



HEALTH NEEDS ASSESSMENT

**For Persons Diagnosed with a Cancer-Predisposing Variant of
BRCA1 and BRCA2 in Ireland**

National Cancer Control Programme

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List of Abbreviations

ANP/cANP	Advanced Nurse Practitioner/candidate ANP
BMJ	British Medical Journal
BRCA	Breast Cancer (Genes)
B-RRM	Bilateral Risk-Reducing Mastectomy
BSHG	Belgian Society of Human Genetics
CA-125	Cancer Antigen-125
CBE	Clinical Breast Exam
CC	Cancer Centre
CHI	Children's Health Ireland
CNS	Clinical Nurse Specialist
COCP	Combined Oral Contraceptive Pill
COVID-19	Coronavirus disease caused by the SARS-CoV-2 virus
CPM	Contralateral Prophylactic Mastectomy
CUH	Cork University Hospital
ESMO	European Society of Medical Oncology
EUS	Endoscopic Ultrasound
GDPR	General Data Protection Regulations
GP	General Practitioner
GUH	Galway University Hospital
HIQA	Health Information and Quality Authority
HIPE	Hospital In-Patient Enquiry
HNA	Health Needs Assessment
HRT	Hormone Replacement Therapy
HSE	Health Service Executive
HTA	Health Technology Assessment
IVF	In-Vitro Fertilisation
MMUH	Mater Misericordiae University Hospital
MRCP	Magnetic Resonance Cholangiopancreatography
NCCN	National Cancer Care Network
NCCP	National Cancer Control Programme
NCS	National Cancer Strategy
NICE	National Institute for Health and Care Excellence
NSABP-P1	National Surgical Adjuvant Breast and Bowel Project – Prevention 1

NUIG	National University of Ireland Galway
PARPi	Poly-ADP Ribose Polymerase Inhibitor
PGD	Pre-implantation Genetic Diagnosis
ROCA	Risk of Ovarian Cancer Algorithm
RR-BSO	Risk-Reducing Bilateral Salpingo-oophorectomy
SEOM	Spanish Society of Medical Oncology
SJH	St. James's Hospital
SVUH	St. Vincent's University Hospital
TVUS	Transvaginal Ultrasound
UHL	University Hospital Limerick
UK	United Kingdom
USA	United States of America
WRH	Waterford Regional Hospital

Glossary of Terms

BRCA carrier	Person with a pathogenic or likely pathogenic variant in one of their two copies of the BRCA1 and/or BRCA2 gene
Cancer-predisposing BRCA variant	Refers to a pathogenic or likely pathogenic variant of the BRCA1 or BRCA2 gene (see below) which predisposes the affected individual to certain cancers
Pathogenic or likely pathogenic BRCA variant	An alteration in a BRCA1 or BRCA2 gene which leads to an increased risk of certain cancers

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Dr Ciara Kelly, SpR in Public Health Medicine & Dr Triona McCarthy, Director of Public Health, NCCP

Note on Terminology

Many different medical terms are used to describe genetic variants which predispose a person to disease. In the case of BRCA, the term 'BRCA mutation' is often used to describe inheritance of a pathogenic or likely pathogenic variant of BRCA. This is an older term which nowadays tends to be replaced by the term 'variant.' A recent publication by the British Medical Journal (BMJ) suggested use instead of the term 'cancer-predisposing BRCA variant' due to its technical accuracy and clarity for different audiences.¹ This term will be used in this report in place of the phrase 'BRCA mutation.' The term 'BRCA carrier' will also be used in this report to refer to a person who has been diagnosed with an inherited cancer-predisposing BRCA variant.

Executive Summary

Background and Context

Recommendation 19 of the current National Cancer Strategy (NCS) 2017-2026 states 'The National Cancer Control Programme (NCCP) will further develop the Programme for Hereditary Cancers to ensure that evaluation, counselling, testing and risk reduction interventions are available as appropriate, and that services are available to patients on the basis of need.' It was also recognised in the NCS that the role of genetics in cancer care – including preventative care – is expanding, with a need for greater resources to support this.

An important patient group to whom Recommendation 19 applies is persons diagnosed with cancer-predisposing variants of the BRCA1 and BRCA2 genes in Ireland (referred to hereafter as BRCA carriers). Persons with a cancer-predisposing BRCA variant have increased risks of several cancers – in particular, female breast and ovarian cancer, male breast and prostate cancer, and pancreatic cancer. The diagnosis of a cancer-predisposing variant of BRCA is life-changing for the affected individual, and the health needs of a BRCA carrier are many. Such needs range from those specific to clinical interventions to reduce cancer risk (such as risk-reducing surgery, cancer surveillance and chemoprevention) and to manage a cancer diagnosis, to psychosocial needs (such as coping with the diagnosis, discussing implications with family, decision-making regarding risk management options, psychosexual health and self-image).

The true number of BRCA carriers in Ireland is currently unknown, although the prevalence of cancer-predisposing BRCA variants in the general population has been examined in previous international studies. Historical data suggested a frequency of approximately 1 in 400 individuals (0.25%) in general (non-cancer) Westernised populations, acknowledging the exception of populations with a higher frequency of founder mutations, such as members of the Ashkenazi Jewish population.^{2,3} In a more recent study from Australia which examined the frequency of 18 breast cancer predisposition genes among breast cancer-affected cases and cancer-free controls, a comparatively higher frequency for BRCA of 0.65% (1:153) - 0.20% (1:500) for BRCA1 and 0.45% (1:222) for BRCA2 - was found among the 1,997 controls.^{2,4}

Rationale

There is no national database or register of persons diagnosed with a cancer-predisposing variant of BRCA in Ireland, and there are also very limited epidemiological data and research available on this population nationally. This precludes valid enumeration of the population, examination of cancer risk reduction strategies chosen by individuals, estimation of cancer incidence among the population, and follow-up of patient outcomes, as well as projections and planning for service needs for these patients. There are also no national guidelines specific to the management of BRCA carriers, although other countries and organisations have developed formal guidance documents for this purpose, including the European Society of Medical Oncology (ESMO), the United Kingdom (UK) National Institute for Health and Care Excellence (NICE) and the United States of America (USA) National Cancer Care Network (NCCN), among others.

To fill an important knowledge gap regarding the BRCA population in Ireland, the NCCP undertook a formal Health Needs Assessment to examine the needs of this population and identify areas where such needs are not currently met across cancer care (and other) services in Ireland. The **scope** of this needs assessment was to address the needs of a BRCA carrier after diagnosis with a cancer-predisposing BRCA variant. The key components of this needs assessment included a review of international guidelines and peer-reviewed literature, data collection from the eight adult cancer centresⁱ and clinical genetics services in Ireland, the Hospital In-Patient Enquiry (HIPE) dataset for risk-reducing surgical activity, and input from stakeholders including a multi-disciplinary steering group and members of the Marie Keating Foundation BRCA Support Group.

Using information provided by cancer centres and public clinical genetics services, a limited descriptive analysis of the epidemiology of BRCA in Ireland was undertaken, as described in detail in the Results section, with key points summarised below.

Epidemiology of BRCA in Ireland

Prior to commencing work on this project, it was acknowledged that in the absence of a national database or register for individuals with a cancer-predisposing BRCA variant in Ireland, multiple data sources would need to be explored. This was considered necessary to inform as accurately as possible an estimation of the size and, if feasible, epidemiology of the BRCA population in Ireland. To achieve this, data were requested from cancer centres in Ireland, and from clinical genetics services.

Nominated representatives from seven out of eight cancer centres were able to provide data on the BRCA population under follow-up in their service. Based on these data, a minimum of 1012 persons with a cancer-predisposing BRCA variant were reported to be currently under follow up in cancer centres in Ireland. Five hospitals were able to provide a breakdown of figures by BRCA1 versus BRCA2 status. Four hospitals provided a gender breakdown – based on this information, the majority of BRCA carriers under follow-up were female.

The estimate of at least 1012 BRCA carriers currently under follow-up in cancer centres in Ireland is chiefly limited by underestimation. Cancer centres highlighted limitations of these data in this context - for example (for some centres) non-inclusion of those with a cancer diagnosis, or of patients from all consultants in the centre. To explore the possible extent of this underestimation, the size of the female general population aged 30 – 70 years old in Ireland was obtained from the 2016 Census.⁵ There were approximately 1.24 million females aged 30 – 69 years old (exact figure: 1,244,836) in this most recent Census. Applying a general population frequency of 1 in 400 (0.25%) for cancer-predisposing BRCA variants to this would suggest there are approximately 3,112 women in this age group with a cancer-predisposing BRCA variant in Ireland. This highlights the potential degree of underestimation of the figure (minimum n=1012) obtained for this report. While this is a crude estimate, this does provide some indication of the potential size of the BRCA population in Ireland, and highlights the possible degree of underestimation from data obtained from cancer centres.

Data were also provided by public clinical genetics services via the Children's Health Ireland at Crumlin laboratory and St. James's Hospital Cancer Genetics Service, to inform an estimation of annual new diagnoses of cancer-predisposing BRCA variants in Ireland. An estimated 642 genetic test samples

ⁱ Hereafter, the term 'cancer centres' will be used to refer to the eight **adult** cancer centres in Ireland.

were identified as positive for a cancer-predisposing BRCA variant between the years 2000 and 2020. These figures were examined in further detail for annual estimates over the five-year period 2015-2019. There was an annual detection rate range of 6.4% – 10.9% (n=36-64 cases per year), with overall trend of increasing volume of samples being referred for genetic testing. Comprehensive estimates of the number of samples identified as positive for a cancer-predisposing BRCA variant were not available from private clinical genetics services. As such, it should be acknowledged that the data provided by public clinical genetics services represent an underestimation. The proportion of samples tested in public versus private services is not known. This is also recognised as a limitation of this needs assessment.

Stakeholders to this project also highlighted there is likely under-ascertainment of persons with a cancer-predisposing BRCA variant in Ireland. Greater application of genomic testing is likely to increase identification of this population, and services for them will need to be planned accordingly.

Recommendations of the Needs Assessment

Eight overarching themes with associated issues specific to the needs of the BRCA population in Ireland were identified in this needs assessment. Recommendations were made under these themes as the main output of this report and are summarised below. From a national health policy perspective, it should be noted that these recommendations are aligned with the fundamental principles of Sláintecare, Ireland's current health service reform programme.⁶ These include prevention and public health, timely access to care, ensuring the patient/service user is paramount, workforce, accountability and governance. The Sláintecare Implementation Strategy also highlighted the importance of population health needs assessment to assess the health needs of specific groups, to inform the development and implementation of new models of care.⁷

The next steps in progressing the recommendations of this report are outlined at the end of this Executive Summary.

1. Information Needs

A consistent and strong message from all stakeholders to this needs assessment was the need for accessible, jargon-free, comprehensive informational resources for BRCA carriers which cover all key aspects of a BRCA diagnosis, including the implications of this diagnosis for the individual and their family members, and cancer risk management options. Collaboration with stakeholders leading the development of existing Irish resources such as www.cancergenetics.ie and www.thisisGO.ie is needed. A need for education specifically for healthcare professionals working with BRCA carriers was also articulated.

Recommendations:

- 1.1 Accessible, inclusive (across age, language and ethnicity) and jargon-free informational resources should be developed for, and available as part of routine care to, BRCA carriers. Consultation with BRCA carrier stakeholders should be part of the development of any such resources.

- 1.2 Development of BRCA information resources specifically for healthcare professionals working in primary care and cancer centres in Ireland is required. This should be informed by consultation with clinical subject matter experts.

2. Data on BRCA in Ireland

There is currently no national database or register for persons with a cancer-predisposing BRCA variant in Ireland. Although some cancer centres record BRCA status of patients under follow-up for family history of breast cancer locally, the completeness of these data is variable. The lack of a national database or register of persons with a cancer-predisposing BRCA variant in Ireland precludes the identification and estimation of the size, epidemiology and needs of this population, as well as follow-up of patient outcomes; and projections and planning for cancer risk management services. Adequate resources to maintain up to date and accurate data are also needed, as well as agreement of appropriate information governance structures.

Recommendations:

- 2.1 A national database with an agreed minimum dataset should be established capturing data pertaining to BRCA carriers under follow-up in this country. Ideally this would include data from public and private clinical services. This could be developed as part of a national database for inherited cancer predisposition. Such a database should be based on the use of a unique patient identifier. It should support national planning and co-ordination of services for the BRCA population and facilitate local follow-up of patients. There should be adequate resources to maintain it.
- 2.2 Local databases, standardised with respect to an agreed minimum dataset i.e. a single data dictionary, should be established in cancer centres which capture data pertaining to BRCA carriers under follow-up.

3. Specialist Genetics Input

There are several pathways to a diagnosis of a cancer-predisposing BRCA variant. For example, some individuals do not have a cancer diagnosis and are tested due a relative's BRCA status. In this case, the individual would receive pre-test genetic counselling and genetic testing from clinical genetics services. Others have a cancer diagnosis and are tested either due to a suspicion of an inherited predisposition or as assessment of suitability for certain drug treatments. Therefore, the pathway to diagnosis can influence the degree of specialist genetics information patients receive prior to their diagnosis. In this needs assessment, improved access to specialist clinical genetics expertise was highlighted as an undeniable need. BRCA carriers want to be able to ask relevant questions of suitably qualified healthcare professionals after diagnosis.

Areas where specialist genetics input are also needed include resources to support discussing a BRCA diagnosis with family members and information regarding reproductive options such as pre-implantation genetic diagnosis (PGD).

Recommendations:

- 3.1 BRCA carriers should have access to suitably qualified healthcare professionals after their consultation at diagnosis with clinical genetics, to ask any questions that arise after they have had a chance to process their diagnosis. Some of these queries could be addressed by designated genetics-trained healthcare professional(s) (e.g. Advanced Nurse Practitioners (ANPs)) in cancer centres, while other queries would fall within the remit of Genetic Counsellors.
- 3.2 BRCA carriers should be provided with information regarding, and signposted to, family planning resources including accessing PGD and in-vitro fertilisation (IVF).
- 3.3 BRCA carriers should be considered eligible for publicly available onco-fertility services.

4. Structured Care Pathway and Co-ordination of Care

The lack of a structured care pathway for BRCA carriers in Ireland was highlighted. Care needs to be better coordinated and there should be a dedicated point of contact for BRCA carriers in each cancer centre.

Recommendations:

- 4.1 Improved coordination of care is required, including between clinical genetics services and cancer centres. This could be delivered by a nurse-led service, with the CNS/ANP also acting as the dedicated point of contact for BRCA carriers, within the cancer centres.
- 4.2 Development of a nurse-led service for BRCA carriers will require specialist training and support. There is benefit to the autonomous clinical role of an ANP in this context.
- 4.3 The model of care (including clinical governance) for BRCA carriers needs to be improved and standardised across all cancer centres, to ensure consistency in and access to optimal standards of care in all geographic areas. Further dedicated consultation on the desired model of care is needed with input from all relevant stakeholders.
- 4.4 All elements of the patient care pathway (structures, processes and outcomes) should have defined quality standards and a subset of specific key performance indicators to facilitate performance measurement.
- 4.5 Patient-reported experience measures should be an embedded quality indicator.

5. Risk-Reducing Surgery

Several representatives from cancer centres who inputted to this needs assessment highlighted significant waiting times for risk-reducing surgery in their centres. This is largely due to a lack of protected theatre time, space and funding, which was further exacerbated by the impact of the COVID-19 pandemic on hospital services. In general, surgeries in an asymptomatic otherwise healthy BRCA carrier are not prioritised above tumour-directed breast or ovarian cancer surgery. However, current waiting times for risk-reducing surgery were considered unacceptable and distressing for BRCA carriers. While all cancer centres currently offer risk-reducing breast and ovarian surgery, an appropriate re-configuration of services for risk-reducing surgery, that would result in low wait times and the best clinical outcomes for women, is now required.

In addition, there is variation between cancer centres with respect to availability of specialist plastic surgery input, limiting the breast reconstruction options available to women. A need for improved

post-operative support – both physical and psychological – was also highlighted by BRCA carriers who inputted to this needs assessment.

Recommendations:

- 5.1 Risk-reducing breast and ovarian surgery for BRCA carriers requires a dedicated pathway with protected resources and should be delivered in a timely fashion. The appropriate configuration of services for risk-reducing surgery, that would result in low wait times and the best clinical outcomes for women, should now be examined.
- 5.2 Adequate post-operative support following risk-reducing surgery (e.g. physiotherapy, psychological support) should be available to patients.
- 5.3 All women should have timely access to specialist plastic surgery expertise regarding breast reconstruction options, and reconstructive surgery itself, if desired.

6. Surveillance

Similar to risk-reducing surgery, while most centres have the physical infrastructure to offer breast surveillance to BRCA carriers, guarantee of surveillance intervals may be impeded by the many competing demands on radiological resources. Ovarian surveillance in asymptomatic BRCA carriers is not recommended, as there is currently insufficient evidence to support any mortality benefit for BRCA carriers. This needs to be communicated very clearly to BRCA carriers who enquire about such surveillance. A lack of available information regarding the risks and benefits of cancer surveillance for male BRCA carriers was also highlighted.

Recommendations:

- 6.1 There should be protected magnetic resonance imaging (MRI) and mammography slots for breast surveillance of asymptomatic BRCA carriers, to ensure surveillance imaging occurs at recommended intervals.
- 6.2 Ovarian surveillance by transvaginal ultrasound and/or Cancer Antigen (CA)-125 measurement is not recommended for BRCA carriers.
- 6.3 Female BRCA carriers who request ovarian surveillance should be made aware of the lack of evidence to demonstrate a survival benefit.
- 6.4 Greater awareness of the risks and benefits of prostate cancer surveillance for male BRCA carriers – particularly for BRCA2 – is needed among patients as well as healthcare professionals. It is not yet known whether surveillance using PSA reduces mortality in men with a cancer-predisposing BRCA variant
- 6.5 An evidence review of international pancreatic cancer surveillance guidelines for BRCA carriers is needed.

7. Psychological Support

A significant lack of publicly available psychological support for BRCA carriers was highlighted by stakeholders. Some centres provide (and require) psychological assessment for BRCA carriers prior to risk-reducing surgery, but ongoing access to psychological support services for individuals and their families is much less readily available. The value of and need for such support was clear, particularly

during the cancer risk management decision-making process. A need for signposting to external peer-based supports for BRCA carriers was highlighted also.

Recommendations:

- 7.1 Psychological support including professional support should be offered (but not mandatory) to all BRCA carriers following a diagnosis of a cancer-predisposing BRCA variant. This should be available if needed throughout the patient journey, including but not only at times such as undergoing risk-reducing surgery and in the event of a cancer diagnosis.
- 7.2 Education initiatives should include the education and training needs of the psychology profession specific to inherited cancer predisposition.
- 7.3 BRCA carriers should be signposted following diagnosis to psychological supports (both professional and peer-based), including those external to cancer centres .

8. Women's Health

Pre-menopausal female BRCA carriers who chose to undergo risk-reducing bilateral salpingo-oophorectomy (RR-BSO) face an immediate surgically-induced menopause, the implications of which include symptoms of oestrogen deprivation and longer-term health risks (such as cardiovascular disease, osteoporosis and cognitive decline).⁸ A need for access to information and expertise regarding menopause management (hormonal and non-hormonal) was articulated by stakeholders to this needs assessment. Of note, Action 4 of the National Women's Health Action Plan 2022-2023 – launched March 2022 - includes 'Changing the approach to menopause care to increase the public supports available to women before, during and after menopause', with commitment to investment in expanding the number of publicly-funded specialist menopause clinics in Ireland to four total.⁹

Recommendations:

- 8.1 Women should have access to clear information regarding the symptoms and longer-term health risks associated with early menopause, prior to risk-reducing surgery.
- 8.2 Women should have access to expert advice regarding their options for menopause management (hormonal and non-hormonal), which could be provided by a suitably trained doctor, ANP or other adequately trained healthcare professional.
- 8.3 Women should be referred to specialist menopause clinics if adequate support or expertise is not available in their hospital.

Next Steps

With respect to the next steps in addressing the needs of the BRCA population in Ireland, this Needs Assessment and its recommendations were presented to, and subsequently approved by, the NCCP Executive in early April 2022. As such, the NCCP will now prepare an implementation plan to progress the recommendations of this report. Input received from public consultation on this report will also inform this process.

It should also be noted that stakeholders to this needs assessment highlighted the issue of management of patients identified with other cancer predisposition syndromes. These include those

that confer risks similar to BRCA (such as PALB2, CDH1, TP53 and others), and others such as Lynch Syndrome. The findings of this needs assessment and service solutions that will be developed as a result of it are highly relevant to these populations. Examination of current literature on both of these issues was outside of the scope of this needs assessment. However, this will require further exploration in the future with cancer centre and clinical genetics stakeholders.

