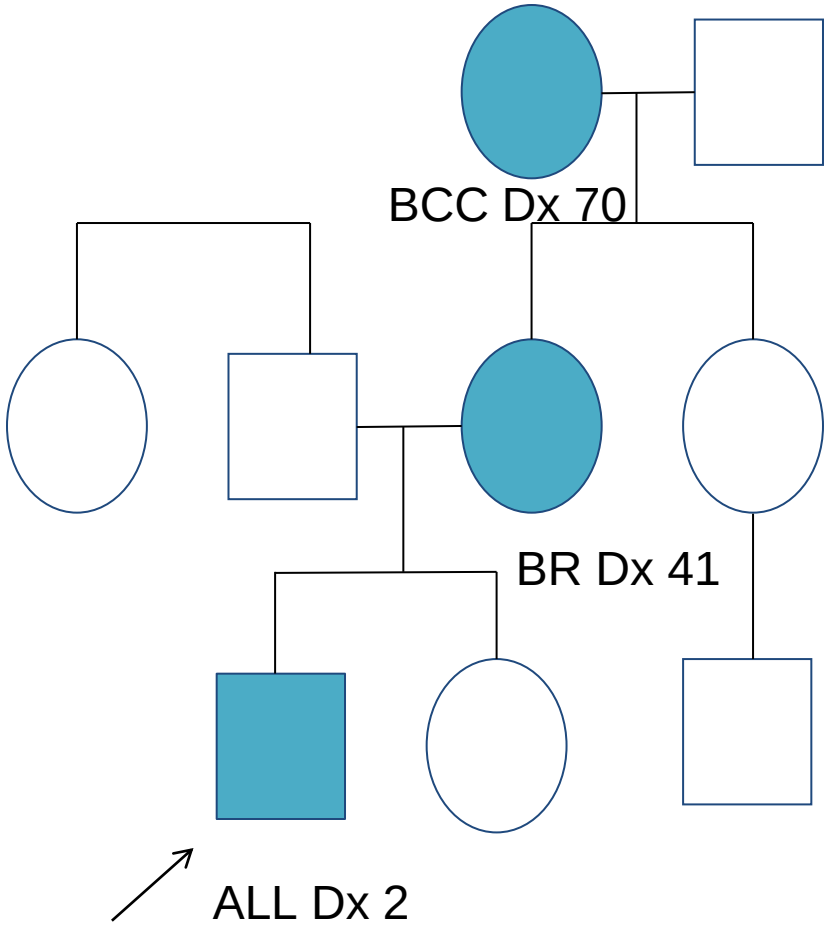
Cancer Risk Assessment

- Confirm pathology – is it really ALL?
- Review medical records – does he have Down Syndrome or any other medically predisposing reason for his ALL?
- Examination – does he have any CAL spots? Is he dysmorphic? Is he developmentally delayed?
- Who else in his family has cancer?