1. Introduction

1.1 Background

1.1.1 BRCA 1 and 2

The BRCA1 and BRCA2 genes, located on chromosomes 17 and 13 respectively, are tumour suppressor genes, and play a key role in repair of DNA damage.¹⁰ Since their discovery in the early 1990s, research has identified several increased cancer risks conferred by germline mutations in BRCA1 and 2, including risks for breast (male and female), ovarian, prostate, pancreatic, and possible others.¹¹ The exact cancer risk depends on several factors, including the BRCA gene involved, the specific gene alteration, age, gender, lifestyle factors, environmental factors and other genetic modifiers.¹² Table 1 below outlines the approximate lifetime cancer risks for BRCA1 and BRCA2 for female breast, ovarian, male breast and prostate cancer, and pancreatic cancer.^{13–15} For women with BRCA1 or BRCA2, the risks of breast and ovarian cancer are markedly increased compared to the general population. For men with BRCA2, the risks of male breast and prostate cancer are particularly elevated above the general population risk, while men with BRCA1 have a slightly higher risk for male breast cancer and prostate cancer compared to that of the general population. The risk of pancreatic cancer is also elevated for males and females.

Table 1. Lifetime Cancer Risks Associated with BRCA1 and BRCA2.

	BRCA1	BRCA2
Women: Without breast cancer Risk of Breast Cancer ¹³ (Cumulative risk up to age 80)	72% (95% CI 65-79)	69% (95% CI 61-77)
Women: Risk of New Breast Cancer in Contralateral Breast ¹³ (Cumulative risk 20 years after first breast cancer diagnosis)	40% (95% CI 35-45)	26% (95% CI 20-33)
Ovarian Cancer ¹³ (Cumulative risk up to age 80)	44% (95% CI 36-53)	17% (95% CI 11-25)
Male: Breast Cancer ¹⁴ (Cumulative risk up to age 80)	0.4% (95% CI 0.1-1.5)	3.8% (95% CI 1.9-7.7)
Prostate Cancer ¹⁵ (Cumulative risk up to age 85)	29% (95% CI 17–45)	60% (95% CI 43–78%)
Pancreatic Cancer ¹⁴ (Cumulative risk up to age 80)		
Male	2.9% (95% CI 1.9-4.5)	3.0% (95% CI 1.7-5.4)
Female	2.3% (95% CI 1.5-3.6)	2.3% (95% CI 1.3-4.2)

CI = Confidence Interval

1.1.2 Needs of Persons Identified with a Cancer-Predisposing BRCA Variant

The identification of a cancer-predisposing BRCA variant is a life-changing diagnosis. The health needs of a BRCA carrier are broad, ranging from clinical needs for healthcare intervention to reduce cancer risks (such as risk-reducing surgery, cancer surveillance, chemoprevention) and to manage cancer if diagnosed, to psychosocial needs such as coping with the diagnosis, discussing implications with

family, decision-making regarding risk management options, psychosexual health and self-image. Figure 1 outlines the key areas of need for a person with a cancer-predisposing BRCA variant.

Figure 1. Key Areas of Need for a Person with a Cancer-Predisposing BRCA Variant



Addressing these needs requires involvement of various healthcare specialties and services within a given healthcare system over time. Female BRCA carriers in particular have to come to terms with challenging and complex decisions regarding options - such as risk-reducing surgery and surveillance - to reduce BRCA-associated breast and ovarian cancer risks. In addition, identification of a cancer-predisposing BRCA variant has implications for not only the affected individual, but also their family, as BRCA has an autosomal dominant pattern of inheritance resulting in a 50% (1 in 2) risk of a child or sibling (if parent is a carrier) of a BRCA carrier inheriting the same gene variant.¹²

1.2 Context

1.2.1 Cancer Centres in Ireland

Cancer Centres in Ireland are defined by the Health Service Executive (HSE)¹⁶ as hospitals in which 'staff with specialist expertise in cancer/specific types of cancer are concentrated', with 'a multi-disciplinary approach, an appropriate workload and the availability of necessary supports to achieve the best practice.' There are nine designated cancer centres in Ireland - eight of which are specific to adult cancer care - and all are part of the public hospital system. Table 2 below outlines the cancer centres in Ireland (the first eight of which are specific to adult cancer care) and their associated hospital group.¹⁷ Currently, persons identified with a cancer-predisposing BRCA variant may attend any of the (adult) cancer centres for follow-up and intervention.

Table 2. Cancer Centres in Ireland and Respective Hospital Groups.

Hospital Group	Cancer Centre
Royal College of Surgeons in Ireland (RCSI)	Beaumont University Hospital
Ireland East	Mater Misericordiae University Hospital (MMUH)
	St. Vincent's University Hospital (SVUH)
Dublin Midlands	St. James's University Hospital (SJH)
South/Southwest	Cork University Hospital (CUH)
	University Hospital Waterford (UHW)
Saolta University	Galway University Hospital (GUH) Satellite: Letterkenny General Hospital
University Limerick	University Hospital Limerick (UHL)
Children's Health Ireland (CHI)	CHI, Crumlin

1.2.2 Role of the National Cancer Control Programme and Rationale for Project

The National Cancer Control Programme is a directorate of the Health Service Executive (HSE) and was established in 2007. The NCCP was tasked with implementing cancer strategy in Ireland, with the aim of reducing cancer incidence, morbidity and mortality, and improving quality of life for those living with cancer in Ireland.¹⁸ In the most recent National Cancer Strategy 2017-2026,¹⁹ Recommendation 19 stated 'The NCCP will further develop the Programme for Hereditary Cancers to ensure that evaluation, counselling, testing and risk reduction interventions are available as appropriate, and that services are available to patients on the basis of need.' The expanding role of genetics in cancer care, both from the treatment and prevention perspective, was recognised, and the need for increased investment in resources for this area.

The COVID-19 pandemic, since its beginning in early 2020, has impacted all aspects of cancer care in Ireland and continues to do so.²⁰ However, it remains critically important that optimal cancer care – including preventative care - be provided to patients while balancing protection of healthcare staff and patients from COVID-19. In July 2021, the Community Oncology/Public Health division of the NCCP identified a Health Needs Assessment for persons diagnosed with a cancer-predisposing BRCA variant as an NCCP priority project, under the NCS Recommendation 19. The Public Health Medicine Specialist Registrar seconded to the NCCP was appointed as Project Lead and work subsequently commenced on this project in August 2021.

1.3 Process

1.3.1 Defining Health Needs Assessment

Health needs assessment (HNA) is a public health tool, which can be defined as 'a systematic method for reviewing the health issues facing a population, leading to agreed priorities and resource allocation that will improve health and reduce inequalities'.²¹ The benefits of HNAs include fostering greater public and patient involvement and participation in decision-making; better use of resources; greater cross-sectoral working and partnership; improved communication with patients, the public and other organisations; and ultimately, improved patient care.

1.3.2 Process for Needs Assessment

Approaches to HNA may be²²:

- Epidemiological – considering the epidemiology of the condition of interest, current provision of services for the population, and effectiveness of services and interventions
- Comparative – comparing service provision between populations
- Corporate – seeking views of stakeholders

In practice, HNAs often involve a combination of the above approaches. The key steps to a HNA are summarised below²¹:

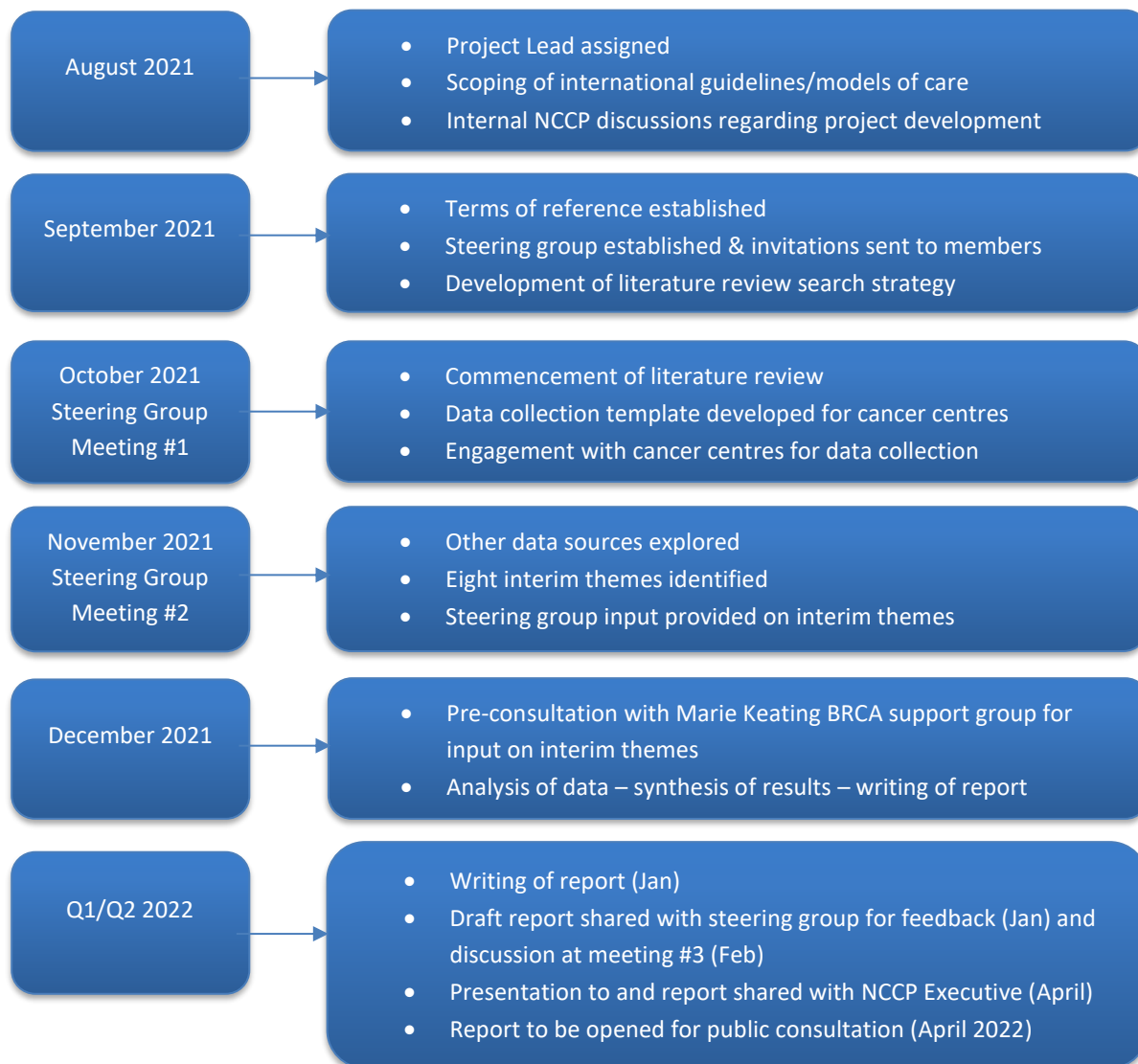
1. Planning – define population of interest/aim of HNA/stakeholders/resources
2. Identifying health priorities – profile population/review current service provision
3. Identifying priorities for change
4. Planning for and implementing change
5. Monitoring and evaluation of any change implemented

This report will focus on Steps 1 to 3 as applied to this HNA. Steps 4 is in progress, and Step 5 has not yet commenced at present.

1.3.3 Timeline of Process for Needs Assessment

Figure 2 below outlines the timeline of the process for this needs assessment.

Figure 2. Timeline of Process for BRCA Health Needs Assessment.



1.4 Structure of Report

This report commences with an overview of the methodology for this needs assessment followed by review of international peer-reviewed literature and guidelines. A synthesis of results from data collected for this needs assessment is then presented followed by a discussion of key findings, and project strengths and limitations. Finally, the key issues identified are summarised with associated recommendations for change.

2. Aims and Objectives

2.1 Aim

To undertake a health needs assessment for individuals with a diagnosis of a cancer-predisposing BRCA variant in Ireland, with a view to making health service recommendations to adequately meet the needs of this population.

2.2 Objectives

The objectives of this needs assessment were to:

1. Define the needs of the BRCA population by undertaking a review of peer-reviewed literature, and international guidelines.
2. Estimate the size and epidemiology of the BRCA population in Ireland through use of available data sources.
3. Define and describe the services currently available to BRCA carriers in Ireland through engagement with cancer centres in Ireland.
4. Engage and consult with stakeholders (from the BRCA population and health services) to determine views regarding existing and desired services.
5. Determine the most appropriate and (clinically and cost) effective solutions to meet the unmet needs of the target population.
6. Determine the resource implications of meeting unmet needs.
7. Monitor and evaluate any changes implemented.

This report focuses on objectives 1-5. Additional work on objective 5, and commencement of work on objectives 6 and 7, will follow as part of development of an implementation plan by the NCCP to progress the recommendations of this report.

3. Methods

3.1 Project Oversight and Steering Group

A multi-disciplinary steering group for this needs assessment was established in September 2021. The project terms of reference and steering group membership are available separate to this report as Appendices A and B respectively. During the course of the project three virtual meetings of the steering group were held – the majority of members were in attendance on each occasion.

3.2 Ethics and GDPR

Formal ethical clearance was not sought for this needs assessment as there was no formal research component to it, i.e. no quantitative or qualitative study conducted as part of the process. All data collected were for service planning purposes and no patient-identifying data were collected. Data collection was conducted in line with the General Data Protection Regulations (GDPR).

3.3 Data on BRCA in Ireland

Prior to commencing work on this project, it was acknowledged that there is currently no national database or register for individuals with a cancer-predisposing BRCA variant in Ireland. In the absence of such a resource, it was agreed that multiple data sources – both quantitative and qualitative – should be explored, to inform as accurately as possible estimation of the size and epidemiology of the BRCA population in Ireland and to define services currently available to them in cancer centres.

3.4 Overview of Data and Information Sources

The project data and information sources are summarised below:

- Peer-Reviewed Literature and International Guidelines
- Quantitative Data Sources
 - Cancer centres in Ireland – using a bespoke data collection template to collect data on the number of persons with a cancer-predisposing BRCA variant under follow-up (as proxy of prevalence) and the structure and process of services currently available to them.
 - Clinical genetics – for estimates of annual new diagnoses of BRCA (as proxy of incidence).
 - The Hospital In-Patient Enquiry (HIPE) dataset – for estimates of annual activity for risk-reducing breast (mastectomy) and ovarian (bilateral salpingo-oophorectomy) surgery.
- Qualitative Data Sources
 - Qualitative research recently conducted by Ms. Nikolett Warner (one of two steering group representatives for the Marie Keating Foundation BRCA Support Groupⁱⁱ) on the

ⁱⁱ An online peer support group for BRCA carriers organised and run by the Marie Keating Foundation.

medical and coping experiences of persons with a cancer-predisposing BRCA variant in Irelandⁱⁱⁱ (unpublished - under review for publication at time of writing^{iv}).

- Pre-consultation with the Marie Keating Foundation BRCA Support Group.

3.5 Quantitative Data

3.5.1 Data Collection from Cancer Centres

3.5.1.1 Data Collection Template

A bespoke data collection template was created (available separate to this report as Appendix C) by the Project Lead^v, designed for administration via virtual interview with a representative (or representatives) from the relevant cancer centre. There were four specific sections of the template^{vi}, pertaining to:

- Whether the centre had a database of BRCA carriers under follow-up.
- The number of BRCA carriers under follow-up by the centre. Estimates according to BRCA1 vs. BRCA2 status, age and gender were requested, if available.
- International guidelines and/or internal policies/protocols used to guide management of BRCA carriers.
- The current structure of and process for services for BRCA carriers under follow-up – specifically in relation to risk-reducing surgery, surveillance, chemoprevention and psychological support.

3.5.1.2 Data Collection Process

Figure 3 outlines the process for data collection from the cancer centres^{vii}:

ⁱⁱⁱ Ethical approval was granted for Ms. Warner's own work, separate to and independent of this Health Needs Assessment and prior to the commencement of this work.

^{iv} As of March 16th 2022.

^v With input from the Project Supervisor.

^{vi} At the end of each interview, cancer centre representatives were encouraged to raise any additional areas or issues not included in the data collection template which they felt were relevant to the needs assessment.

^{vii} One of the centres has a satellite hospital with its own Breast Service unit, and a separate interview was therefore completed with a representative from this hospital.

Figure 3. Process for Data Collection from the Cancer Centres.



Cancer centre representatives included healthcare professionals in the following roles^{viii}:

- Consultant Breast Surgeon
- Advanced Nurse Practitioner, Breast Care
- Candidate Advanced Nurse Practitioner, Breast Care
- Candidate Advanced Nurse Practitioner, Breast Family Risk
- Family History Clinical Nurse Specialist, Breast Care
- Consultant Gynaecological Oncologist
- Cancer Services Manager
- Cancer Services Data Manager
- Business and Operations Manager

3.5.2 Clinical Genetics

Estimates for annual new diagnoses of BRCA were requested from both public and private clinical genetics services. Cancer clinical genetics services are provided in the public sector by St James's Hospital Cancer Genetics Service and by the Department of Clinical Genetics at CHI at Crumlin. It was acknowledged that such figures may be underestimated given the impact the COVID-19 pandemic had on service provision and volume of testing, particularly during 2020.

^{viii} Roles of representatives varied by cancer centre and were mostly from the Breast Service of the centre.

3.5.3 Hospital In-Patient Enquiry Dataset

HIPE data were accessed to estimate the volume of risk-reducing breast and ovarian surgery performed across all centres in Ireland over the past decade (2011 to 2020 inclusive). The HSE Healthcare Pricing Office HIPE coding team were consulted with regarding to the optimal HIPE coding strategy^{ix}.

3.6 Qualitative Data

It was decided not to conduct formal qualitative research as part of this needs assessment. This was in view of recent qualitative research conducted on a sample of the BRCA population by Ms. Nikolett Warner - one of two representatives of the Marie Keating Foundation BRCA Support Group on the steering group - as part of her Health Psychology PhD in the National University of Ireland Galway (NUIG). This research – supervised by Professor AnnMarie Groarke (NUIG) - aims to explore the experiences, risk perceptions and health behaviours of BRCA carriers in Ireland.

Two studies completed to date as part of this research – under academic journal review for publication at present – were of particular relevance to this needs assessment, as they explored the subjective medical and coping experiences and needs of a sample of BRCA carriers. Ms. Warner kindly gave permission for inclusion in this report (and approved text of) a summary of the main themes identified in these two studies. Participants in these studies were required to be over the age of 18; have an identified cancer-predisposing variant of BRCA1/2; and have undergone genetic testing in Ireland. They were recruited through closed Facebook groups, the 2020 Marie Keating Foundation Annual BRCA Conference and an article in a national newspaper. Eighteen participants were interviewed (16 female and two male), with analysis of interview content completed through reflexive thematic analysis.

3.7 Pre-Consultation with Marie Keating Foundation BRCA Support Group

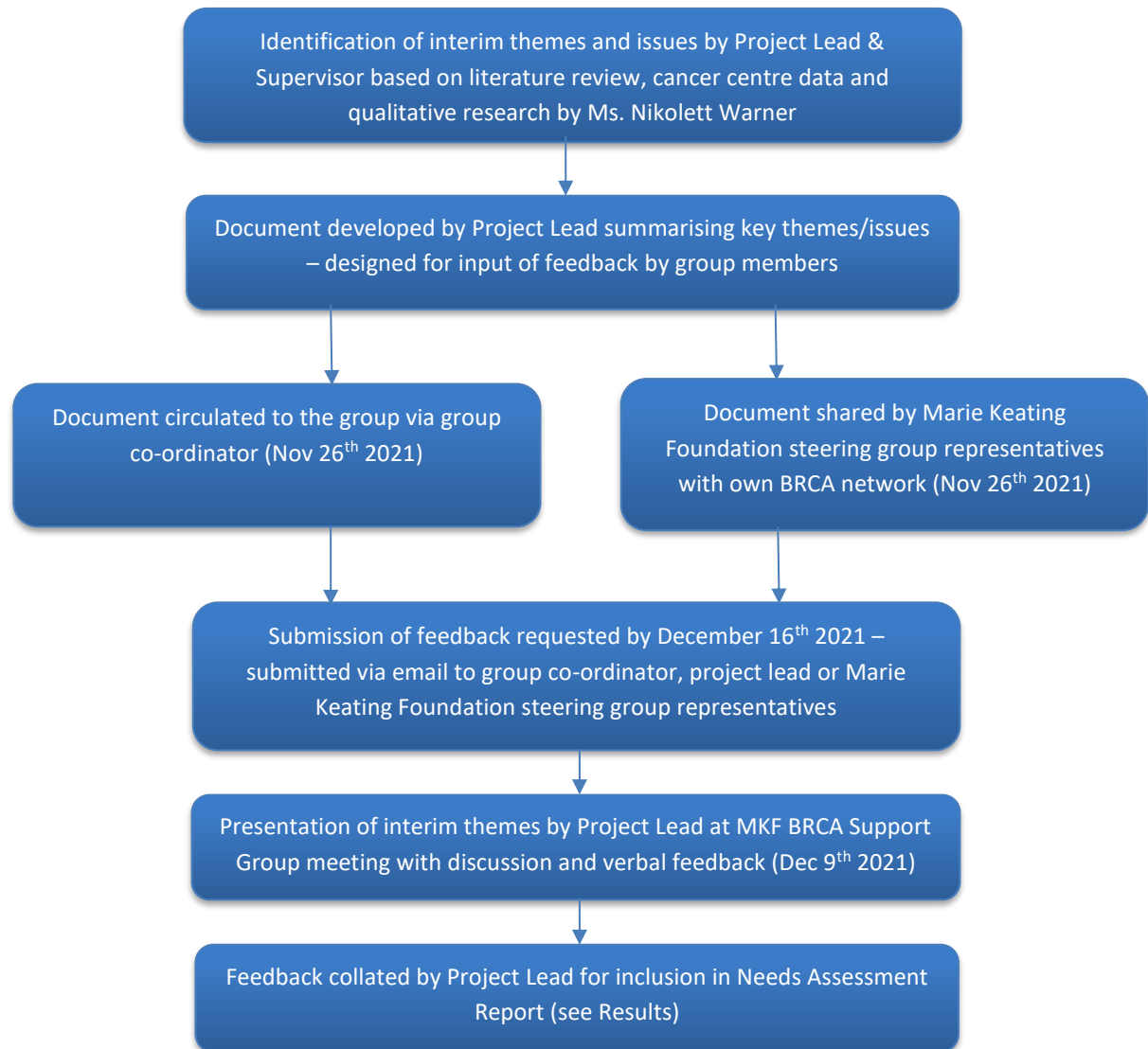
Public consultation is the process of actively seeking contributions from interested and affected groups on a particular issue.²³ In advance of drafting this report and prior to planned public consultation, a ‘pre-consultation’ was designed for completion with the Marie Keating Foundation BRCA Support Group. Development of this exercise was informed by the literature review for this report, cancer centre data and the previously mentioned qualitative research by Ms. Nikolett Warner.