Cancer Risk Assessment



Conclusion



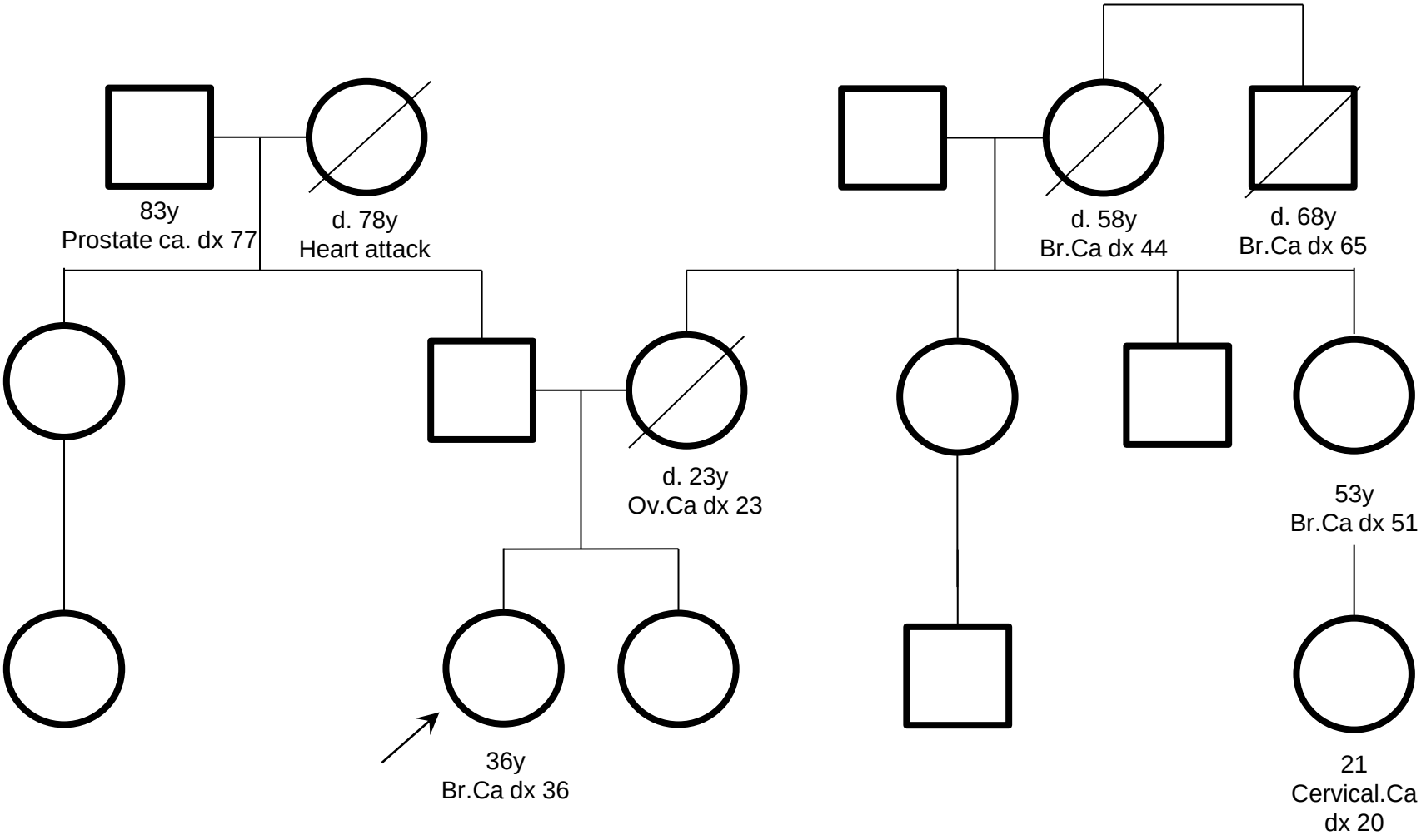
- Suggest breast surveillance for Mom's sister and daughter
- No genetic testing
- Risk for new pregnancy low

Case 2: Hereditary Breast and Ovarian Cancer

- Margaret is 36 and was recently diagnosed with breast cancer.
- Her mother died of ovarian cancer when she was 23 years old.
- Margaret would like to learn about genetic testing options.

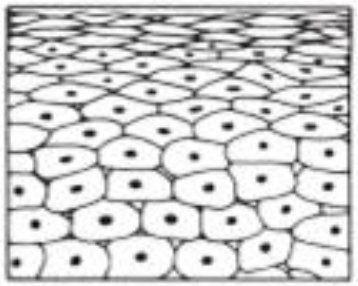
- Is the pattern of cancers in Margaret's family suggestive of hereditary cancer?
- If Margaret finds out that she carries a mutation in a breast cancer gene, what can she do?