The aim of this exercise, held in early December 2021, was to provide an opportunity for this group - as key stakeholders – to review and input on themes and associated issues identified at an interim stage of the needs assessment. Group members were advised that participation was voluntary.

A feedback document circulated as part of the pre-consultation exercise with the Marie Keating Foundation BRCA Support Group is available separate to this report as Appendix D. Eight interim themes were presented in this document with associated issues – these are discussed further in Results. Figure 4 outlines the process for the pre-consultation.

^{ix} Analysis run on December 17th 2021, by a member of the Cancer Intelligence Team within the NCCP.

Figure 4. Process for Pre-Consultation with the Marie Keating Foundation BRCA Support Group.



4. Literature Review

4.1 Overview and Literature Review Search Strategy

This literature review is a combined review of peer-reviewed studies and international guidelines. Findings regarding management of BRCA in women and men are presented separately. The literature search was completed via the Evidence Team of the HSE National Health Library and Knowledge Service, according to the NCCP Evidence Search Protocol. It should be noted that this review was not a systematic review and should not be interpreted as such. Appendix E (available separate to this report) details the literature review questions and study identification, screening and selection process. An additional targeted grey literature search was also completed by the Project Lead to specifically look for international guidelines specific to management of BRCA carriers.

4.2 Results of Literature Review

4.2.1 International Guideline Sourced

The international guidelines presented in this literature review were identified from:

- Europe (European Society of Medical Oncology (ESMO))²⁴
- The United Kingdom (UK) (National Institute for Clinical Excellence (NICE), Royal Marsden/Institute for Cancer Research)²⁵, National Health Service (NHS) Surveillance Protocols for Very High-Risk Women (published by Public Health England^x)²⁶
- The United States of America (USA) (National Comprehensive Cancer Network (NCCN))²⁷
- Australia (eviQ^{xi} – New South Wales)²⁸
- France (French National Cancer Institute)²⁹
- Spain (Spanish Society of Medical Oncology (SEOM))³⁰
- Germany (German Society for Gynaecological Oncology)³¹
- The Netherlands (National Breast and Ovarian Cancer Council Netherlands)³²
- Belgium (Belgian Society of Human Genetics)³³

4.2.2 Management of BRCA in Women

The key aspects of the above guidelines in relation to management of BRCA in women – including education, surveillance, risk-reducing surgery, chemoprevention and psychological support - are summarised in Appendix F (available separate to this report).

4.2.2.1 Education and Clinical Examination

Education regarding breast awareness and lifestyle advice for BRCA carriers is recommended internationally.^{24,25,27} NICE guidance also advises women be provided with contact details for local and

^x Public Health England was officially replaced by the UK Health Security Agency on October 1st 2021.

^{xi} eviQ is an Australian Government, freely available online resource of cancer treatment protocols developed by multidisciplinary teams of cancer specialists.

national support groups.²⁵ Clinical breast examination is recommended by ESMO and NCCN guidance for female BRCA carriers - in ESMO guidance, whichever is the earliest of age 25 or 10 years prior to the earliest breast cancer diagnosis in the family, and in NCCN guidance, every 6-12 months from age 25.^{24,27}

4.2.2.2 Risk-Reducing Surgery

Risk-reducing (RR) breast and ovarian surgery – specifically RR-bilateral salpingo-oophorectomy (BSO) and bilateral RR-mastectomy (B-RRM) - are considered the most effective strategies to reduce breast and ovarian cancer risks respectively in unaffected BRCA1 and BRCA2 carriers.²⁴

Risk-Reducing Ovarian Surgery

RR-BSO, which involves removal of both ovaries and the fallopian tubes, has been consistently shown to reduce ovarian cancer risk by 80-90%, and to confer a survival benefit, in BRCA carriers.²⁴ The risk of peritoneal carcinoma after RR-BSO is estimated at less than 1.9%.³⁴

The timing of RR-BSO is largely dependent upon whether a woman is BRCA1 or BRCA2 positive, and her family plans. Consideration of individual family history is also required. With respect to age, acknowledging some minor variation in international guidance, there is consistency in that RR-BSO is recommended at an earlier age in BRCA1 carriers, from age 35/between age 35 and 40, compared to BRCA2 carriers, in whom RR-BSO is recommended from age 40 /between age 40 and 45.^{24,27} Regarding family planning, RR-BSO is recommended after child-bearing is complete,^{28,35} with discussion of options for fertility preservation if a woman wishes to undergo RR-BSO before her family is complete.²⁴

Risk-Reducing Breast Surgery

B-RRM has been shown to reduce the risk of breast cancer in asymptomatic BRCA carriers by approximately 90%, depending on the surgery type completed,²⁴ based on retrospective and prospective observational studies (as no randomised controlled trials have been completed on this intervention). A 2016 systematic review of cancer risk reduction and survival benefits associated with RR-surgery found the risk of breast cancer after B-RRM to be less than 3%.³⁴

Although improvements in survival following B-RRM were not demonstrated in earlier studies, this was hypothesised to be due to inadequate length of participant follow-up.³⁶ Previous modelling studies have suggested almost comparable survival between B-RRM with RR-BSO and breast surveillance (using MRI and mammography) with RR-BSO.³⁶ However, prospective data to confirm this are limited. A more recent prospective cohort study from the Netherlands³⁶ - published in 2019 – followed 2,857 female BRCA1/2 carriers (1,712 BRCA1; 1,145 BRCA2). This demonstrated significantly lower overall and breast-cancer specific mortality rates among BRCA1 carriers who chose B-RRM compared to those who opted for breast surveillance. Among BRCA2 carriers, there was insufficient data to examine breast-cancer specific mortality rates, although a non-significant negative association with overall mortality was observed for those who selected B-RRM versus surveillance. Criticisms of this study included suboptimal statistical power and inadequate length of follow-up in the BRCA2 group.³⁷ Further prospective studies with adequate length of follow-up are needed. At present, B-RRM and breast surveillance are offered to women as reasonable risk reduction options.

In female BRCA carriers with unilateral breast cancer – a cohort known to be at elevated risk of contralateral breast cancer - contralateral prophylactic mastectomy (CPM) has also been shown to reduce contralateral breast cancer risk by approximately 91%.³⁸ Similarly to B-RRM, improvement in survival in BRCA carriers who have undergone CPM has not been consistently identified in studies conducted to date, which have mostly been retrospective in design.

Comparison of surgical options for mastectomy and breast reconstruction are beyond the scope of this literature review. However, with respect to breast reconstruction after RRM, international guidelines recommend that all women should be afforded the opportunity to discuss breast constructive options - such as implant-based versus autologous (or ‘flap’) reconstruction³⁹ - and offered immediate breast reconstruction post-mastectomy.^{24,25,27}

Impact of Risk-Reducing Surgery on BRCA Carriers

RRM and RR-BSO are irreversible, life-changing surgeries.³⁴ RRM can have significant negative psychological impacts on women’s body image, self-esteem, sexuality and quality of life.⁴⁰ RR-BSO results in an immediate early menopause, with potentially debilitating symptoms of oestrogen deprivation and increased risks for non-cancer causes of morbidity and mortality such as cardiovascular disease, cognitive dysfunction and dementia, and osteoporosis.⁸ International guidelines recommend the implications and options for management of early menopause be discussed with female BRCA carriers pre-RR-BSO.^{25,27,35}

Reproductive factors are also relevant to decision-making regarding risk-reducing surgery and its impact on an individual. Previous research has described, for women whose family is not complete but wish to pursue RR-BSO as advised by their physician, increased pressure to have children in order to proceed with surgery by the recommended age.⁴¹ In the same study, pressure regarding the timing of B-RRM for women who wish to breastfeed their children was also described, as well as the impact of decisions to pursue risk-reducing surgery on relationships with current and prospective partners.

4.2.2.3 Surveillance

Breast Surveillance

Radiological breast surveillance is recommended for women with a cancer-predisposing BRCA variant who have not yet undergone or choose not to undergo B-RRM. A multi-modal surveillance strategy combining magnetic resonance imaging (MRI) and mammography is recommended internationally for most women. There is some variation internationally in the recommended age at which to commence breast surveillance, as summarised in Appendix F. NICE guidelines advise annual MRI from age 30 to 49, with addition of annual mammogram from age 40 to 69.²⁵ From age 70, mammographic surveillance as part of the population breast screening programme is recommended. Of note, the UK NHS breast surveillance guidance protocols - updated December 2021 - for very high-risk women differ slightly to NICE guidance, in that annual MRI is recommended from age 25 to 29.²⁶ Thereafter, recommendations are similar - from 30 to 39 annual MRI is advised, followed by annual MRI and mammography from age 40 to 50. From age 51 to <71, annual mammography +/- MRI is advised, with annual review of MRI on the basis of background density from age 50.

Use of ultrasound imaging in BRCA breast surveillance is not routinely recommended in international guidelines but may be used when MRI is not available or contraindicated, or to aid interpretation of results of mammography or MRI.^{24,27}

The question of whether breast surveillance confers a survival benefit from breast cancer in BRCA carriers remains under research and cannot be examined in a randomised controlled trial setting due to the ethical implications of having to offer no screening to one trial arm in such a design.⁴² However, several prospective observational studies have shown a favourable stage shift of cancers detected in BRCA carriers through breast surveillance.⁴²

Ovarian Surveillance

At present, there is no evidence to support a survival benefit from ovarian cancer surveillance for BRCA carriers, and there is variation in international guidance as to whether this should be offered to them, as summarised in Appendix F. ESMO guidelines state that six-monthly transvaginal ultrasound (TVUS) and Cancer Antigen (CA)-125 testing may be considered in BRCA carriers from age 30, but caution that the limitations of these measures as surveillance should be highlighted to patients.²⁴ Similarly, NCCN guidance states TVUS and CA-125 are of uncertain benefit, and may be considered 'at the clinician's discretion' from age 30-35.²⁷ The UK Royal Marsden/Institute for Cancer Research, US Food and Drug Administration (FDA), Dutch and Australian guidance advise against ovarian surveillance.^{35,43}

Recent prospective cohort studies from the UK and USA examined use of more frequent (4- and 3-monthly respectively) CA-125 testing evaluated using a 'Risk of Ovarian Cancer (ROCA)' algorithm - with TVUS dependent on ROCA result. These identified high sensitivity for ovarian cancer detection for this approach^{44,45} and evidence of a shift to earlier stage at diagnosis.⁴⁴ However, these studies are limited by low statistical power due to small numbers of incident cancers, and their findings cannot be used to infer survival benefit. There remains therefore a lack of evidence for ovarian surveillance as an effective alternative to RR-BSO. Further prospective research - including exploration of use of the ROCA algorithm - with larger cohorts is needed.

Surveillance for Other Cancer Risks

Pancreatic Cancer

Very limited clinical data are available currently to inform pancreatic cancer surveillance in BRCA carriers. Recent literature estimated lifetime risks (to age 80) for pancreatic cancer according to gender and BRCA1 vs. BRCA2 status.¹⁴ For male and female BRCA1 carriers, lifetime risks were 2.9% (95% CI 1.9-4.5%) and 2.3% (95% CI 1.5-3.6%) respectively, and for male and female BRCA2 carriers, 3.0% (1.7-5.4%) and 2.3% (1.3-4.2%) respectively. The International Cancer of the Pancreas Screening (CAPS) Consortium recommends pancreatic surveillance for BRCA carriers with at least one affected first-degree blood relative, or at least two affected relatives of any degree for BRCA2 carriers.⁴⁶ MRI/MRCP and EUS were recommended by the CAPS as first-line surveillance modalities. ESMO guidance highlights a lack of evidence to inform pancreatic cancer surveillance and suggests EUS or MRI/Magnetic Resonance Cholangiopancreatography (MRCP) beginning from age 50 or (if there is a family history of pancreatic cancer) 10 years earlier than the earliest diagnosis in the family.²⁴ NICE guidelines recommend MRI/MRCP or EUS to BRCA1/2 carriers with one or more first-degree relatives

with pancreatic cancer.⁴⁷ However, the UK Cancer Genetics Group challenged this recommendation as premature, citing concerns regarding overestimation of lifetime risks for pancreatic cancer for certain genes including BRCA1/2.⁴⁸ This group recommend pancreatic surveillance be undertaken only in the context of a clinical research trial. Appendix G (available separate to this report) summarises the key recommendations by international guidance publication.

Melanoma

A recent review published in the British Journal of Dermatology which synthesised evidence on skin cancer risk and BRCA status concluded that overall, studies to date have not demonstrated any strong associations between skin cancer risk and BRCA1 or BRCA2.⁴⁹ No studies have identified a statistically significant association between BRCA1 and melanoma. A small number of retrospective familial studies have identified a significantly increased risk of melanoma in probable BRCA2 carriers. However, these studies have several limitations including potential selection bias resulting in overestimation of cancer risk, and incomplete confirmation of BRCA and melanoma diagnoses. Other studies have identified non-significant associations. As such, at present there are insufficient data to inform melanoma surveillance in BRCA carriers. ESMO and NCCN guidelines acknowledge a possible melanoma risk in their recommendations. ESMO suggests annual full-body skin and eye examination could be considered for melanoma surveillance²⁴, while NCCN suggests 'general melanoma risk management', including annual full-body skin examination and minimisation of UV exposure.²⁷ SEOM guidelines recommend consideration of skin and eye examination according to personal and familial risk factors.³⁰

Endometrial Cancer

Findings from studies which have examined the risk of endometrial cancer in BRCA carriers are conflicting at present. At present, there are no international guidance recommendations to support endometrial surveillance, and hysterectomy at the time of RR-BSO is not currently recommended solely for the purposes of reducing cancer risk.⁵⁰ A 2021 systematic review and meta-analysis of 11 cohort studies which examined the risk of endometrial cancer in women with cancer-predisposing BRCA variants identified a slightly increased risk of endometrial cancer for this population, which was observed mainly for BRCA1.⁵¹ However, results were not adjusted for Tamoxifen use or previous history of breast cancer, limiting generalisability. The authors recommended decision-making for patient management in this context should be tailored to individual factors, including age, medical and family history, surgical risk factors and quality of life considerations. More recent studies have not identified a significant association between cancer-predisposing BRCA variants and endometrial cancer.^{14,52}

4.2.2.4 Chemoprevention

For female BRCA carriers who are awaiting or do not wish to pursue risk-reducing breast or ovarian surgery, two risk-reducing chemoprevention agents are recommended for consideration in conjunction with surveillance – for breast cancer, tamoxifen, and for ovarian cancer, the combined oral contraceptive pill (COCP). ESMO, NICE, NCCN and Australian guidance advise consideration of their use with discussion of the relevant risks and benefits with patients.^{24,25,27,28} Royal Marsden guidelines advise against offering chemoprevention to BRCA1 carriers, and for BRCA2 carriers to discuss risks and benefits if offering to patients with no contra-indications.³⁵

Little evidence is available to inform use of tamoxifen for chemoprevention in BRCA carriers. As regards primary prevention, a subgroup analysis of the large National Surgical Adjuvant Breast and Bowel Project - Prevention 1 (NSABP-P1) Trial did not identify any significant associations between BRCA1/2 status and tamoxifen use in relation to breast cancer risk.^{53,54} The associations differed by BRCA status – positive for BRCA1 and negative for BRCA2. However, very wide confidence intervals were observed, which was likely due to the very small number of identified BRCA carriers analysed (BRCA1 8, BRCA2 11). A 2015 meta-analysis of observational studies which examined use of tamoxifen as secondary prevention in BRCA1/2 carriers with primary unilateral breast cancer found a significant risk reduction in the incidence of contralateral breast cancer (CBC).⁵⁵ The potential for adverse effects is also an important consideration with respect to use of tamoxifen – in particular, possible increased risk of endometrial cancer.⁵³

A further point of note is the use of aromatase inhibitors (AIs) for risk reduction of CBC for BRCA carriers with a history of primary breast cancer. Previous research has shown the aromatase inhibitors (AIs) exemestane and anastrozole to be effective in reducing breast cancer incidence among postmenopausal general population women at high breast cancer risk.^{27,56} An added benefit of AIs is that they are not known to increase endometrial cancer risk, unlike Tamoxifen. However, minimal evidence is available regarding use of AIs in BRCA carriers. A preprint single centre retrospective cohort study published in 2021 was the first to evaluate the role of AIs in this context, and only study identified in this literature review which addressed this question.⁵⁷ Among the 935 women included, 53 and 94 participants had a BRCA1 and BRCA2 pathogenic variant respectively. AI therapy was significantly associated with reduced risk of CBC (HR 0.44 (95% CI 0.25-0.77)), irrespective of BRCA1 or BRCA2 status or whether used alone or in combination with tamoxifen. However, it is important to note that as this study represents a preprint, it has not yet undergone peer-review, and is based on a small sample. Further prospective studies with larger cohorts are needed to validate these findings.

Regarding use of the COCP, a 2011 meta-analysis by Cibula et al. of cohort, case-control and case-case studies found (based on analysis of three case-control studies which examined the association of breast or ovarian cancer risk with the use of the COCP in BRCA carriers) a significantly reduced risk of ovarian cancer in BRCA carriers for any COC use - comparable to the risk reduction seen in general population studies - and a significant trend by duration of use.⁵⁸ At present, data on breast cancer risk from COCP use in BRCA carriers are considered heterogeneous and inconsistent.^{59,60}

Overall, further prospective research is needed on use of tamoxifen, AIs and the COCP as chemoprevention for BRCA carriers.

4.2.2.5 Psychological Support

BRCA carriers are faced with complex decisions regarding strategies to reduce their cancer risks, and how to communicate their diagnosis to family members. Studies have reported elevated levels of psychological distress among BRCA carriers after diagnosis,^{61,62} although there is conflicting literature at present regarding the trajectory of psychological coping with BRCA over time.⁶³ The reasons for psychological distress among BRCA carriers are many. Choosing risk management strategies are complex, personal and multi-factorial decisions to make, and have life-long impacts. Age at diagnosis with BRCA, BRCA1 versus BRCA2 status, and importantly personal and family history or cancer and/or

BRCA also play a role in decision-making.⁶⁴ It is evident that effective and readily available psychological supports and interventions are needed for BRCA carriers. Psychological intervention for BRCA carriers should not be considered a once-off intervention, as support may be needed at various time points throughout a patient journey. It is encouraging and important to note research currently underway in Ireland by St. James's Hospital with the Irish Cancer Society and Trinity College Dublin to develop a decision aid toolkit for female BRCA carriers to support and inform them in this process.⁶⁵

Psychosocial support for BRCA carriers may come from a number of sources, such as healthcare professionals, peers, and/or personal supports such as family. In terms of international guidelines, ESMO guidance recommends formal counselling be available to BRCA carriers after diagnosis,²⁴ and counselling around risk-reducing surgery is recommended by ESMO, NICE and NCCN guidance.^{24,25,27} Whether delivery of counselling could be completed in individual versus group settings, is not specified in these guidelines but has been the subject of recent research. A small randomised controlled trial published in 2015 from The Netherlands examined differences in distress and empowerment (as primary outcomes) between a group of BRCA carriers that received group medical consultations (GMC) as the intervention (n = 63 BRCA carriers) and a control (n = 59) group that received standard of care individual visits, at their annual clinical review.⁶² Of note, although there was no between-group differences in the primary outcomes and the group sizes were very small, GMCs were observed to be less time-efficient, and less acceptable to BRCA carriers and healthcare professionals compared with individual visits. However, 75% of those in the GMC group did experience peer support. The authors suggested further research was needed to examine other means of facilitating guided peer support groups separate to medical visits. This conclusion is supported by previous qualitative research which has documented the role and perceived benefit of educational peer support groups among BRCA carriers.⁶⁶

4.2.2.6 Other Areas of Relevance

Two other areas of relevance to the needs of female BRCA carriers were identified in the literature review - management of early menopause and counselling regarding implications for other family members and reproduction.

Management of Early Menopause

For female BRCA carriers, the implications of early menopause following RR-BSO include cessation of menstruation; loss of fertility; and experiencing symptoms of oestrogen deprivation, with possible smaller impacts due to the latter for postmenopausal women also.⁶⁷ Symptoms of oestrogen deprivation, such as hot flushes, mood changes, sleep disturbance, fatigue and vaginal dryness can have debilitating effects on women's quality of life.⁶⁸ In the long-term, oestrogen deprivation increases risks for cardiovascular disease, osteoporosis, cognitive impairment and dementia.⁶⁹

Counselling regarding management of early menopause for BRCA carriers who have chosen to undergo RR-BSO is consistently recommended in international guidance.^{24,25,27,28,35} Studies identified in this literature review which examined early menopause management in BRCA carriers predominantly focussed on hormone replacement therapy (HRT). Positive effects of HRT on oestrogen deprivation symptoms and bone health have been identified in previous studies, although data on mitigation of cardiovascular and cognitive adverse effects are lacking at present.⁷⁰ The most recent

systematic review on HRT use in BRCA1/2 carriers and risk of breast, ovarian and endometrial cancer highlighted the limited data available in this area.⁷¹ Limitations of existing studies included small sample sizes; limited subgroup analysis by BRCA gene; and consideration of different HRT regimens. Acknowledging these caveats, the authors concluded that there did not appear to be ‘relevant increases’ in breast cancer risk in BRCA carriers post-RR-BSO, and HRT could therefore be recommended for use in the BRCA population after RR-BSO before the age of 50. There was insufficient evidence regarding the effect of HRT on risks of ovarian and endometrial cancer in BRCA carriers.

Importantly, it should be noted these findings are specific to BRCA carriers **without** a history of breast cancer. In BRCA carriers with a history of oestrogen positive breast cancer, Royal Marsden and ESMO guidelines recommend against use of HRT.^{24,35} For these women, and for those who may not be able to tolerate or be prescribed HRT for other reasons, non-hormonal management of symptoms associated with early and natural menopause may be needed.^{68,69} In general, management of early menopause, and use of hormonal and/or non-hormonal approaches, will need to be discussed with and tailored to the individual – in particular, their clinical history and symptomatology. Further research is needed with respect to early menopause management in BRCA carriers, particularly long-term, prospective and well-designed studies with subgroup analysis by BRCA1/2 status and consideration of HRT dose and regimen.

Counselling Regarding Implications for Other Family Members and Reproduction

A BRCA diagnosis has implications for not only the individual, but also their existing and potential future family. A key part of pre- and post-test genetic counselling is to educate patients regarding the pattern of inheritance of BRCA and implications for patients’ family members who may be affected. Similarly, genetic counselling regarding future reproductive plans may be needed, including options for fertility preservation if a woman is pursuing RR-BSO before child-bearing is complete; pre-natal diagnosis such as pre-implantation genetic diagnosis (PGD); and assisted reproduction.^{24,27,50} However, it should be noted that currently in Ireland, such services (i.e. PGD/ in-vitro fertilisation (IVF)) are not available via the HSE, requiring patients to self-fund high costs to access to private clinics in order to avail of them.

4.2.3 Management of BRCA in Men

There is very limited literature which has examined the management of a cancer-predisposing BRCA variant in men. There is a common misperception in the general population that BRCA is only relevant to women, yet men and women are equally likely to inherit or pass on a cancer-predisposing BRCA variant.¹ In international guidelines, there are areas of concordance (age to commence prostate cancer surveillance) and discordance (age to commence annual breast exam) in recommendations for management of male BRCA carriers. Table 3 below summarises the key recommendations from these guidelines. Supporting these international guidelines, a clinical practice bulletin published by the BMJ in October 2021 highlighted the following key points regarding management of men with a cancer-predisposing BRCA variant¹:

- Men and women are equally likely to inherit or pass on a cancer-predisposing BRCA variant.
- Male BRCA carriers, particularly BRCA2 carriers have an increased risk of breast cancer and should be breast aware.

- Male BRCA2 carriers have an increased risk of developing prostate cancer. Male BRCA1 carriers also have an increased prostate cancer risk but it is lower in comparison to BRCA2.
- The European Association of Urology (EAU) recommends that Prostate-Specific Antigen (PSA) assessment may be offered to male BRCA2 carriers from age 40⁷² after discussion on the risks and benefits with a suitably qualified clinician. However, the EAU do not specify a recommended screening interval.
- It is not yet known whether surveillance using PSA reduces mortality in men with a cancer-predisposing BRCA variant.

Table 3. Comparison of International Guidelines for Management of BRCA in Men.

	International Guideline			
	ESMO ²⁴	NCCN ²⁷	SEOM ³⁰	BSHG ³³
Key Recommendations*	<ul style="list-style-type: none"> • Annual clinical breast exam by a physician from age 30 • No evidence to support routine annual breast imaging • Annual surveillance for prostate cancer may be considered from age 40, particularly for BRCA2 carriers 	<ul style="list-style-type: none"> • Breast self-exam training and education from age 35 • Annual clinical breast exam by a physician from age 35 • Consideration of annual mammogram in men with gynaecomastia from age 50 or 10 years before the earliest known male breast cancer in the family (whichever first) • From age 40, prostate cancer surveillance is recommended for BRCA2 carriers, and should be considered for BRCA1 carriers 	<ul style="list-style-type: none"> • No clinical benefit to breast surveillance for men with BRCA • Mammography could be considered if gynaecomastia • Surveillance for prostate cancer using annual PSA is recommended from age 40 for BRCA2 carriers, and should be offered to BRCA1 carriers. 	<ul style="list-style-type: none"> • Do not recommend breast surveillance for male BRCA1 carriers, • Advise consideration of annual clinical breast exam by a physician from age 40 years for BRCA2 carriers. • For prostate cancer surveillance, annual PSA and digital prostate exam is advised from age 50 years for BRCA1 carriers and from age 40 years for BRCA2 carriers (or 10 years earlier than youngest diagnosis, whichever comes first).

*Note: Surveillance recommendations for other possible BRCA-associated cancer risks in men (e.g. pancreatic cancer, melanoma) are as outlined for women in this report. ESMO = European Society of Medical Oncology; NCCN = National Comprehensive Cancer Network; SEOM = Spanish Society of Medical Oncology; BSHG = Belgian Society for Human Genetics

5. Results

5.1 Overview of Results

Results are presented under the following headings:

- Epidemiology of BRCA in Ireland
 - Prevalence of BRCA: Cancer Centre Data
 - Incidence of BRCA: Clinical Genetics Data
- Cancer Centre Services for BRCA Carriers
 - International Guidelines
 - Services and Current Care Pathway for BRCA Carriers in Ireland
- Risk-Reducing Surgical Activity in Ireland: Results from the HIPE Dataset
- Summary of Irish Qualitative Research on BRCA Carriers
- Pre-Consultation with Marie Keating Foundation BRCA Support Group

5.2 Epidemiology of BRCA in Ireland

5.2.1 Prevalence of BRCA in Ireland: Cancer Centre Data

Data were requested from nine hospitals across eight cancer centres (CCs) for this needs assessment^{xii}. No centre currently maintains a specific database for BRCA carriers under follow-up. However, representatives from the breast service of six hospitals (CC1-CC4/CC6-CC8) reported that they formally capture data on BRCA carriers under follow-up in their centre, predominantly as part of existing databases of patients under follow-up for high breast cancer risk due to family history. The limitations due to incompleteness of these data and resulting underestimation of the number of BRCA carriers were highlighted. Three hospitals (CC5/CC5 Satellite/CC8) do not currently maintain any data on BRCA carriers under follow-up – however, CC8 was able to provide an estimate through review of internal records. Table 4 below presents the estimates of BRCA carriers under follow-up provided by representatives of the breast services in the cancer centres, with individual limitations of each estimate described.

Acknowledging these limitations, at least 1012 persons with a cancer-predisposing BRCA variant are estimated to currently be under follow up in cancer centres in Ireland (Table 4). Unfortunately, not all centres were able to provide a breakdown of these figures by BRCA1/2 status and gender. Very few were able to provide a breakdown by age. Where BRCA1/2 status and/or gender were provided, this is indicated in Table 4.

^{xii} Data were collected separately from the satellite hospital of one of the cancer centres

Table 4. Estimated Numbers of BRCA Carriers under Follow-up by Cancer Centre.

Cancer Centre	BRCA Carriers Under Follow-Up (n)	BRCA1 (n)	BRCA2 (n)	Limitations of Estimate
CC1	200	N/A	N/A	<ul style="list-style-type: none"> Includes 112 without history of cancer and at least 80 with history of cancer Likely an underestimate
CC2	304	114	190	<ul style="list-style-type: none"> All female – no males Does not include estimates from 2021 Likely an underestimate
CC3	55	23	30	<ul style="list-style-type: none"> 53 Female – 2 Male Does not include patients with history of cancer Likely an underestimate
CC4	193	96	97	<ul style="list-style-type: none"> 189 Female – 4 Male
CC5	No database	N/A	N/A	<ul style="list-style-type: none"> No database
Satellite Hospital	No database	N/A	N/A	<ul style="list-style-type: none"> No database
CC6	152	67	60	<ul style="list-style-type: none"> 147 Female – 5 Male BRCA status not annotated for n = 25 Does not include patients from all relevant consultants in the centre Likely an underestimate
CC7	74	39	35	<ul style="list-style-type: none"> Likely an underestimate
CC8	34	N/A	N/A	<ul style="list-style-type: none"> No database - may be an underestimate.
Total	1012	339*	412*	

CC = Cancer Centre; TBC = To Be Confirmed; N/A = Not Available *Five centres provided BRCA1/2 status.

5.2.2 Incidence of BRCA in Ireland: Clinical Genetics Data

Genetic testing for BRCA in Ireland may be sought via public or private clinical genetics services. Public and private clinical genetics services in Ireland are provided by the following hospitals:

- Public
 - St. James's Hospital
 - CHI at Crumlin
- Private
 - Mater Private Hospital
 - Hermitage Clinic
 - Blackrock Clinic

It should be noted that the COVID-19 pandemic had a significant impact on continuity of clinical genetics services during 2020 - therefore data are likely to be incomplete and underestimated.

5.2.2.1 Public Clinical Genetics Services

The CHI at Crumlin Hospital laboratory provided estimates (presented in Table 5 below) of the total number of samples identified as positive for a cancer-predisposing BRCA variant for the 20-year period between 2000 and 2020, including referrals during that time from St. James's Hospital (SJH) and the Mater Misericordiae University Hospital (MMUH). The SJH Cancer Genetics Service also provided estimates of the number of samples identified as positive for a pathogenic or likely pathogenic BRCA variant detected following requests to commercial genetic testing companies from the service. Such requests included either a specific BRCA variant or BRCA 1 and BRCA 2 genes included in a multi-gene panel. These estimates reflect testing during 2019 when these requests began and during 2020. For both the CHI at Crumlin and SJH estimates, data for 2021 were not available as they were subject to ongoing collection and validation at the time of undertaking this needs assessment.

In total, as shown in Table 5, an estimated 642 genetic test samples were identified as positive for a cancer-predisposing BRCA variant between 2000 and 2020.

Table 5. Number of Samples Identified as Positive for a Cancer-Predisposing BRCA Variant in Public Clinical Genetics Services for Period 2000-2020.

Hospital	Total Positive Cases (n)	BRCA1 only (males) (n)	BRCA2 only (males) (n)	BRCA1 & BRCA2 (males) (n)
CHI at Crumlin	352	178 (2)	174 (12)	0
SJH (Public)*	203	102 (1)	101 (3)	0
SJH (Commercial Tests)**	18	7 (0)	10 (3)	1 (1)
MMUH*	69	28 (0)	41 (0)	0
Total	642	315 (3)	326 (18)	1 (1)

CHI = Children's Health Ireland; SJH = St. James's University Hospital; MMUH = Mater Misericordiae University Hospital. *Referrals for testing sent from SJH and MMUH to CHI at Crumlin from 2011-2021 and 2012-2018 respectively. **Reflects results from 2019 and 2020.

These figures were examined in further detail for annual estimates over the five-year period 2015-2019. Table 6 demonstrates an annual detection rate range of 6.4% – 10.9% (n=36-64 cases per year), as well an overall trend of increasing volumes of samples referred for testing. Table 6 does not include estimates from the St. James's Hospital Cancer Genetics Service.

From 2017-2019, the CHI at Crumlin laboratory was receiving additional samples from two sources which should be noted.

1. From a direct ordering pathway for BRCA testing established by the NCCP for medical oncologists, to support prescribing of Olaparib (a poly-ADP ribose polymerase inhibitor (PARPi)) in line with HSE-reimbursed indications in ovarian cancer. Since October 2020, tumour testing for cancer pre-disposing BRCA variants has been incorporated into this testing pathway. Also since October 2020, the Cancer Molecular Diagnostics Laboratory at St. James's Hospital and the Beaumont Hospital Molecular Pathology Laboratory have provided germline BRCA and tumour BRCA testing to support this direct ordering pathway.
2. From a t-BRCA study, which aimed to examine feasibility of a novel oncology provider-led pathway of routine tumour testing for women with high-grade serous/endometrioid ovarian, fallopian tube or primary peritoneal cancer for variants in the BRCA1 and BRCA2 genes with concurrent germline BRCA testing.⁷³

Receipt of additional samples from these two sources will have contributed to the observed increase in volume of samples for testing – the figures from these two sources are highlighted in red text in Table 6 below.

Table 6. Number of Samples Identified as Positive for a Cancer-Predisposing BRCA Variant Annually in Public Clinical Genetics Services for Period 2015-2019.

	2015	2016	2017	2018	2019
Total tested (n)	456	378	610 (16)	730 (148)	843 (194)
Cases with deleterious BRCA variant identified (n)	36 BRCA1:14 BRCA2:22	41 BRCA1:20 BRCA2:21	49 (2) BRCA1:22 (1) BRCA2:27 (1)	64 (16) BRCA1:35 (10) BRCA2:29 (6)	54 (12) BRCA1:24 (4) BRCA2:30 (8)
Detection Rate (%)	7.9	10.9	8.0	8.8	6.4

5.2.2.2 Private Clinical Genetics Services

Comprehensive estimates of the number of samples identified as positive for a cancer-predisposing BRCA variant were not available from private clinical genetics services for this needs assessment. As such, it should be acknowledged that the above data from public clinical genetics services (Tables 5 and 6) are an underestimation of the annual incidence of BRCA in Ireland. The proportion of samples tested in public versus private services is not known.

5.3 Cancer Centre Results

5.3.1 International Guidelines

All cancer centres reported that their Breast Service follows the NICE guideline ‘Familial Breast Cancer: Classification, care and managing breast cancer and related risks in people with a family history of breast cancer (CG164)’,²⁵ particularly with respect to breast surveillance, for management of BRCA carriers. One centre reported they also follow the NCCN guideline ‘Genetic/Familial High-Risk Assessment: Breast, Ovarian, and Pancreatic, Version 2.2021, NCCN Clinical Practice Guidelines in Oncology’ (2) with respect to timing of clinical breast exam for BRCA carriers. One centre indicated they may consider following NCCN guidance²⁷ with respect to breast surveillance for a BRCA carrier aged under 30.

5.3.2 Structure and Process of Services for Persons with BRCA in Ireland

5.3.2.1 Pathways to Diagnosis with BRCA

Although the scope of this needs assessment was to address the needs of a BRCA carrier **after** such a diagnosis, it is important and relevant to briefly highlight the main pathways to identification of a cancer-predisposing BRCA variant in Ireland, as they influence the specific needs of patients downstream.

Asymptomatic ‘at-risk’ individuals may be referred for predictive genetic testing on the basis of specific risk factors, most commonly having a relative with an identified cancer-predisposing BRCA

variant. In this case, the individual would receive pre-test genetic counselling by clinical genetics services as per European recommendations.⁷⁴

Individuals may also be referred to genetic services for diagnostic genetic testing on the basis of an existing cancer diagnosis (e.g. based on tumour characteristics or family history), and/or to inform cancer treatment indications. Alternatively, via mainstreaming of genetic testing, such as via the NCCP direct ordering pathway for PARP inhibitor therapy in ovarian cancer described in Section 5.2.2.1, with pre-test information provided to patients by their medical oncologist. Therefore, the degree of specialist genetics input and counselling available to individuals prior to diagnostic genetic testing for BRCA may vary depending on the pathway to diagnosis. Patients diagnosed by this pathway are then offered referral to genetic services for post-test counselling and cascade screening of family members.

5.3.2.2 Management of Female BRCA Carriers

Figure 5 below presents the current patient care pathway for female BRCA carriers without an existing cancer diagnosis following predictive genetic testing, based on information received from the cancer centres as part of this needs assessment. Table 7 below presents the main findings regarding the structure and process of current services for female BRCA carriers. These findings are summarised further below with key issues identified by cancer centres highlighted. A section on male BRCA carriers is also included below.

Figure 5. Flow Diagram of the Patient Journey for a Female BRCA Carrier Following Predictive Genetic Testing Resulting in Diagnosis of a Cancer-Predisposing BRCA Variant.

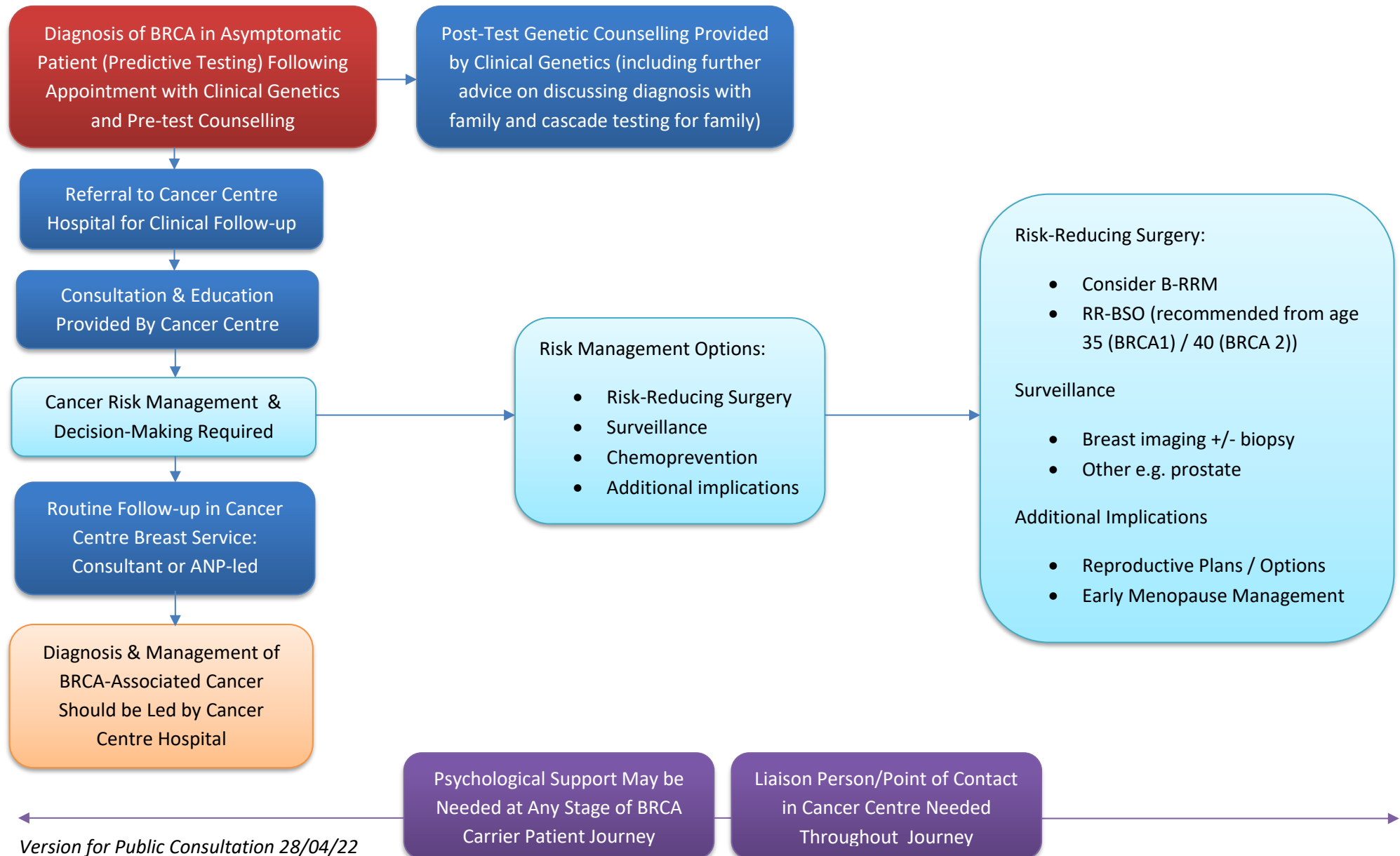


Table 7. Services for Women with a Cancer-Predisposing BRCA Variant in Ireland by Cancer Centre.