Pedigree

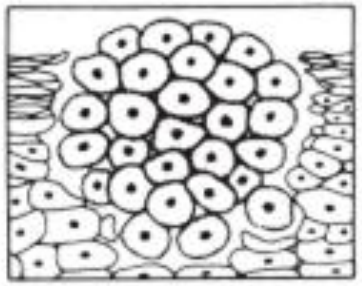

83y
Prostate ca. dx 77
d. 78y
Heart attack
d. 58y
Br.Ca dx 44
d. 68y
Br.Ca dx 65
d. 23y
Ov.Ca dx 23
53y
Br.Ca dx 51
36y
Br.Ca dx 36
21
Cervical.Ca
dx 20

Case 2: Hereditary Breast and Ovarian Cancer

Cells make up our organs.



Normal cells



Cells forming a tumour

Cancerous cells show:

- Uncontrolled cell division
- Cells irregularly shaped
- Cells don’t function normally
- Cells lose communication with neighboring cells
- Cells can separate from neighbor cells and move

Case 2: Hereditary Breast and Ovarian Cancer

Hereditary Breast and Ovarian Cancer:
Autosomal dominant susceptibility to breast and ovarian cancer
Genes: BRCA1 and BRCA2

By RYAN JASLOW / CBS NEWS / May 14, 2013, 3:45 PM

BRCA test leads Angelina Jolie to get double mastectomy: Who should get tested?

Case 2: Hereditary Breast and Ovarian Cancer

Aspects of a family history suggesting hereditary cancer:

- Three or more affected relatives on the same side of the family (either maternal or paternal relatives)
- Patterns of cancer, or cancers known to be associated to a particular cancer syndrome (e.g. breast and ovarian cancer)
- Early ages at the time of diagnosis (e.g. 30s and 40s)
- Multiple generations affected
- More than one primary cancer in the same individual
- Cancers rarely seen in the general population (e.g. breast cancer in males)

Case 2: Hereditary Breast and Ovarian Cancer

Women:

- 40-66% lifetime risk for breast cancer (versus 11% for general population)
- 13-46% lifetime risk for ovarian cancer (versus 1-2% for general population)

Men:

- Increased risk for prostate and breast cancer (2-3 times higher than the general population)

What can a person do?

- Cancer screening (e.g. clinical breast exam, MRI, mammogram)
- Prophylactic surgery (e.g. oophorectomy, mastectomy)

Case 2: Hereditary Breast and Ovarian Cancer

Margaret felt like she was “going through a lot” and decided against genetic testing at this time.

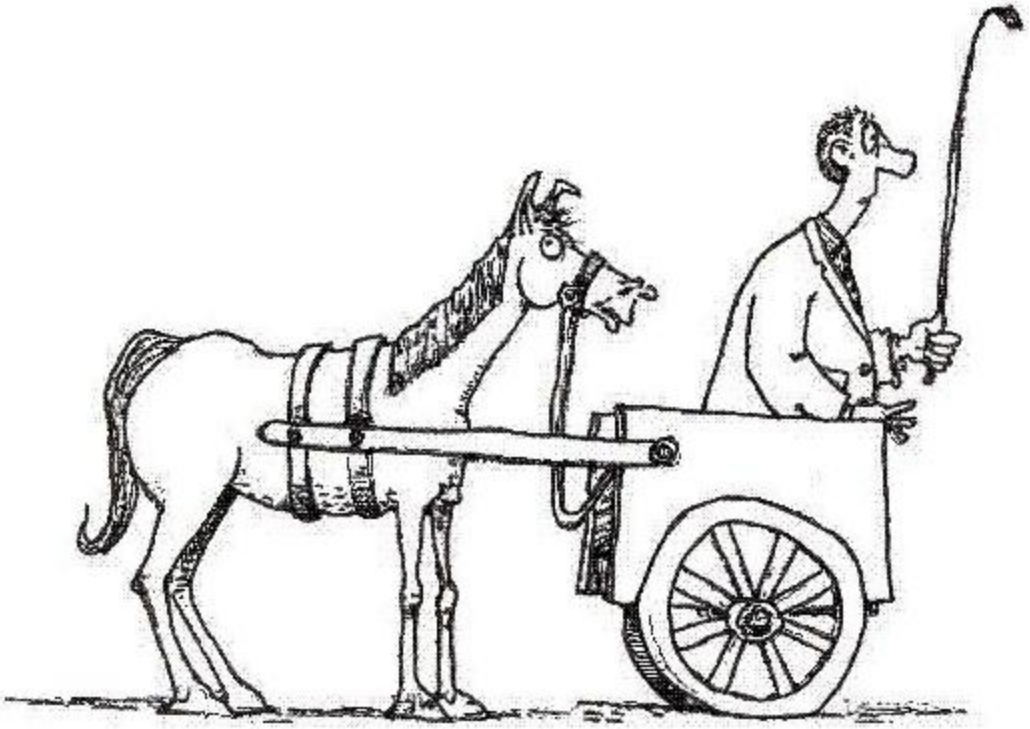
She may opt for genetic testing in the future as she might be interested in a prophylactic surgery if she had a positive result.