Centre	Clinic Attended for Routine Follow-Up	Co-ordination of Care	Risk-Reducing Surgery	Surveillance	Chemoprevention	Psychological Services
CC1	Family risk breast clinic	Consultant-led Aim to move to ANP-led	Available on-site (Breast and Ovarian)	Breast: Available on-site MRI biopsy available on-site Ovarian: If requested – 6 or 12-monthly TVUS with CA-125.	Very little discussion with patients regarding use.	Psycho-oncology assessment required prior to risk-reducing surgery.
CC2	BRCA-Specific Clinic	ANP-led with consultant support	Available on-site (Breast and Ovarian)	Breast: Available on-site MRI biopsy available on-site Ovarian: Offered	Low uptake generally among patients.	Psycho-oncology assessment required prior to risk-reducing surgery.
CC3	'Returns' breast clinic	Consultant-led but ANP can do referral to Gynaecology /Clinical Genetics	Available on-site (Breast and Ovarian)	Breast: Available on-site MRI biopsy available on-site Ovarian: Offered: Annual TVUS and CA-125	Very little discussion with patients regarding use.	No formal support for BRCA carriers.
CC4	Familial risk breast clinic 'Review'/Symptomatic breast clinic	Consultant-led	Available on-site (Breast and Ovarian)	Breast: Available on-site Ovarian: No dedicated service, can be referred to other public hospital if desired	Breast: Yes Ovarian: No – may be offered by gynaecological service attended.	No formal support on site. Can be referred to psycho-oncologist or general psychologist by service or general practitioner.
CC5	N/A	N/A	N/A	N/A	N/A	N/A
CC5 Satellite Hospital	General breast clinic	Consultant-led Very little nurse support available	Available on-site (Breast and Ovarian)	Breast: Available on-site No capacity for MRI-biopsy on-site. Ovarian: Not known	Not discussed with or offered to patients.	No formal support for BRCA carriers.
CC6	Family history risk assessment clinic	Consultant-led Aim to move to ANP-led	Available on-site (Breast and Ovarian)	Breast: Available on-site MRI biopsy available on-site Ovarian: Not offered	Very little if any use clinically.	No formal support for BRCA carriers.
CC7	Familial risk breast clinic – mixed currently with 'Review' breast clinic	Consultant-led Aim to move to ANP-led	Available on-site (Breast and Ovarian)	Breast: Mammogram available on-site MRI performed in local private hospital. No capacity for MRI-biopsy on-site Ovarian: Offered	Very little if any use clinically.	Psycho-oncology assessment required prior to risk-reducing surgery.
CC8	'Review' breast clinic	Consultant-led	Available on-site (Breast and Ovarian)	Breast: Available on-site No capacity for MRI-biopsy on-site. Ovarian: Not known	Very little if any use clinically.	No formal support for BRCA carriers.

CC = Cancer Centre; TBC = To Be Confirmed;; ANP = Advanced Nurse Practitioner; TVUS = Transvaginal Ultrasound; CA-125 = Cancer Antigen-125; MRI = Magnetic Resonance Imaging; N/A = Not Available.

Clinics and Co-ordination of Care

One cancer centre runs a dedicated clinic specifically for BRCA carriers at present. There are no such clinics currently in any of the other cancer centres. There was variation between centres as to which breast service clinic BRCA carriers attended for routine follow-up (i.e. if asymptomatic from a breast perspective). Some attend general 'review' clinics (where there is a mix of persons who may have symptomatic breast concerns and who are asymptomatic) whereas others review BRCA carriers at breast service family history risk clinics (where only asymptomatic persons are in attendance).

In terms of the overall co-ordination of routine care and follow-up for BRCA carriers (i.e. excluding management of a cancer diagnosis), in most centres this is at present predominantly led by a consultant breast surgeon. Seven centres have a candidate Advanced Nurse Practitioner (cANP) in post in the Breast Service, while two centres have fully qualified ANPs. One centre has transitioned to an ANP-led model for management of BRCA carriers (with consultant support where required). In another centre, care is consultant-led but the ANP can complete referrals to gynae-oncology and clinical genetics for patients. Four centres indicated a desire to move towards an ANP-led model of care for certain high-risk patients which could include BRCA carriers – however, the need for adequate resources to achieve this and education in areas such as clinical genetics was also highlighted. Two hospitals do not have any ANP/cANPs in post at present.

Risk-Reducing Surgery

In all centres, access to risk-reducing breast and ovarian surgery is available on-site. However, several cancer centre representatives reported significant waiting lists for risk-reducing surgery, resulting in delays for patients who have chosen to pursue this pathway. This issue applies to both breast and ovarian risk-reducing surgery. It is known that some women seek risk-reducing surgery in private hospitals as a result of these delays. Contributing factors to the current waiting lists and delays that were highlighted include:

- A lack of dedicated theatre resources – specifically, protected time, space and funding
- The impact of the COVID-19 pandemic in terms of cancellations of elective surgical procedures (currently this includes risk-reducing surgery)

Two additional issues were identified:

- In some centres, there are inadequate onco-plastic surgery and pathology specialist resources. The former results in limitations on which breast reconstruction options are available to patients post-mastectomy in a given centre. The latter has implications for the volume of risk-reducing ovarian surgery that can be completed, as expertise is required for pathological examination of surgical specimens including adherence to the SEE-FIM protocol (Sectioning and Extensively Examining the FIMbriated End) for fallopian tube specimens.
- Representatives from some centres highlighted a need for adequate expert advice and support for women regarding management of early menopause post RR-BSO, with respect to hormonal and non-hormonal options.

Surveillance

Regarding breast surveillance, mammography is available on-site in all centres, and MRI is available in the majority. In one centre, surveillance MRIs are performed in a local private hospital as part of a service agreement with the centre. In three hospitals, MRI-guided biopsy, if required, is available on-site. Despite the physical availability of surveillance imaging modalities, many centres highlighted the issue of competing demands on radiological resources. Similarly to risk-reducing surgery, a lack of protected imaging time and funding for BRCA breast surveillance was identified, which can result in delays to surveillance MRI and mammography.

Regarding ovarian surveillance, three hospitals indicated that this option is offered to patients by gynaecological services, while two indicated that referral to gynaecology for consideration of surveillance can be made if requested by the patient. However, most centres highlighted that risk-reducing surgery is the most strongly recommended and optimal strategy for patients to reduce ovarian cancer risk, and that there is inadequate evidence to support ovarian surveillance. In two hospitals, information was not available as to whether this is offered to patients. It was also highlighted that there may be variation in practice between consultants in a given centre as to whether and to what extent ovarian surveillance is offered to BRCA carriers.

Chemoprevention

Representatives from the majority of centres indicated that chemoprevention as a potential risk-reducing option for BRCA carriers was either rarely or not at all discussed with or prescribed to patients. Risk-reducing surgery and surveillance are the two strategies consistently recommended to BRCA carriers given the significant body of evidence supporting their use.

Psychological Services

In three hospitals, assessment by the centre's psycho-oncology service is routinely required prior to risk-reducing surgery. In all other centres, representatives highlighted that psycho-oncology service resources are insufficient to provide a pre-operative routine assessment, as services are prioritised for patients with a cancer diagnosis. Some centres indicated they instead signpost or refer BRCA carriers to external organisations or services for psychological support, such as the local Community Cancer Support Centres that offer services to this cohort. Generally, a lack of available psychological support – particularly counselling – for asymptomatic BRCA carriers was identified by many centres.

5.3.2.3 Management of Male BRCA Carriers

Information from Cancer Centre Breast Services

Information on the number and management of male BRCA carriers attending the cancer centres was much less readily available compared to information on female BRCA carriers, largely due to fewer males identified with a cancer-predisposing BRCA variant in Ireland^{xiii}. Four hospitals provided a gender profile of BRCA carriers under follow-up (see Table 4). Some centres reported that follow-up of male BRCA carriers may be dictated by the patient personal history of BRCA-associated cancer,

^{xiii} ≤5 per centre where this information was provided (see Table 4 above).

which could precede identification of BRCA. Table 8 below summarises the information available regarding management of male BRCA carriers in cancer centre breast services.

Table 8. Summary of Key Points Regarding Management of Asymptomatic Male BRCA Carriers in Cancer Centre Breast Services.

Cancer Centre	Breast Service Follow-Up
CC1	<ul style="list-style-type: none"> Management based on individual risk assessment
CC2	<ul style="list-style-type: none"> No follow-up Men advised to attend GP for Clinical Breast Examination
CC3	<ul style="list-style-type: none"> Attend consultant-led clinic for baseline CBE and advice +/- baseline mammogram (consultant-dependent) Attend for annual CBE
CC4	<ul style="list-style-type: none"> Attend familial risk breast clinic
CC5	<ul style="list-style-type: none"> Information not available
CC5 Satellite Hospital	<ul style="list-style-type: none"> No follow-up – possibly offered mammogram
CC6	<ul style="list-style-type: none"> Offered baseline CBE May be further clinical follow up e.g. if gynaecomastia or to link with urology for prostate surveillance depending on age
CC7	<ul style="list-style-type: none"> Not available
CC8	<ul style="list-style-type: none"> Not available

GP = General Practitioner; CBE = Clinical Breast Exam.

5.4 Results from HIPE: Risk-Reducing Surgery in Ireland

5.4.1 Bilateral Risk-Reducing Mastectomy

Table 9 below presents the surgical activity for bilateral risk-reducing mastectomy (B-RRM) from 2011-2020. As shown in the 'Totals' bar at the bottom of the table, from 2011-2019 the overall number of B-RRM completed per year increased substantially in Irish hospitals. The impact of the COVID-19 pandemic on this activity is however evident in the reduced volume of surgery during 2020 (n=18). In total, 205 B-RRM surgeries have been completed in public hospitals in the past decade. The vast majority of these surgeries were completed in cancer centre hospitals, as shown in Table 9.

It should be noted that the figures in Table 9 do not solely represent B-RRM surgeries completed for BRCA carriers (i.e. includes B-RRM completed for other indications). As such, the number of these surgeries performed specifically for BRCA carriers, and their pathway to diagnosis and risk-reducing surgery, are not known.

Table 9. Volume of Surgical Activity for ‘Prophylactic Surgery for Risk Factors Related to Breast Cancer’ by Hospital, 2011-2020.

Hospital	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total	% of Total
Cancer Centre	1	1	5	3	10	7	4	10	8	4	53	25.9%
Cancer Centre	2	1	3	1	5	5	9	5	8	1	40	19.5%
Cancer Centre	2	2	0	1	7	6	6	7	1	5	38	18.5%
Cancer Centre	1	2	0	1	3	3	5	5	5	3	28	13.7%
Cancer Centre	0	1	4	3	2	1	0	2	2	4	19	9.3%
Cancer Centre	0	0	0	0	3	1	1	2	2	0	9	4.4%
Cancer Centre	0	0	0	0	1	0	2	3	1	0	7	3.4%
Cancer Centre	0	0	0	0	0	1	0	1	3	0	5	2.4%
Non-Cancer Centre Hospital	0	0	1	0	2	0	0	0	0	0	3	1.5%
Non-Cancer Centre Hospital	0	0	0	0	0	1	0	0	1	0	2	1.0%
Non-Cancer Centre Hospital	0	0	0	0	0	1	0	0	0	0	1	0.4%
TOTAL	6	7	13	9	33	26	27	35	31	18	205	

Table 10 below presents the B-RRM surgical activity by five-year age groups of patients for the past decade. The greatest volume of surgery has been completed in women aged 40-44 years followed by 35-39 and 50-54 years respectively, with an overall average age for B-RRM of approximately 44.39 years. Average length of stay was relatively similar across all age groups, with a mean of 5.70 days.

Table 10. Surgical Activity for Prophylactic Surgery for Risk Factors Related to Breast Cancer, by Age (Five-Year Age Groups), 2011-2020.

Age (5 year breaks)	Total	Percentage	ALOS	Inpatient Bed Days	IsDaycase	Average Age
025->029 YEARS	6	2.93	4.92	29.5	0	27.33
030->034 YEARS	22	10.73	5.68	125	0	31.95
035->039 YEARS	41	20	5.49	225	0	37.17
040->044 YEARS	47	22.93	5.78	271.5	0	41.94
045->049 YEARS	25	12.2	5.7	142.5	0	46.72
050->054 YEARS	37	18.05	6.42	237.5	0	52.46
055->059 YEARS	9	4.39	4.33	39	0	56.56
060->064 YEARS	15	7.32	5.6	84	0	61.67
065->069 YEARS	3	1.46	4.67	14	0	65
TOTAL	205	100	5.7	1168	0	44.39

ALOS = Average Length of Stay

5.4.2 Risk-Reducing Bilateral Salpingo-Oophorectomy

Tables 11 below presents the volume of surgical activity for bilateral risk-reducing salpingo-oophorectomy (RR-BSO) from 2011-2020. As shown in the ‘Totals’ bar at the bottom of the table, similarly to the above figures for B-RRM from 2011 to 2019 the overall number of RR-BSO completed per year increased substantially - approximately 5-fold – to a peak of 91 surgeries completed in 2019. The impact of the COVID-19 pandemic on this activity is evident in the reduced volume of surgery completed in 2020 (n=51). In total, 574 RR-BSO surgeries have been completed in public hospitals in the past decade. Approximately 61% of these surgeries were completed in cancer centre hospitals, and 39% in non-cancer centre hospitals.

It should be noted that the figures in Table 11 do not solely represent RR-BSO surgeries completed for BRCA carriers (i.e. includes RR-BSO completed for other indications). As such, the number of these surgeries performed specifically for BRCA carriers, and their pathway to diagnosis and risk-reducing surgery, are not known.

Table 11. Volume of Surgical Activity for Prophylactic Surgery for Risk Factors Related to Ovarian Cancer by Hospital, 2011-2020.

Hospital	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total	% of Total
Cancer Centre	1	9	9	11	22	4	6	5	5	10	82	14.3%
Non-Cancer Centre Hospital	1	0	5	5	9	7	9	18	20	10	84	14.6%
Cancer Centre	0	0	1	8	2	20	12	12	7	6	68	11.8%
Cancer Centre	3	7	1	3	9	5	8	10	9	6	61	10.6%
Cancer Centre	0	2	7	4	8	6	5	5	6	1	44	7.7%
Cancer Centre	3	3	6	5	3	2	5	6	6	1	40	7.0%
Cancer Centre	1	0	2	0	3	3	5	5	6	0	25	4.4%
Non-Cancer Centre Hospital	1	0	3	1	2	2	5	6	4	3	27	4.7%
Non-Cancer Centre Hospital	1	0	1	5	3	3	2	0	4	2	21	3.7%
Non-Cancer Centre Hospital	2	0	0	1	3	0	2	5	4	1	18	3.1%
Non-Cancer Centre Hospital	1	5	1	2	1	0	1	1	0	0	12	2.1%
Non-Cancer Centre Hospital	2	0	1	0	2	4	0	0	1	2	12	2.1%
Cancer Centre	0	0	2	1	1	2	0	2	2	1	11	1.9%
Non-Cancer Centre Hospital	0	0	0	3	1	0	0	1	4	0	9	1.6%
Cancer Centre	0	0	0	2	0	0	1	2	5	0	10	1.7%
Non-Cancer Centre Hospital	0	0	0	2	0	2	1	0	2	2	9	1.6%
Cancer Centre	0	1	0	2	0	1	3	0	1	1	9	1.6%
Non-Cancer Centre Hospital	0	0	1	0	0	1	2	2	0	1	7	1.2%
Non-Cancer Centre Hospital	0	0	0	0	2	1	0	2	0	0	5	0.9%
Non-Cancer Centre Hospital	1	0	0	1	0	1	1	0	0	0	4	0.7%
Non-Cancer Centre Hospital	0	0	0	0	0	0	0	0	1	2	3	0.5%
Non-Cancer Centre Hospital	0	0	0	1	0	0	0	1	0	1	3	0.5%
Non-Cancer Centre Hospital	0	0	0	0	0	0	0	0	0	1	1	0.2%
Non-Cancer Centre Hospital	0	0	1	0	0	0	1	0	0	0	2	0.3%
Non-Cancer Centre Hospital	0	0	0	0	0	0	0	1	1	0	2	0.3%
Non-Cancer Centre Hospital	0	0	0	0	0	0	0	0	2	0	2	0.3%
Non-Cancer Centre Hospital	1	0	0	0	0	0	0	0	0	0	1	0.2%
Non-Cancer Centre Hospital	0	0	0	0	0	0	0	0	1	0	1	0.2%
Non-Cancer Centre Hospital	0	0	0	0	0	0	1	0	0	0	1	0.2%
TOTAL	18	27	41	57	71	64	70	84	91	51	574	

Table 12 below presents the RR-BSO surgical activity by five-year age groups of patients for the past decade. The greatest volume of RR-BSO has been completed in women aged 45-49 years followed by 50-54 and 40-44 years respectively, with an overall average age of 49.74 years. Average length of stay was 1.37 days, with approximately one-third (34.3%) of RR-BSO surgeries completed as day case procedures

Table 12. Surgical Activity for Prophylactic Surgery for Risk Factors related to Ovarian Cancer by Age (Five-Years Age Groups), 2011-2020 (Note: Data are provisional and subject to change).

Keyfield	Total	Percentage	ALOS	Inpatient Bed Days	IsDaycase	Average Age
025->029 YEARS	1	0.17	0	0	1	25
030->034 YEARS	8	1.39	1	5	3	32.63
035->039 YEARS	48	8.36	1.24	31	23	37.48
040->044 YEARS	101	17.6	1.36	88.5	36	41.92
045->049 YEARS	138	24.04	1.34	134	38	46.99
050->054 YEARS	126	21.95	1.37	108.5	47	51.91
055->059 YEARS	76	13.24	1.41	74.5	23	56.76
060->064 YEARS	41	7.14	1.46	38	15	61.61
065->069 YEARS	30	5.23	1.67	35	9	66.73
070->074 YEARS	3	0.52	1	3	0	70
075->079 YEARS	2	0.35	0	0	2	75.5
TOTAL	574	100	1.37	517.5	197	49.74

ALOS = Average Length of Stay

5.5 Existing Qualitative Research on a Sample of the BRCA Population in Ireland

A summary of key findings from the qualitative research by Ms. Nikolett Warner on the previously described sample of 18 BRCA carriers is presented in this section.

5.5.1 Medical Experiences

The key themes identified in Ms. Warner's study with respect to the medical experiences and needs of participants in navigating cancer risk reduction measures are as shown in Table 13 below:

Table 13. Summary of Themes on Medical Experiences and Needs Identified.

Theme 1: Healthcare services as a burden to navigate
Subtheme 1: Healthcare services as largely inaccessible (as perceived by female participants) <ul style="list-style-type: none">○ Reflecting uncertainty among participants regarding where to access key information, support and services regarding BRCA and associated care pathways○ Reflecting differences in awareness of and access to public versus private clinical services for BRCA carriers, with substantially longer waiting times in public services for clinical genetics testing and risk-reducing surgery
Subtheme 2: Healthcare services as inappropriate <ul style="list-style-type: none">○ Reflecting participants' perception of themselves as a burden on the healthcare system○ Reflecting a perceived lack of specialised information available to inform decision-making regarding BRCA-associated cancer risk management strategies
Theme 2: Burden experienced through interaction with healthcare professionals
Subtheme 1: Healthcare professionals as lacking insight <ul style="list-style-type: none">○ Reflecting participants' perception of a general lack of empathy and understanding in some previous experiences with healthcare professionals regarding their BRCA diagnosis and decisions regarding cancer risk management
Subtheme 2: Disempowerment around decision making <ul style="list-style-type: none">○ Reflecting disempowerment experienced by BRCA carriers in making decisions regarding their cancer risk management, often feeling disempowered by healthcare professionals

5.5.2 Coping Experiences

The key themes identified in Ms. Warner's study with respect to the experiences of participants in coping with a diagnosis of a BRCA1/2 alteration were as shown in Table 14 below:

Table 14. Summary of Themes on Coping Experiences Identified.

Theme 1: Adjusting to a new perspective
Subtheme 1: Emotional aspects <ul style="list-style-type: none">○ Reflecting emotional aspects of decision-making regarding risk-reducing surgery experienced by participants, as well as conflicting emotions regarding the impact of same alongside the BRCA diagnosis itself on their body
Subtheme 2: Relationship-changing <ul style="list-style-type: none">○ Reflecting challenges to and improvements in relationships experienced by participants in disclosing their BRCA diagnosis to family and/or partners
Theme 2: Making sense of BRCA (Coping)
Subtheme 1: Meaning-making <ul style="list-style-type: none">○ Reflecting participants' attempts to create meaning from learning of their BRCA status, such as helping them make sense of decisions regarding risk-reducing surgery, and/or coming to terms with a familial or personal history of cancer
Subtheme 2: Hope <ul style="list-style-type: none">○ Reflecting participants' drawing on hope to help them make sense of their BRCA status, such as hope for future improved cancer risk management options, and/or for the positive impact knowledge of diagnosis may have on their cancer risk by enabling them to take action to reduce it.

5.6 Pre-Consultation with Marie Keating Foundation BRCA Support Group

5.6.1 Summary of Feedback

The summarised key points of the feedback received from the Marie Keating Foundation BRCA Support Group pre-consultation are summarised by theme in Table 15 below. 16 BRCA carriers (all female) from the group attended the virtual meeting on December 9th 2021 and contributed to the discussion regarding the interim themes outlined below. Subsequent to the meeting, seven of the 16 attendees provided written feedback on these interim themes via the pre-consultation summary document.

Table 15. Summary of Feedback Provided as Part of Pre-Consultation with Marie Keating Foundation BRCA Support Group.

Interim Theme	Summary of Feedback – Key Points and Issues Highlighted
Information Needs	<ul style="list-style-type: none">• Need for accessible educational information covering all aspects of the implications of a BRCA diagnosis and risk management options• Need for greater education of healthcare professionals regarding BRCA
Data on BRCA in Ireland	<ul style="list-style-type: none">• National database/register needed to capture data on the BRCA population in Ireland.
Specialist Genetics Input	<ul style="list-style-type: none">• Need for access to suitably trained healthcare professional post-diagnosis with BRCA, for queries - possible role of trained ANP in this context highlighted.• Need for information regarding and signposting to family planning and fertility management resources (e.g. regarding pre-implantation genetic diagnosis).• Need for information for patients' family members to support patient in informing them of BRCA diagnosis.
Model and Co-ordination of Care	<ul style="list-style-type: none">• Need for dedicated BRCA 'liaison person' within hospitals.• Need for consistency in model of care and access to services between hospitals and geographic areas.
Risk-Reducing Surgery	<ul style="list-style-type: none">• Substantial waiting times for risk-reducing surgery – need for prioritisation of these surgeries.• Need for consistency in access to specialist plastic surgery input regarding breast reconstruction options post-mastectomy.• Need for adequate post-operative information and support after risk-reducing surgery, including signposting to supports outside of hospital.
Surveillance	<ul style="list-style-type: none">• Waiting times for breast surveillance imaging highlighted. Need for prioritisation of breast surveillance.• Greater consistency in practice needed regarding ovarian cancer surveillance.
Psychological Support	<ul style="list-style-type: none">• Significant need for greater access to psychological support – e.g. counselling, psychotherapy – for BRCA carriers throughout patient journey.
Women's Health	<ul style="list-style-type: none">• Need for clear information regarding implications of early menopause after RR-BSO (e.g. symptoms and potential long-term effects).• Need for clear information regarding hormonal and non-hormonal management of early menopause after RR-BSO.• Onco-fertility needs i.e. access to publicly-funded services via the HSE, as opposed to current self-funding privately for these services.

6. Discussion

6.1 Review of Main Findings

6.1.1 Context

The importance of timely access to services for patients with hereditary predisposition to cancer on the basis of need, including risk-reduction interventions, was highlighted as a priority in Recommendation 19 of the current National Cancer Strategy 2017-2026.¹⁹ This health needs assessment has shown that the needs of the population diagnosed with a cancer-predisposing BRCA variant in Ireland - particularly for interventions to reduce their increased risks of cancer - are substantial and time-sensitive. Meeting these needs requires consistency and co-ordination across different healthcare specialties and services, from clinical genetics to surgery, to radiology to psychology and, for some, oncology.

This Health Needs Assessment primarily sought to:

- Identify the needs of those with a cancer-predisposing BRCA variant
- Examine the size and epidemiology of the BRCA population in Ireland
- Establish the structure and process of current services for BRCA carriers in cancer centres
- Identify areas where the needs of BRCA carriers are not currently being met
- Make informed recommendations for change in the current model of care to ensure the needs of the BRCA population in Ireland are adequately met going forward

6.1.2 Epidemiology of BRCA in Ireland

Examination of the size and epidemiology of the BRCA population in Ireland for this needs assessment highlighted the lack of a BRCA-specific national database or register. Proxy estimates of the prevalence and incidence of BRCA were sought via data from cancer centre breast care and clinical genetics services. Available data from these sources were however limited, chiefly by incompleteness resulting in underestimation. International comparisons are similarly limited by a lack of aggregate data and/or national registries which capture data on BRCA carriers.⁷⁵

Limitations notwithstanding, with respect to prevalence and based on data from cancer centres, at least 1012 persons with a cancer-predisposing BRCA variant (across all age groups) are estimated to be currently under follow-up in cancer centres in Ireland. The only previously known estimates of the size of a subset of the Irish BRCA population preceding this needs assessment were reported in a 2013 Health Technology Assessment by the Health Information and Quality Authority (HIQA) of surveillance of women aged under 50 years of age at elevated risk of breast cancer. It was estimated that there were a median of 160 BRCA1 and 117 BRCA2 carriers^{xiv} under the age of 50 receiving surveillance or were otherwise known to family risk clinics.⁷⁶ It was acknowledged that this known population was likely a small proportion of the estimated total population in Ireland.

^{xiv} 95% Confidence Intervals 87-237 for BRCA1 and 52-198 for BRCA2 respectively.

It is therefore acknowledged that the estimate obtained for this report of at least 1012 persons with a cancer-predisposing BRCA variant under follow-up likely represents an underestimate of the BRCA population in Ireland. The proportion of female to male BRCA carriers could not be accurately estimated as just four centres were able to provide a gender profile. Four hospitals provided a gender breakdown – based on this information, the majority of BRCA carriers under follow-up were female. Most centres were unable to provide an age profile of BRCA carriers.

To explore the possible extent of this underestimation, the size of the female general population aged 30 – 69 years old in Ireland was obtained from the 2016 Census.⁵ There were approximately 1.24 million females aged 30 – 70 years old (exact figure: 1,244,836) in the 2016 Census. Based on a general population frequency of 0.25% for pathogenic BRCA variants, there are approximately 3,112 women in this age group with a cancer-predisposing BRCA variant in Ireland. This highlights the potential degree of underestimation of the 1012 figure obtained in this report. The above calculation did not include males – however, using the 2016 Census estimate for males aged 30-69 (exact figure: 1,210,259) and the same population frequency would suggest approximately 3,026 male BRCA carriers in this age group.

Examination of clinical genetics data as proxy of incidence of BRCA in Ireland identified for the five-year period of 2015-2019 a range of 36-64 new cases of BRCA diagnosed per year through public services – an approximate 6.4%-10.9% detection rate – with an increasing volume of sample referrals for testing in that time. Since BRCA testing began in public clinical genetics services at CHI at Crumlin Hospital in 2000 and up to 2020, a total of 642 new cases of BRCA have been diagnosed (BRCA1 315, BRCA2 326), the majority of whom were female (n=620) and a minority male (n=22). Data pertaining to new diagnoses of BRCA in 2020 was also requested from private clinical genetics services – however, complete data were not available, and it should be acknowledged that the above figures therefore underestimate the size of the BRCA population in Ireland.

The available epidemiological data for this report, even with the caveat of underestimation, and calculations based on Census figures as outlined above, suggests that the BRCA population in Ireland is a reasonably defined group. Therefore, while the healthcare needs of this population may be complex, the task of meeting those needs should not be insurmountable.

6.1.3 Services for the BRCA Population in Cancer Centres in Ireland

Examination of the structure and process of current services for BRCA carriers in Irish cancer centres highlighted areas of concordance and discordance. BRCA carriers attend different Breast Service clinics in different centres for routine follow-up – e.g. general review clinics or specific familial risk clinics. Care is mostly consultant-led at present, although many centres indicated plans to transition to an ANP-led model of care, with one centre having done so already.

All centres are in a position to offer breast surveillance and risk-reducing breast and ovarian surgery to female BRCA carriers. However, several cancer centres reported waiting times for risk-reducing surgery, largely due to a lack of dedicated theatre time, space and funding. Some centres are unable to provide women with access to certain breast reconstruction options due to limited availability of specialist plastic surgery input. Delays to scheduled breast surveillance intervals were also highlighted – largely due to competing demands on radiology resources in the absence of protected imaging slots for surveillance of high-risk individuals.

Chemoprevention is little discussed with BRCA carriers in all centres, with the focus of risk management on interventions (risk-reducing surgery and surveillance) for which there is more supportive evidence. Psychological assessment is available in some centres to asymptomatic BRCA carriers before risk-reducing surgery – however, a general lack of psychological support, particularly access to counselling, via cancer centres was highlighted.

Finally, the majority of information collected from cancer centres was specific to management of female BRCA carriers. There is variation in clinical follow-up from a breast service perspective for male BRCA carriers across the centres, and in general concern was expressed regarding a lack of awareness among the public and healthcare professionals alike of the implications of a diagnosis of BRCA for men.

The impact of the COVID-19 pandemic on services for BRCA carriers was also highlighted in this needs assessment, with reports from cancer centres of exacerbation of existing delays to risk-reducing surgery and clinical genetics services.

6.1.4 Experiences and Needs of the BRCA Population in Ireland

As outlined in this report, recent qualitative research conducted on a small sample of Irish BRCA carriers highlighted some of the key challenges this population perceive in navigating the Irish healthcare system. These challenges included a need and perceived lack for appropriate and accessible information and services across all relevant healthcare specialties, adequate knowledge and understanding from healthcare professionals, and psychological support for coping with a BRCA diagnosis and the complex decision-making required to navigate options to reduce cancer risks.

Much of the feedback provided by the Marie Keating Foundation BRCA Support Group in the pre-consultation exercise of this needs assessment echoed these challenges. Most notably, concerns raised centred around two key issues:

1. A current lack of access to clear, jargon-free, basic and inclusive information regarding BRCA and its implications – particularly cancer risk management strategies – from the HSE.
2. Inadequate psychological support, for coping with a BRCA diagnosis and throughout the journey of cancer risk management (especially pre- and post-risk-reducing surgery).

6.2 Strengths and Limitations

There are a number of strengths to this needs assessment. A comprehensive literature review (albeit not a systematic review) was completed focusing on key areas of need for BRCA carriers, and review of international best practice guidelines. A multi-disciplinary steering group oversaw and provided input to the needs assessment throughout. BRCA carrier stakeholder input was also generously provided by the Marie Keating Foundation BRCA Support Group, through a live virtual pre-consultation with opportunity provided for written submissions from the group also. Every effort was made to explore available sources of data to inform estimation of the size and epidemiology of the BRCA population in Ireland, through engagement with cancer centres and clinical genetics services.

However, there are several limitations that should be noted. A formal qualitative study with patient stakeholders was not undertaken as part of this needs assessment. This was because a steering group

member – one of two representatives of the Marie Keating BRCA support group – had undertaken qualitative research on a sample of the BRCA population in Ireland in recent times and supported inclusion of the key learning points from this work in this report (as described in Results). A further limitation was the non-inclusion of private hospitals - it is known that some BRCA carriers may seek aspects of cancer risk management (e.g. surveillance) privately, possibly due to public healthcare system waiting times. The general lack of complete data available to inform accurate estimation of the size and epidemiology of the BRCA population in Ireland is also an important limitation (noted in the recommendations of this report).

With regard to the HIPE data, the risk-reducing surgical activity reflects surgeries performed for patients with other clinical indications as well as those with hereditary cancer predisposition due to BRCA, which is a limitation. The completeness of the HIPE data could not be accurately established, therefore under-ascertainment of the true level of risk-reducing surgical activity is possible. It was also not possible due to the nature of HIPE data collection to establish the proportion of risk-reducing surgery performed specifically for BRCA carriers.

Stakeholders to this project also highlighted there is likely under-ascertainment of persons with a cancer-predisposing BRCA variant in Ireland. Greater application of genomic testing is likely to increase identification of this population, and services for them will need to be planned accordingly.

Two final relevant issues were outside of the scope of this needs assessment to address and should be mentioned here. First, it is well-known that there are significant waiting times to access genetic testing via public clinical genetics services in Ireland. A report prepared for the Irish Cancer Society based on a mixed-methods approach published in 2021 which examined unmet needs in clinical genetics services in Ireland, found one in seven and one in 27 respondents were waiting 13-24 months and over 24 months respectively for genetics counselling and testing appointments.⁷⁷ A 2019 clinical review of the clinical genetics medical workforce in Ireland by the HSE National Doctor's Training and Planning (NDTP), which described a priority waiting list of 15-18 months and over 2 years for routine referrals, supports these findings.⁷⁸ Many respondents reported accessing private clinical genetics services in order to expedite testing. Although the scope of this needs assessment was to address the needs of a BRCA carrier after the point of diagnosis, it is acknowledged that these waiting times are unacceptable and urgently need to be addressed. Such delays also affect at-risk relatives of BRCA carriers referred for cascade testing.

Second, stakeholders highlighted the issue of management of patients identified with other cancer predisposition syndromes. These include those that confer risks similar to BRCA (such as PALB2, CDH1, TP53 and others), and others such as Lynch Syndrome. The findings of this needs assessment and service solutions that will be developed as a result of it are highly relevant to these populations. Examination of current literature on both of these issues was outside of the scope of this needs assessment. However, this will require further exploration in the future with cancer centre and clinical genetics stakeholders.

7. Recommendations

7.1 Overview

As described previously, eight interim themes and associated issues specific to needs of BRCA carriers in Ireland were identified following the literature review and interview of representatives from cancer centres. Following review of feedback provided via the steering group and Marie Keating Foundation BRCA Support Group, the eight themes were accepted, and a number of additional issues highlighted were included. This feedback informed the development of recommendations outlined below under each theme as the main output of this needs assessment.

From a national health policy perspective, it should be noted that these recommendations are aligned with the fundamental principles of Sláintecare, Ireland's current health service reform programme.⁶ These include prevention and public health, timely access to care, ensuring the patient/service user is paramount, workforce and accountability and governance. The Sláintecare Implementation Strategy also highlighted the importance of population health needs assessment to assess health needs of specific groups, to inform development and implementation of new models of care.⁷

7.2 Themes – Issues and Recommendations

1. Information Needs

A consistent and strong message from all stakeholders to this needs assessment was the need for accessible, jargon-free, comprehensive informational resources for BRCA carriers which cover all key aspects of a BRCA diagnosis, including the implications of this diagnosis for the individual and their family members, and cancer risk management options. Collaboration with stakeholders leading the development of existing Irish resources such as www.cancergenetics.ie and www.thisisGO.ie is needed. A need for education specifically for healthcare professionals working with BRCA carriers was also articulated.

Recommendations:

- 1.1 Accessible, inclusive (across age, language and ethnicity) and jargon-free informational resources should be developed for and available as part of routine care to BRCA carriers. Consultation with BRCA carrier stakeholders should be part of the development of any such resources.
- 1.2 Development of BRCA information resources specifically for healthcare professionals working in primary care and cancer centres in Ireland is required. This should be informed by consultation with clinical subject matter experts.

2. Data on BRCA in Ireland

There is currently no national database or register for persons with a cancer-predisposing BRCA variant in Ireland. Although some cancer centres record BRCA status of patients under follow-up in for family history of breast cancer locally, the completeness of these data is variable. The lack of a national

database or register of persons with a cancer-predisposing BRCA variant in Ireland precludes the identification and estimation of the size, epidemiology and needs of this population, as well as follow-up of patient outcomes; and projections and planning for cancer risk management services. Adequate resources to maintain up to date and accurate data are also needed, as well as agreement of appropriate information governance structures.

Recommendations:

- 2.1 A national database with an agreed minimum dataset should be established capturing data pertaining to BRCA carriers under follow-up in this country. Ideally this would include data from public and private clinical services. This could be developed as part of a national database for inherited cancer predisposition. Such a database should be based on the use of a unique patient identifier. It should support national planning and co-ordination of services for the BRCA population and facilitate local follow-up of patients. There should be adequate resources to maintain it.
- 2.2 Local databases, standardised with respect to an agreed minimum dataset i.e. a single data dictionary, should be established in cancer centres which capture data pertaining to BRCA carriers under follow-up.

3. Specialist Genetics Input

There are several pathways to a diagnosis of a cancer-predisposing BRCA variant. For example, some individuals do not have a cancer diagnosis and are tested due a relative's BRCA status. In this case, the individual would receive pre-test genetic counselling and genetic testing from clinical genetics services. Others have a cancer diagnosis and are tested either due to a suspicion of an inherited predisposition or as assessment of suitability for certain drug treatments. Therefore, the pathway to diagnosis can influence the degree of specialist genetics information patients receive prior to their diagnosis. In this needs assessment, improved access to specialist clinical genetics expertise was highlighted as an undeniable need. BRCA carriers want to be able to ask relevant questions of suitably qualified healthcare professionals after diagnosis.

Areas where specialist genetics input are also needed include resources to support discussing a BRCA diagnosis with family members and information regarding reproductive options such as pre-implantation genetic diagnosis (PGD).

Recommendations:

- 3.1 BRCA carriers should have access to suitably qualified healthcare professionals after their consultation at diagnosis with clinical genetics, to ask any questions that arise after they have had a chance to process their diagnosis. Some of these queries could be addressed by designated genetics-trained healthcare professional(s) (e.g Advanced Nurse Practitioners (ANPs)) in cancer centres, while other queries would fall within the remit of Genetic Counsellors.
- 3.2 BRCA carriers should be provided with information regarding, and signposted to, family planning resources including accessing PGD and in-vitro fertilisation (IVF).
- 3.3 BRCA carriers should be considered eligible for publicly available onco-fertility services.

4. Structured Care Pathway and Co-ordination of Care

The lack of a structured care pathway for BRCA carriers in Ireland was highlighted. Care needs to be better coordinated and there should be a dedicated point of contact for BRCA carriers in each cancer centre.

Recommendations:

- 4.1 Improved coordination of care is required, including between clinical genetics services and cancer centres. This could be delivered by a nurse-led service, with the CNS/ANP also acting as the dedicated point of contact for BRCA carriers.
- 4.2 Development of a nurse-led service for BRCA carriers will require specialist training and support. There is benefit to the autonomous clinical role of an ANP in this context.
- 4.3 The model of care (including clinical governance) for BRCA carriers needs to be improved and standardised across all cancer centres, to ensure consistency in and access to optimal standards of care in all geographic areas. Further dedicated consultation on the desired model of care is needed with input from all relevant stakeholders.
- 4.4 All elements of the patient care pathway (structures, processes and outcomes) should have defined quality standards and a subset of specific key performance indicators to facilitate performance measurement.
- 4.5 Patient-reported experience measures should be an embedded quality indicator.

5. Risk-Reducing Surgery

Several representatives from cancer centres who inputted to this needs assessment highlighted significant waiting times for risk-reducing surgery in their centres. This is largely due to a lack of protected theatre time, space and funding, which was further exacerbated by the impact of the COVID-19 pandemic on hospital services. In general, surgeries in an asymptomatic otherwise healthy BRCA carrier are not prioritised above tumour-directed breast or ovarian cancer surgery. However, current waiting times for risk-reducing surgery were considered unacceptable and distressing for BRCA carriers. While all cancer centres currently offer risk-reducing breast and ovarian surgery, an appropriate re-configuration of services for risk-reducing surgery, that would result in low wait times and the best clinical outcomes for women, is now required.

In addition, there is variation between cancer centres with respect to availability of specialist plastic surgery input, limiting the breast reconstruction options available to women. A need for improved post-operative support – both physical and psychological – was also highlighted by BRCA carriers who inputted to this needs assessment.

Recommendations:

- 5.1 Risk-reducing breast and ovarian surgery for BRCA carriers requires a dedicated pathway with protected resources and should be delivered in a timely fashion. The appropriate configuration of services for risk-reducing surgery, that would result in low wait times and the best clinical outcomes for women, should now be examined.
- 5.2 Adequate post-operative support following risk-reducing surgery (e.g. physiotherapy, psychological support) should be available to patients.

- 5.3 All women should have timely access to specialist plastic surgery expertise regarding breast reconstruction options, and reconstructive surgery itself, if desired.

6. Surveillance

Similar to risk-reducing surgery, while most centres have the physical infrastructure to offer breast surveillance to BRCA carriers, guarantee of surveillance intervals may be impeded by the many competing demands on radiological resources. Ovarian surveillance in asymptomatic BRCA carriers is not recommended, as there is currently insufficient evidence to support any mortality benefit for BRCA carriers. This needs to be communicated very clearly to BRCA carriers who enquire about such surveillance. A lack of available information regarding the risks and benefits of cancer surveillance for male BRCA carriers was also highlighted.

Recommendations:

- 6.1 There should be protected magnetic resonance imaging (MRI) and mammography slots for breast surveillance of asymptomatic BRCA carriers, to ensure surveillance imaging occurs at recommended intervals.
- 6.2 Ovarian surveillance by transvaginal ultrasound and/or Cancer Antigen (CA)-125 measurement is not recommended for BRCA carriers.
- 6.3 Female BRCA carriers who request ovarian surveillance should be made aware of the lack of evidence to demonstrate a survival benefit.
- 6.4 Greater awareness of the risks and benefits of prostate cancer surveillance for male BRCA carriers – particularly for BRCA2 – is needed among patients as well as healthcare professionals. It is not yet known whether surveillance using PSA reduces mortality in men with a cancer-predisposing BRCA variant
- 6.5 An evidence review of international pancreatic cancer surveillance guidelines for BRCA carriers is needed.

7. Psychological Support

A significant lack of publicly available psychological support for BRCA carriers was highlighted by stakeholders. Some centres provide (and require) psychological assessment for BRCA carriers prior to risk-reducing surgery, but ongoing access to psychological support services for individuals and their families is much less readily available. The value of and need for such support was clear, particularly during the cancer risk management decision-making process. A need for signposting to external peer-based supports for BRCA carriers was highlighted also.