She will continue with breast cancer screening at this time.

Psychological Impact

- Cancer as a single diagnosis that might be overcome vs. lifetime risk for future cancer development.
- Parental Guilt if they passed “bad gene”
- Complex explanation of genetics and decision to undertake genetic testing has impacted extended family members.

Genetic testing



Genetic testing is not appropriate for everyone!

Genetic counselling ≠ genetic testing

Ethics and Genetics

- Who should know your personal genetic information?
    - Your family? Your boss? An insurance company?
- Who owns and controls genetic information?
- How does your genetic information affect the way you think about yourself? The way your friends think about you?
- How does genetic testing affect different cultures?
- Should we test for conditions if there is no treatment?
- Should parents be allowed to test their kids for conditions that start when the kid is an adult?

Questions?

Biochemical and imaging surveillance in germline *TP53* mutation carriers with Li-Fraumeni syndrome: a prospective observational study

Anita Villani, Uri Tabori, Joshua Schiffman, Adam Shlien, Joseph Beyene, Harriet Druker, Ana Novokmet, Jonathan Finlay, David Malkin

Summary

Background Individuals with Li-Fraumeni syndrome have a high lifetime risk of developing cancer. We assessed the feasibility and potential clinical effect of a comprehensive surveillance protocol in asymptomatic *TP53* mutation carriers in families with this syndrome.

Methods We implemented a clinical surveillance protocol, using frequent biochemical and imaging studies, for asymptomatic *TP53* mutation carriers on Jan 1, 2004, and did a prospective observational study of members of eight families with Li-Fraumeni syndrome who either chose to undergo surveillance or chose not to undergo surveillance. The primary outcome measure was detection of new cancers. The secondary outcome measure was overall survival.

Findings As of Nov 1, 2010, 33 *TP53* mutation carriers were identified, 18 of whom underwent surveillance. The surveillance protocol detected ten asymptomatic tumours in seven patients, including small, high-grade tumours and low-grade or premalignant tumours. All seven mutation carriers were alive after a median follow-up of 24 months (IQR 22–65 months). 12 high-grade, high-stage tumours developed in 10 individuals in the non-surveillance group, two of whom (20%) were alive at the end of follow-up (p=0·0417 for comparison with survival in the surveillance group). 3-year overall survival was 100% in the surveillance group and 21% (95% CI 4–48%) in the non-surveillance group (p=0·0155).

Interpretation Our findings show the feasibility of a clinical surveillance protocol for the detection of asymptomatic neoplasms in individuals with germline *TP53* mutations. This strategy offers a management option for affected individuals, and its benefits lend support to the use of early genetic testing of at-risk individuals and families.

Lancet Oncol. **June 2011;12(6):559-67**