Recommendations:

- 7.1 Psychological support including professional support should be offered (but not mandatory) to all BRCA carriers following a diagnosis of a cancer-predisposing BRCA variant. This should be available if needed throughout the patient journey, including but not only at times such as undergoing risk-reducing surgery and in the event of a cancer diagnosis.
- 7.2 Education initiatives should include the education and training needs of the psychology profession specific to inherited cancer predisposition.

- 7.3 BRCA carriers should be signposted following diagnosis to psychological supports (both professional and peer-based), including those external to cancer centres.

8. Women's Health

Pre-menopausal female BRCA carriers who chose to undergo risk-reducing bilateral salpingo-oophorectomy (RR-BSO) face an immediate surgically-induced menopause, the implications of which include symptoms of oestrogen deprivation and longer-term health risks (such as cardiovascular disease, osteoporosis and cognitive decline). A need for access to information and expertise regarding menopause management (hormonal and non-hormonal) was articulated by stakeholders to this needs assessment. Of note, Action 4 of the National Women's Health Action Plan 2022-2023 – launched March 2022 - includes 'Changing the approach to menopause care to increase the public supports available to women before, during and after menopause', with commitment to investment in expanding the number of publicly-funded specialist menopause clinics in Ireland to four total.⁹

Recommendations:

- 8.1 Women should have access to clear information regarding the symptoms and longer-term health risks associated with early menopause, prior to risk-reducing surgery.
- 8.2 Women should have access to expert advice regarding their options for menopause management (hormonal and non-hormonal), which could be provided by a suitably trained doctor, ANP or other adequately trained healthcare professional.
- 8.3 Women should be referred to specialist menopause clinics if adequate support or expertise is not available in their hospital.

8. Conclusions

This Health Needs Assessment has identified several key areas where the needs of persons with a cancer-predisposing BRCA variant in Ireland are not currently being met. The COVID-19 pandemic has exacerbated some of these issues, with waves of infection over the past two years resulting in periodic cancellations of elective hospital services for BRCA carriers such as risk-reducing surgery and in-person consultations.

Recommendations for much-needed change – the main output of this work – across identified areas of need are made in this report, informed by review of international literature and guidelines, input from stakeholders on the steering group, information provided by representatives from cancer centres in Ireland working in services accessed by BRCA carriers, and input from members of the Marie Keating Foundation BRCA Support Group.

Female BRCA carriers from the Marie Keating Foundation BRCA Support Group who generously inputted to this needs assessment, emotively articulated their self-perception as ‘ticking time-bombs’, referring to their higher risks of breast and ovarian cancer compared to the general population, and the resulting anxiety and distress they endure while awaiting risk-reducing surgery and surveillance. Design of a comprehensive care pathway for persons with a cancer-predisposing BRCA variant in Ireland is identified as a key priority recommendation in this report. Provision of adequate, inclusive and accessible informational resources for the BRCA population will be essential to their empowerment and to supporting them in navigation of this pathway.

Many of these recommendations made in this report are complex and will require multi-disciplinary collaboration and action to further explore and develop. With respect to the next steps in addressing the needs of the BRCA population in Ireland, the NCCP has commenced work on the development of an implementation plan to progress the recommendations of this needs assessment. Input received following public consultation on this report will also inform this process. Stakeholder input, from persons affected by BRCA as well as healthcare professionals working in clinical services for BRCA carriers will be of utmost importance. Monitoring and evaluation of any change implemented will be both necessary and critical to sustain progress and learn from changes made.

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Appendices

Appendix A: Steering Group Terms of Reference

BRCA Patient Needs Assessment

Steering Group

Terms of Reference

Purpose

The National Cancer Control Programme (NCCP) is establishing an inter-disciplinary steering group to oversee a needs assessment for individuals (women and men) with a diagnosis of a BRCA gene alteration in Ireland. This project is being co-ordinated by the public health team within the NCCP.

Background and Aim

Individuals with a diagnosis of a BRCA gene alteration have a diverse range of healthcare, psychosocial, informational and support needs. In order to identify appropriate and effective solutions to best meet these needs, a formal needs assessment is required.

The aim of this project is to undertake and publish results of a needs assessment for individuals with a diagnosis of a BRCA gene alteration in Ireland. The objectives of this project will be to:

8. Define the needs of the target population – undertake a literature review and a review of international practice/models of care/clinical guidelines.
9. Estimate the size of the BRCA population in Ireland – examine the epidemiology of individuals diagnosed with BRCA gene alterations.
10. Define and describe the services that are currently available to this target population in Ireland – engage with Cancer Centres to ascertain current services offered.
11. Engage in stakeholder consultation - to determine views and suggestions from the target population and other key stakeholders (including healthcare professionals) regarding existing and desired services.
12. Determine the most appropriate and effective (clinically effective and cost effective) solutions to meet the unmet needs of the target population.
13. Determine the resource implications of meeting the unmet need.

The needs assessment will be designed with input from the NCCP and Steering Group. Data collected as part of the needs assessment are envisioned to be both quantitative and qualitative in nature. Commencement of the project and data collection are planned for Q3 and Q4 2021 respectively and draft final report to be published by Jan 2022.

Membership Expectations and Frequency of Meetings

Members of the steering group are expected to actively provide advice, guidance and oversight on progression of the Needs Assessment, including with regard to:

1. The scope of the needs assessment
2. Data sources regarding BRCA epidemiology and current services in Ireland for the target population
3. Consultation with stakeholders
4. Ethics submission
5. Data analysis
6. Production of final report
7. Submission of articles to relevant academic journals
8. Dissemination of findings

Meetings will be held virtually via Cisco Webex on approximately three occasions over a 6-8 month period, with communication between meetings via email to support work progression.

A meeting schedule will be agreed at the steering group first meeting. If unable to attend, apologies would be appreciated at least 48 hours in advance of the meeting. Please do consider nominating an alternative to attend if appropriate.

Administration

Administrative support will be provided by the NCCP. Brief notes and action points will be circulated after each meeting.

Governance

The steering group will be chaired by Dr Triona McCarthy, NCCP Director of Public Health. Each action and output to deliver the project will be signed off by the Chair, with guidance from the steering group.

The NCCP Director of Public Health reports to the NCCP Director and NCCP Executive for final sign off on project deliverables.

Appendix B: Project Steering Group Representatives with Associated Professional Role and Organisation.

Name	Professional Role and Organisation
Triona McCarthy (TMC)	Consultant in Public Health Medicine, NCCP (Chair)
Ciara Kelly (CK)	Specialist Registrar in Public Health Medicine, NCCP (Project Lead)
Risteárd Ó Laoide (ROL)	National Director, NCCP
Heather Burns (HB)	Consultant in Public Health Medicine, NCCP
Fiona Bonas (FB)	Assistant National Director, Quality and Safety, NCCP
Eve O'Toole (EOT)	Head of Evidence and Quality Hub, NCCP
Niamh Kilgallen (NK)	Senior Research Officer, Evidence and Quality Hub, NCCP
Helen Greally (HG)	National Clinical Lead - Psycho-Oncology, NCCP
Louise Mullen (LM)	General Manager – Survivorship Programme, NCCP
Bernie O'Loughlin (BOL)	Programme Manager - Survivorship Programme, NCCP
Pauline Robinson (PR)	Assistant Director of Nursing – Oncology Nursing, NCCP
Úna Kennedy (UK)	GP Advisor, NCCP
Clare Meaney (CM)	Senior Pharmacist, NCCP
Catherine Duffy (CD)	Programme Manager – Skin Cancer, Gynae-Oncology, NCCP
Maeve Cusack (MC)	Programme Manager – Surgical Oncology, NCCP
Eileen Nolan (EN)	Programme Manager – Children, Adolescents and Young Adults and Urological Cancers and Urological Cancers, NCCP
Rachel Morrogh (RM)	Director of Advocacy and External Affairs, Irish Cancer Society
Alan Smith (AS)	Consultant in Public Health Medicine, National Screening Service
Frances Drummond (FM)	Research Manager, Breakthrough Cancer Research
Helen Forristal (HF)	Director of Nursing Services, Marie Keating Foundation
Bernie Carter (BC)	Assistant Director of Nursing, Marie Keating Foundation
Nikolett Warner (NW)	Representative, Marie Keating Peer Support Group
Rachel McKeon (RMck)	Representative, Marie Keating Peer Support Group
Yvonne Hanhauser (YH)	Advanced Nurse Practitioner, Breast Care, St. James's Hospital

Carol Spillane (CS)	Candidate Advanced Nurse Practitioner, Breast Family Risk, St. James's Hospital
Lisa Bradley (LB)	Consultant Clinical Geneticist, Department of Clinical Genetics, Children's Health Ireland at Crumlin
Claire Giffney (CG)	Principal Genetic Counsellor, Children's Health Ireland at Crumlin
Karen Cadoo (KC)	Consultant Medical Oncologist and Cancer Geneticist, St. James's Hospital, Irish Society of Medical Oncology (ISMO) Representative for the group
Sylvia O'Keefe	Consultant Radiologist, St. James's Hospital
Martin O'Sullivan	Consultant Breast Surgeon, Cork University Hospital
Claire Thompson (CT)	Consultant Gynaecological Oncologist, Mater Hospital
Killian Walsh (KW)	Consultant Urologist, University Hospital Galway/Bons Secours Hospital Galway

Appendix C: Cancer Centres Data Collection Template



NCCP BRCA Needs Assessment

DRAFT Data Collection Template for Cancer Centres

Date: XX/XX/2021

Developed by: Dr. Ciara Kelly, NCCP

Introduction

The National Cancer Control Programme is currently undertaking a Needs Assessment for individuals with a diagnosis of a BRCA gene alteration in Ireland. Data collection is being conducted with the assistance of the Cancer Centres in Ireland as part of this project. The aims and objectives of this data collection process and relevant outputs are described below.

Aims

- To ascertain the total number and gender/age profile of individuals diagnosed with a BRCA gene alteration that attend the adult national cancer centres in Ireland.
- To ascertain the current type and co-ordination of surveillance, surgical, medical and psychological services in place in these cancer centres for individuals diagnosed with a BRCA gene alteration.

Objectives

- To ascertain the number of individuals diagnosed with a BRCA gene alteration attending the eight cancer centres in Ireland.
- To ascertain the gender and (if available) age profile of individuals diagnosed with a BRCA gene alteration in Ireland attending these cancer centres.
- To ascertain from a services perspective, within the individual cancer centres:
 - Whether the centre maintains a database of individuals diagnosed with a BRCA gene alteration.
 - What international guidelines, and/or internal policies/protocols are used by the cancer centres to guide management of individuals diagnosed with a BRCA gene alteration.
 - The current type and co-ordination of surveillance services in place for individuals diagnosed with a BRCA gene alteration.
 - The current type and co-ordination of risk-reducing surgical services in place for individuals diagnosed with a BRCA gene alteration.
 - The current type and co-ordination of medical services (including chemoprevention) in place for individuals diagnosed with a BRCA gene alteration.
 - The current type and co-ordination of psychological services in place for individuals diagnosed with a BRCA gene alteration.

Identifier:

Hospital (Cancer Centre):	Cancer Centre:
	Hospital Group:
Completed by:	Name:
	Role:
Completed with:	Name:
	Role:
Date of completion (DD/MM/YYYY):	

Section 1

Data Management

- a. Does the Cancer Centre have a database or register held locally for individuals with a diagnosis of a BRCA gene alteration?

Yes:	No:
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Other:

- b. What software is used to maintain the database/register?

- c. Who is responsible for maintaining the database/register?

Additional comments:

Section 2

Guidelines and Protocols for BRCA Management

- i. Are any national or international guidance documents used in the Cancer Centre to guide management of individuals diagnosed with a BRCA gene alteration? Specify below.

- ii. Are any internal policies or protocols are used in the Cancer Centre to guide management of individuals diagnosed with a BRCA gene alteration? Specify below.

Section 3

Size and Epidemiology of the BRCA Population Attending the Cancer Centre

- a. Approximately how many individuals with a diagnosis of a BRCA gene alteration currently attend the Cancer Centre? Record below the number of women and men respectively with a BRCA 1 or 2 gene alteration attending the centre. If it is not possible to provide these numbers according to gender or by BRCA 1 or 2 gene alteration, record the total number of individuals with a BRCA 1 and/or 2 gene alteration attending the centre.

Diagnosis	Number attending (n)
BRCA 1	
Women	
Men	
BRCA 2	
Women	
Men	
BRCA 1 – Overall	
BRCA 2 – Overall	
BRCA 1 and 2 – Overall	

Additional comments:

- b. Record below, if available, the age range, and/or (for females) number per age bracket, of the individuals with a diagnosis of a BRCA gene alteration currently attending the Cancer Centre:

Age Category	BRCA1 (n)	BRCA2 (n)
Female:		
Female (20-30)		
Female (30-39) <ul style="list-style-type: none"> 30-35 (if available) 35-39 (if available) 		
Female (40-49) <ul style="list-style-type: none"> 40-45 (if available) 45-49 (if available) 		
Female (50-59)		
Female (60-69)		
Female (70+)		
Male:		
Male (20-30)		
Male (30-39)		
Male (40-49)		
Male (50-59)		
Male (60-69)		
Male (70+)		

Additional comments:

- c. Approximately how many individuals with a breast cancer risk due to family history (moderate or high risk) are under surveillance in your centre?

Section 4

Services Available for Individuals with a BRCA Gene Alteration

The following questions relate to current processes and clinical services available within the Cancer Centre for individuals with a diagnosis of a BRCA gene alteration. Certain responses may be pre-populated following the response to Section 2 regarding external guidelines and internal policies/protocols in use in the centre – if pre-populated, the responses should be verified with the respondent.

a. Clinic Services

- i. Which clinics do women with a diagnosis of a BRCA gene alteration attend in the centre? Respond 'Yes' to all that apply. If answering 'other', please elaborate.

Clinic	Response (Yes/No)
Symptomatic Breast Clinic	
Familial Risk Breast Clinic	
General Gynae Clinic	
Other (please specify)	

Additional comments:

ii. State the frequency of the relevant clinic (s) in the second box below.

Clinic Frequency	Response
Clinic Type	
At least weekly	
At least monthly	
Other (please specify)	
Clinic Type	
At least weekly	
At least monthly	
Other (please specify)	
Clinic Type	
At least weekly	
At least monthly	
Other (please specify)	

Additional comments:

iii. Which clinics do men with a diagnosis of a BRCA gene alteration attend in the Cancer Centre?

- iv. State the frequency of the relevant clinic (s) in the second box below.

Clinic Frequency	Response
Clinic Type	
At least weekly	
At least monthly	
Other (please specify)	
Clinic Type	
At least weekly	
At least monthly	
Other (please specify)	
Clinic Type	
At least weekly	
At least monthly	
Other (please specify)	

Additional comments:

b. Co-ordination of Care

- i. For individuals with a diagnosis of a BRCA gene alteration attending the Cancer Centre, who co-ordinates the person's care? This refers to overall co-ordination of surveillance, referrals for risk-reducing surgery and psychological services, etc. e.g. doctor, registered nurse, other.

c. Surgical Services

- i. For individuals with a diagnosis of a BRCA gene alteration attending the Cancer Centre, are services available on-site for risk-reducing surgery for this group? Specify for both breast and ovarian risk-reducing surgery.

Surgery Type	Response (Yes/No)
Breast (Mastectomy)	
Ovarian (Bilateral salpingo-oophorectomy - BSO)	

- ii. If risk-reducing surgery is not available on site, where are individuals with a BRCA gene alteration referred to in order to undergo risk-reducing surgery?

A. Breast (Mastectomy):

B. Ovarian (BSO):

iii. Who is responsible for making the referral for risk-reducing surgery?

A. Breast (Mastectomy):

B. Ovarian (BSO):

Additional comments:

d. Surveillance

i. For individuals with a diagnosis of a BRCA gene alteration attending the Cancer Centre, are radiological facilities for breast surveillance available on site? Specify for breast and ovarian surveillance and the type of surveillance offered.

A. Breast Surveillance:

	Yes	No
MRI		
Mammography		

ii. Does the centre offer ovarian cancer surveillance to individuals with a diagnosis of a BRCA gene alteration attending? Specify yes or no. If answering 'other', elaborate if possible.

Yes:	No:
------	-----

Other:

iii. If yes, state the type (s) of ovarian surveillance offered below:

	Yes	No
Transvaginal ultrasound		
CA-125		

Additional comments:

- iv. If surveillance is not available on site, where are patients referred to in order to undergo surveillance? Specify for breast and ovarian surveillance.

Breast Surveillance

Ovarian Surveillance

- v. Who is responsible for co-ordination of surveillance? Specify for breast and ovarian surveillance.

Breast Surveillance

Ovarian Surveillance

Additional comments:

e. Chemoprevention

- i. For individuals with a diagnosis of a BRCA gene alteration attending the Cancer Centre, are chemoprevention strategies discussed and available as part of risk management (e.g. Tamoxifen/selective oestrogen receptor modulators for breast cancer, the oral contraceptive pill for ovarian cancer)? Specify yes or no and the type of chemoprevention offered. Further information can be provided in the Additional Comments section.

	Yes	No
Breast		

Type of chemoprevention available/offered:

	Yes	No
Ovarian		

Type of chemoprevention available/offered:

Additional comments:

f. Psychological Support

- i. For individuals with a diagnosis of a BRCA gene alteration attending the centre, are psychological assessment and support services available on site? Specify yes or no and the nature of assessment and support offered.

	Yes	No
Psychological support on site		

Type of assessment and support offered:

- ii. If psychological assessment and/or support are not available on site, where are patients referred to for this?

- iii. Who is responsible for making this referral?

Additional comments:

Record any additional comments the respondent may have in relation to services available in the Cancer Centre for individuals diagnosed with a BRCA gene alteration, or regarding any of the other questions in this survey.

Appendix D: Pre-Consultation Document for the Marie Keating Foundation BRCA Support Group.



BRCA Needs Assessment Project

Project Pre-Consultation with Marie Keating BRCA Support Group

Introduction

- The National Cancer Control Programme (NCCP) is currently undertaking a Needs Assessment for individuals identified with a BRCA gene alteration in Ireland.
- The scope of this project is to address the needs of this population after the point of detection of a BRCA gene alteration.
- As part of this project:
 - A review of international guidelines and studies on the management of BRCA and the needs of those identified with a BRCA gene alteration is in progress.
 - Data are being collected from the Cancer Centre hospitals in Ireland to estimate the number of persons identified with a BRCA gene alteration in Ireland, and the structure of current services available to them (including surveillance, risk-reducing surgery and psychological services, among others).
- Using these information sources, a number of key areas (themes) have been identified at this stage in this project, where recommendations for change will ultimately be made.
- It is planned that these recommendations will inform improvement of current services to meet the needs of those identified with a BRCA gene alteration in Ireland.

Purpose of this Document and Pre-Consultation with the Marie Keating BRCA Support Group

- This pre-consultation is specifically for persons identified with a BRCA gene alteration.
- In this document, there are eight key areas presented with the main associated issues identified to date outlined.
- Your input at this early phase of the project on the identified areas and issues would be greatly appreciated.
- Your input will be used to inform the recommendations developed as part of this project.
- The report of this BRCA Needs Assessment will be opened for public consultation in early 2022 – therefore, this pre-consultation exercise is **not** the last opportunity to input to this project.

Instructions for Participation

A short presentation on the project and the areas outlined below will be made by Dr. Ciara Kelly (Public Health doctor/Project Lead at the NCCP) at the December 9th meeting of the Marie Keating BRCA Support Group. Ahead of this meeting, we are sharing this summary document to give you the

opportunity to review the content in advance and record your feedback. The options for participating in this pre-consultation exercise are as follows:

1. If you can attend the meeting on December 9th 2021 as part of the Marie Keating BRCA Support Group:
 - Record your feedback in this Word document using the outlined sections and spaces and return the document via email by December 16th 2021 to any of the following persons: Bernadette Carter (Assistant Director of Nursing, Marie Keating Foundation) bcarter@mariekeating.ie; Niki Warner (BRCA Needs Assessment Steering Group Representative for the Marie Keating BRCA Support Group) niki.warner6@gmail.com; Rachel McKeon (BRCA Needs Assessment Steering Group Representative for the Marie Keating BRCA Support Group) rachel.ireland@hotmail.co.uk ; or Dr. Ciara Kelly (Public Health Doctor/Project Lead) prevention@cancercontrol.ie
 - At the December 9th meeting, there will be a short period allocated to presentation and discussion of the areas and issues outlined in this document.
2. If you cannot attend the meeting on December 9th 2021 **or** are not currently a member of the Marie Keating BRCA Support Group:
 - Return your feedback as per step 1 - record your feedback in this Word document using the outlined sections and return the document via email by December 16th 2021 to any of the following persons: Bernadette Carter (Assistant Director of Nursing, Marie Keating Foundation) bcarter@mariekeating.ie ; Niki Warner (BRCA Needs Assessment Steering Group Representative for the Marie Keating BRCA Support Group) niki.warner6@gmail.com; Rachel McKeon (BRCA Needs Assessment Steering Group Representative for the Marie Keating BRCA Support Group) rachel.ireland@hotmail.co.uk ; or Dr. Ciara Kelly (Public Health Doctor/Project Lead) prevention@cancercontrol.ie

In the following pages, each of the eight key areas (themes) are presented, with the main associated issues identified to date summarised, following by space for your comments and/or suggestions regarding any issues not identified and/or suggestions for how you would like to see the issues resolved. At the end, there is also space to record any areas or issues not included in this document that you feel are relevant.

Please note:

There is no obligation to participate in this exercise or project. We would also ask that those participating do not include any identifying information (such as your name or personal medical/surgical history) in this document.

Theme 1: Information Needs

Issues identified:

- A number of areas have been identified where greater information resources are needed for persons identified with a BRCA gene alteration in Ireland, particularly in relation to:
 - Accessible and reliable educational information for those identified with a BRCA gene alteration, including options for reducing the risks associated with BRCA
 - Options for risk-reducing surgery, including options for breast reconstruction after risk-reducing breast surgery (mastectomy)
 - Practical information on post-surgery care after risk-reducing surgery
 - Use of Hormone Replacement Therapy (HRT) after risk-reducing ovarian surgery (bilateral salpingo-oophorectomy (BSO))
 - Family planning after a person has been identified with a BRCA gene alteration
 - Pre-implantation Genetic Diagnosis (PGD)
 - Information for men identified with a BRCA gene alteration (e.g. the implications for them and their family, and options for reducing the risks associated with BRCA)

Please record any additional issues you feel relate to this theme below:

Please record any suggestions for how you would like to see these issues resolved:

Theme 2: Access to Specialist Genetics Expertise

Issues identified:

- Access to specialist genetics expertise is needed, particularly regarding:
 - Discussing the implications of BRCA with family members
 - Family planning after identification of a BRCA gene alteration, including Pre-implantation Genetic Diagnosis (PGD)

Please record any additional issues you feel relate to this theme below:

Please record any suggestions for how you would like to see these issues resolved:

Theme 3: Model and Co-ordination of Care

Issues identified:

- There is a need for greater clarity regarding the co-ordination of care for persons with a BRCA gene alteration, across healthcare specialties (e.g. breast surgery versus gynaecology) and services (e.g. surveillance, surgery, psychological support) in the healthcare system
- There is a need for greater consistency in the points of contact in hospitals for persons with a BRCA gene alteration

Please record any additional issues you feel relate to this theme below:

Please record any suggestions for how you would like to see these issues resolved:

Theme 4: Risk-Reducing Surgery (Breast and Ovarian)

Issues identified:

- In some public hospitals, there are substantial waiting times for risk-reducing surgery, due to a combination of factors. These factors include having dedicated access to theatre time and space for surgery.
- In some hospitals, there can be variation in access to certain options for breast reconstruction after risk-reducing mastectomy.
- The ongoing COVID-19 pandemic continues to have an impact on these services.

Please record any additional issues you feel relate to this theme below:

Please record any suggestions for how you would like to see these issues resolved:

Theme 5 (a): Breast Surveillance

Issues identified:

- Guarantee of breast surveillance imaging (e.g. MRI and mammography) at scheduled intervals can be challenging due to competing demands on radiology resources

Please record any additional issues you feel relate to this theme below:

Please record any suggestions for how you would like to see these issues resolved:

Theme 5 (b): Ovarian Surveillance

Issues identified:

- There can be variation in practice regarding ovarian cancer surveillance

Please record any additional issues you feel relate to this theme below:

Please record any suggestions for how you would like to see these issues resolved:

Theme 5 (c): Surveillance for Men and Other Risks

Issues identified:

- There is a need for greater clarity and information on surveillance for men identified with a BRCA gene alteration, particularly prostate cancer surveillance
- There is a need for greater clarity and information on surveillance for other cancer risks associated with BRCA

Please record any additional issues you feel relate to this theme below:

Please record any suggestions for how you would like to see these issues resolved:

Theme 6: Psychological Support

Issues identified:

- In some hospitals, there are adequate resources to provide routine assessment by a psycho-oncology team to persons with a BRCA gene alteration before risk-reducing surgery. In other hospitals, there are not sufficient resources to facilitate this
- There is a need for adequate psychological supports and interventions for those identified with a BRCA gene alteration to assist with coping with this diagnosis and with decision-making regarding future care and management (note – there is current research ongoing in Ireland on development of such resources)

Please record any additional issues you feel relate to this theme below:

Please record any suggestions for how you would like to see these issues resolved:

Theme 7: Women's Health

Issues identified:

- There is a need for greater access for persons identified with a BRCA gene alteration to dedicated support for management of specific women's health issues, including:
 - Management of early menopause after risk-reducing ovarian surgery

Please record any additional issues you feel relate to this theme below:

Please record any suggestions for how you would like to see these issues resolved:

Theme 8: Data on BRCA in Ireland

Issues identified:

- There is currently no national database or register for persons with a BRCA gene alteration
- This affects capacity to estimate the size of the BRCA population in Ireland and to plan services to meet the needs of this population

Please record any additional issues you feel relate to this theme below:

Please record any suggestions for how you would like to see these issues resolved:

Additional Comments

Please record below any additional comments or suggestions of themes or issues not addressed in the content of this document:

End of Document

Thank you very much for your input to this project pre-consultation exercise.

Appendix E. Literature Review – Study Identification, Screening and Selection Process.

Five specific questions were submitted to the Evidence Team of the HSE National Health Library and Knowledge Service, according to the NCCP Evidence Search Protocol, with individual searches completed for each as outlined below.

For individuals with a cancer-predisposing BRCA variant:

1. What are the international guidelines/models of care?
2. Does risk-reducing surgery impact on cancer-related survival/mortality?
3. What types of surveillance impact on cancer-related survival/mortality?
4. What types of chemoprevention impact on cancer-related survival/mortality?
5. What types of psychosocial interventions impact on quality of life and/or emotional well-being?

Due to the volume of results and to focus the findings to the most up to date studies from the past decade, the search was restricted to studies published in the past decade (i.e. from 2011 onwards). Titles and/or abstracts not considered relevant were excluded. All remaining studies were then reviewed in full-text, with small number subsequently excluded. Appendix F outlines the study screening and selection process. Reference lists of included studies were reviewed. Grey literature was also searched for international guidelines on management of BRCA.

Question		Results Returned	Number of Studies Post-Title/Abstract Screen	Number of Studies Included and Excluded After Full-Text Review
1	International Guidelines	123	12	5 <ul style="list-style-type: none"> 7 excluded based on more recent version available (5), outcome (1), duplicate (1)
2	Risk-Reducing Surgery	442	53	47 <ul style="list-style-type: none"> 7 excluded based on duplicate status (6) and study outcome (1)
3	Surveillance	217	38	31 <ul style="list-style-type: none"> 7 excluded based on study population (2) and design (5)
4	Chemo-prevention	387	6	6 <ul style="list-style-type: none"> No exclusions after full-text review
5	Psychological Support	90	16	16 <ul style="list-style-type: none"> No exclusions after full-text review

Appendix F. Comparison of International Guidelines for Management of BRCA in Women.

Guideline	Clinical Breast Exam	Education	Surveillance	Risk-Reducing Surgery	Chemoprevention	Psychological Support
Europe: ESMO	CBE every 6–12 months from age 25 or 10 years before the youngest breast cancer in family (whichever earlier)	Encourage breast awareness and lifestyle modifications for breast and ovarian cancer risk reduction	<p>Breast:</p> <p>Age 25: Commence annual MRI</p> <p>Age 30: Commence annual mammography</p> <p>Upper age limits not described</p> <p>Ovarian:</p> <p>Before RRSO, 6-monthly, TVUS and CA-125 may be considered from the age 30. Limited value of screening should be communicated to patients.</p> <p>Melanoma:</p> <p>May consider annual skin and eye examination.</p> <p>Pancreatic:</p> <p>May consider annual screening for pancreatic cancer with EUS or MRI/MRCP (inform that data supporting this approach very limited). No consensus when to commence screening—however, age 50 or 10 years before earliest diagnosed case in family would be reasonable</p>	<p>Breast:</p> <p>RR-mastectomy is most effective strategy to reduce breast cancer risk. Immediate breast reconstruction should be offered.</p> <p>Ovarian:</p> <p>RR-BSO is most effective strategy to reduce ovarian cancer risk – should be carried out at age 35-40. Fertility preservation options should be discussed if wish to undergoing BSO and childbearing not complete.</p>	<p>Tamoxifen may be considered as risk-reducing measure for breast cancer (although evidence deemed weak).</p> <p>Use of OCP may be considered as risk-reducing measure for ovarian cancer.</p>	<p>Post-diagnosis:</p> <p>Counselling needed to outline options for surveillance, risk-reducing measures and regarding fertility preservation in women who have not completed their family.</p> <p>Post RR-Surgery:</p> <p>Appropriate counselling should be available. After RR-BSO, appropriate information should be available to women regarding management of early menopause.</p>

ESMO = European Society of Medical Oncology; NCCN = National Comprehensive Cancer Network; NICE = National Institute for Health and Care Excellence; SEOM = Spanish Society of Medical Oncology; BSHG = Belgian Society for Human Genetics; CBE = Clinical Breast Exam; MRI = Magnetic Resonance Imaging; RR = Risk-Reducing; BSO = Bilateral Salpingo-oophorectomy; OCP = Oral Contraceptive Pill; ER = Oestrogen-Receptor; TVUS = Transvaginal Ultrasound; CA-125 = Cancer Antigen-125; UV = Ultraviolet; MRCP = Magnetic Resonance Cholangio-pancreatography; EUS = Endoscopic Ultrasound

Guideline	Clinical Breast Exam	Education	Surveillance	Risk-Reducing Surgery	Chemoprevention	Psychological Support
United Kingdom: NICE	Not available.	Provide education and information regarding: Breast awareness Lifestyle advice regarding breast cancer risk Contact details of local and national support groups	Breast: Age 30-49: Offer annual MRI Age 40-69: Offer annual mammography Age 30-39: Consider annual mammography Age ≥70: Offer annual mammography as part of population screening Ovarian: Not discussed. However, UK Royal College of Obstetrics and Gynaecology and Royal Marsden/Institute of Cancer Research guidelines advise against offering ovarian surveillance to BRCA carriers.	Breast: Discuss RR-mastectomy. All should be able to discuss breast reconstructive options (immediate and delayed) with a surgical team member with specialist oncoplastic or breast reconstructive skills. Ovarian: Discuss RR-BSO with patients. Discuss risks, benefits and options for management of early menopause pre-operatively.	Consider risk-reducing agents as options for breast and ovarian cancer, including discussion of risks and benefits.	Breast Surveillance: Discuss risks, benefits and possibility of over-diagnosis, impact of recall visit, and false negatives RR-Mastectomy: Pre-operative counselling should be offered regarding psychosocial and sexual consequences. Women should be offered access to support groups and/or women who have undergone the procedure.
United Kingdom: Royal Marsden / Institute for Cancer Research	Not available.	Advise regarding breast awareness.	Breast: Age 30-50: Annual MRI Age 40-70: Annual mammography Ovarian: Screening not recommended.	Breast: Discuss bilateral RR-mastectomy. Ovarian: Offer RR-BSO, once child-bearing is complete. Offer HRT post-operatively until age 50 in women with no history of ER-positive breast cancer.	BRCA1: Not appropriate to offer to BRCA1 carriers. BRCA2: Discuss benefits and side effects – can offer if no contra-indications.	

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Guideline	Clinical Breast Exam	Education	Surveillance	Risk-Reducing Surgery	Chemoprevention	Psychological Support
United Kingdom: NHS Very High-Risk Women Breast Surveillance Protocols	N/A	N/A	For female BRCA carriers: Breast: Age 25 - 29: Annual MRI Age 30 - 39: Annual MRI Age 40 - 50: Annual MRI & mammography Age 51 - <71*: Mammography +/- MRI *MRI to be reviewed annually on the basis of background density from age 50 years.	N/A	N/A	N/A

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Guideline	Clinical Breast Exam	Education	Surveillance	Risk-Reducing Surgery	Chemoprevention	Psychological Support
United States of America: NCCN	CBE every 6-12 months from age 25	<p>Breast self-exam and education (breast awareness) from age 18</p> <p>Cancer Signs and Symptoms: Educate regarding these.</p> <p>Risk to Relatives: Advise regarding possible inherited risks to relative and options for risk assessment and management.</p> <p>Reproductive Options: Advise about options for pre-natal diagnosis and assisted reproduction including PGD.</p>	<p>Breast:</p> <p>Age 25-29: Annual MRI</p> <p>Age 30-75: Annual mammogram and MRI</p> <p>Age >75: Manage on individual basis</p> <p>Ovarian: TVUS and CA-125 may be considered starting between ages 30-35</p> <p>Melanoma: General risk management appropriate, including annual full-body skin examination, minimising UV exposure.</p> <p>Pancreatic: Consider if exocrine pancreatic cancer in ≥1 first- or second-degree relatives from same side of family as patient, starting at the age of 50, or 10 years younger than earliest exocrine pancreatic cancer diagnosis in family. May use annual contrast-enhanced MRI/ MRCP and/or EUS. Consider shorter screening interval if worrisome abnormalities found</p>	<p>Breast: Discuss RR-mastectomy with patients. Counsel regarding risks, benefits, reconstruction options</p> <p>Ovarian: In BRCA1, recommend RR-BSO between age 35-40 In BRCA2, recommend RR-BSO between age 40-45 Counsel regarding risks, benefits, reproductive desires, management of menopausal symptoms, use of hormone replacement therapy</p>	Consider risk-reducing agents as options for breast and ovarian cancer, including discussion of risks and benefits.	General: Address psycho-social and quality of life aspects of RR-surgery

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Guideline	Clinical Breast Exam	Education	Surveillance	Risk-Reducing Surgery	Chemoprevention	Psychological Support
Australia	Not available.	Not available.	<p>Breast:</p> <p>Age 30-50: Offer annual MRI, +/- US</p> <p>Age 40-50: +/- Annual mammogram</p> <p>Age >50: Offer annual mammogram, +/- MRI if dense breasts</p> <p>Ovarian:</p> <p>Do not offer.</p> <p>Pancreatic:</p> <p>Do not offer screening – should only be undertaken as part of a clinical trial</p>	<p>Breast:</p> <p>Discuss RR-mastectomy with patients.</p> <p>Ovarian:</p> <p>In BRCA1, recommend RR-BSO from age 35*</p> <p>In BRCA2, recommend RR-BSO from age 40*</p> <p>*After family completion</p> <p>Ensure individualised discussion regarding management of early menopause pre-operatively.</p>	If considering use, ensure careful assessment of risks and benefits with the individual.	
Spain: SEOM	Not available.	Not available.	<p>Breast:</p> <p>Age 30-70: Annual MRI or earlier if family history of breast cancer before age 30</p> <p>Age 30: Consider annual mammogram</p> <p>Age 40-75: Annual mammogram</p> <p>Ovarian:</p> <p>Consider 6-monthly TVUS/CA-125 from age 30 until age of RR-BSO/for those not undergoing RR-BSO</p>	<p>Breast:</p> <p>RR-mastectomy recommended.</p> <p>Ovarian:</p> <p>In BRCA1, recommend RR-BSO between age 35-40</p> <p>In BRCA2, recommend RR-BSO between age 40-45</p> <p>May consider short-term and low-dose use of HRT in BRCA carriers without a history of breast cancer post-BSO</p>	<p>Consider tamoxifen in primary prevention.</p> <p>Use of OCP not contraindicated (possibility of increased breast cancer risk).</p>	Not available.

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Guideline	Clinical Breast Exam	Education	Surveillance	Risk-Reducing Surgery	Chemoprevention	Psychological Support
Germany	CBE 6-monthly from age 25	Not available.	Breast: Age 25: Annual MRI Age 25: Annual ultrasound between MRI Age 40: Bi-annual mammography Upper age limits not described Ovarian: Not specified.	Breast: RR-mastectomy recommended. Ovarian: RR-BSO recommended.	Risk-reducing options for breast cancer risk recommended.	Not available.
France	CBE annually in carriers under age 25	Not available.	Breast: Age 30-65: Annual synchronous MRI and mammogram, 6-monthly alternating with CBE Age >65: Annual mammogram Consider co-morbidities and life expectancy in upper age limit decision Ovarian: Annual pelvic examination – age to start not specified	Breast: RR-mastectomy recommended from age 30. Ovarian: BRCA1 RR-BSO recommended from age 40 BRCA2 RR-BSO recommended from age 45	Not specified.	Psychological support should be provided to patients through follow-up, and systematically provided during the course of RR-surgery by an experienced psycho-oncologist.

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Guideline	Clinical Breast Exam	Education	Surveillance	Risk-Reducing Surgery	Chemoprevention	Psychological Support
The Netherlands	CBE recommended annually between age 25-75	Not available.	<p>Breast: BRCA1 Age 25-40: Annual MRI Age 40-60: Annual MRI with bi-annual mammogram Age 60-75: Annual mammogram (consider MRI if high breast density)</p> <p>Breast: BRCA2 Age 25: Annual MRI Age 30: Annual MRI with annual mammogram Age 60-75: Annual mammogram (consider MRI if high breast density)</p> <p>Ovarian: Not recommended</p>	Not available.	Not available.	Not available.

ESMO = European Society of Medical Oncology; NCCN = National Comprehensive Cancer Network; NICE = National Institute for Health and Care Excellence; SEOM = Spanish Society of Medical Oncology; BSHG = Belgian Society for Human Genetics; CBE = Clinical Breast Exam; MRI = Magnetic Resonance Imaging; RR = Risk-Reducing; BSO = Bilateral Salpingo-oophorectomy; OCP = Oral Contraceptive Pill; ER = Oestrogen-Receptor; TVUS = Transvaginal Ultrasound; CA-125 = Cancer Antigen-125; UV = Ultraviolet; MRCP = Magnetic Resonance Cholangio-pancreatography; EUS = Endoscopic Ultrasound

Guideline	Clinical Breast Exam	Education	Surveillance	Risk-Reducing Surgery	Chemoprevention	Psychological Support
Belgium: BSHG	CBE 6-monthly from age 25	Not available.	<p>Age 25-35: Annual MRI</p> <p>Age 30: Baseline mammogram and consider starting annually</p> <p>Age 35: Recommend annual mammogram</p> <p>Age 35-65: Annual MRI and mammogram, alternating 6-monthly</p> <p>Age 65-75: Annual mammogram (consider MRI if high breast density)</p> <p>Ovarian: Not recommend, but state tailored surveillance could be offered from age 40 if refuses BSO</p>	<p>Breast: RR-mastectomy recommended.</p> <p>Ovarian: BRCA1 - Recommend to strongly consider BSO <40 years of age. BRCA2 - Recommend to strongly consider BSO <50 years of age.</p>		

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Appendix G: International Guidance Regarding Pancreatic Cancer Surveillance in BRCA Carriers.

International Guideline	Recommendations
ESMO ¹	<ul style="list-style-type: none"> • Lack of evidence to inform pancreatic cancer surveillance • Suggest EUS or MRI/MRCP beginning from age 50 or 10 years earlier than the earliest diagnosis in the family, if there is a family history
NCCN ²¹	<ul style="list-style-type: none"> • If exocrine pancreatic cancer in ≥1 first- or second-degree relatives from same side of family - consider of surveillance using contrast-enhanced MRI/MRCP and/or EUS from age 50 or 10 years earlier than the earliest diagnosis in the family
NICE ²⁰	<ul style="list-style-type: none"> • MRI/MRCP or EUS to BRCA1/2 carriers with one or more first-degree relatives with pancreatic cancer*
SEOM ⁶	<ul style="list-style-type: none"> • Consider pancreatic cancer surveillance with EUS and MRI in BRCA carriers with a first-degree-relative with pancreatic cancer from the age of 50, or 10 years before the youngest diagnosis in the family
BSHG ⁹	<ul style="list-style-type: none"> • Recommends smoking cessation • Recommends pros and cons of surveillance (in accordance with the International <i>Cancer of the Pancreas</i> Screening Consortium guidelines) be discussed with BRCA carriers depending on family history • Surveillance should preferably be conducted in clinical trial setting (Belgian ref). • For BRCA1 carriers, discuss if patient has ≥1 first-degree relatives with pancreatic cancer • For BRCA2 carriers, discuss if ≥1 first-degree relatives or ≥2 relatives of any degree with pancreatic cancer.
Australia ⁴	<ul style="list-style-type: none"> • Does not recommend pancreatic surveillance, outside of clinical trial conditions, due to lack of data to support effectiveness (7).

ESMO = European Society of Medical Oncology; NCCN = National Comprehensive Cancer Network; NICE = National Institute for Health and Care Excellence; SEOM = Spanish Society of Medical Oncology; BSHG = Belgian Society for Human Genetics. *UK Cancer Genetics Group (CGG) challenged this recommendation as premature, citing concerns regarding overestimation of lifetime risks for pancreatic cancer for certain genes including BRCA1/2.²² The UK CGG recommend pancreatic surveillance be undertaken only in the context of a clinical research trial.

