Table S1: Scoping review papers

Relevant background literature	Digital tools and risk assessments in primary care	Educational needs in genomics in primary care	Risk Communication	Clinical utility, communication and ethical issues
Archer, S. *et al.* Evaluating clinician acceptability of the prototype CanRisk tool for predicting risk of breast and ovarian cancer: A multi-methods study. *PloS One* 15, (2020).	Gordon, E. S., Babu, D. & Laney, D. A. The future is now: Technology's impact on the practice of genetic counseling. *American Journal of Medical Genetics Part C: Seminars in Medical Genetics* 178, 15–23 (2018).	Carroll, J. C. *et al.* Genetic education for primary care providers. *Can Fam Physician* 55, e92 (2009).	Glanz, K. *et al.* Effects of Tailored Risk Communications for Skin Cancer Prevention and Detection: The PennSCAPE Randomized Trial. *Cancer Epidemiol Biomarkers Prev* 24, 415 (2015).	Das Gupta, K. *et al.* Communicating polygenic risk scores in the familial breast cancer clinic. *Patient Education and Counseling* 104, 2512–2521 (2021).
Domchek, S. M. *et al.* Application of Breast Cancer Risk Prediction Models in Clinical Practice. *Journal of Clinical Oncology* 21, 593–601 (2003).	Jimenez, G. *et al.* Digital health competencies for primary healthcare professionals: A scoping review. *International Journal of Medical Informatics* 143, 104260 (2020).	Gresty, K., Skirton, H. & Evenden, A. Addressing the issue of e-learning and online genetics for health professionals. *Nursing & Health Sciences* 9, 14–22 (2007).	Goldman, R. E. *et al.* Patients' Perceptions of Cholesterol, Cardiovascular Disease Risk, and Risk Communication Strategies. *Ann Fam Med* 4, 205 (2006).	Forrest, L. E., Sawyer, S. D., Hallowell, N., James, P. A. & Young, M.-A. High-risk women's risk perception after receiving personalized polygenic breast cancer risk information. *Journal of Community Genetics* 10, 197–206 (2019).
Shah, N. *et al.* Exploring mobile working in healthcare: Clinical perspectives on transitioning to a mobile first culture of work. *International Journal of Medical Informatics* 125, 96–101 (2019).	Pagliari, C. Digital health and primary care: Past, pandemic and prospects. *J Glob Health* 11, 01005–01005 (2021).	Hamilton, J. G. *et al.* Primary care providers' cancer genetic testing-related knowledge, attitudes, and communication behaviors: A systematic review and research agenda. *Journal of General Internal Medicine* 32, 315–324 (2017).	Hoover, D. S. *et al.* Enhancing Smoking Risk Communications: The Influence of Health Literacy and Message Content. *Annals of Behavioral Medicine* 52, 204–215 (2018).	Lewis, A. C. F. & Green, R. C. Polygenic risk scores in the clinic: new perspectives needed on familiar ethical issues. *Genome Medicine* 13, 14 (2021).
Short, D., Frischer, M. & Bashford, J. Barriers to the adoption of computerised decision support systems in general practice consultations: a qualitative study of GPs' perspectives. *International Journal of Medical Informatics* 73, 357–362 (2004).		Houwink, E. J. *et al.* Genetic educational needs and the role of genetics in primary care: a focus group study with multiple perspectives. *BMC Family Practice* 12, 5 (2011).	Julian-Reynier, C. *et al.* Risk communication strategies: state of the art and effectiveness in the context of cancer genetic services. *European Journal of Human Genetics* 11, 725–736 (2003).	Lewis, A. C. F., Green, R. C. & Vassy, J. L. Polygenic risk scores in the clinic: Translating risk into action. *Human Genetics and Genomics Advances* 2, 100047 (2021).
Trivedi, M. H. *et al.* Barriers to		Suther, S. & Goodson, P.	Vassy, J. L. *et al.* How Primary	Torkamani, A., Wineinger, N.

implementation of a computerized decision support system for depression: an observational report on lessons learned in 'real world' clinical settings. *BMC Med Inform Decis Mak* 9, 6–6 (2009).		Barriers to the provision of genetic services by primary care physicians: A systematic review of the literature. *Genetics in Medicine* 5, 70–76 (2003).	Care Providers Talk to Patients about Genome Sequencing Results: Risk, Rationale, and Recommendation. *Journal of General Internal Medicine* 33, 877–885 (2018).	E. & Topol, E. J. The personal and clinical utility of polygenic risk scores. *Nature Reviews Genetics* 19, 581–590 (2018).
Usher-Smith, J., Emery, J., Hamilton, W., Griffin, S. J. & Walter, F. M. Risk prediction tools for cancer in primary care. *British Journal of Cancer* 113, 1645–1650 (2015).		Trinidad, S. B. *et al.* Educational Needs in Genetic Medicine: Primary Care Perspectives. *Public Health Genomics* 11, 160–165 (2008).		
		Smit, A. K. *et al.* Knowledge, views and expectations for cancer polygenic risk testing in clinical practice: A cross-sectional survey of health professionals. *Clinical Genetics* 100, 430–439 (2021).		

<u>Material S1:</u>

Training evaluation questionnaire (pre): before completing the 'Multifactorial breast cancer risk assessment in primary care' online training programme

<u>Demographic information questions:</u>

Q1: What is your gender?
- Male
- Female
- Non-binary / third gender
- Prefer not to say

Q2: What is your age group?
- 25-30
- 31-35

- 36-40
- 41-45
- 46-50
- 51-55
- 56-60
- Over 60

Q3: What is your profession?

- General Practitioner
- Practice Nurse

Q4: What is the region of your primary care practice?

- North East
- North West
- Yorkshire and the Humber
- East Midlands
- East of England
- London
- South East
- South West
- West Midlands
- Wales
- Scotland
- Northern Ireland

Q5: Which of the following would you say best describes your primary care practice?

- Urban
- Rural
- Mixed

Q6: How many patients are registered in your primary care practice?

- 0-5000
- 5001-10000
- 10001-15000
- 15001-20000
- over 20000

Q7: How many years of clinical experience in primary care do you have?

1-5
6-10
11-15
16-20
over 20

Q8: Have you completed any previous training in genetics and or cancer risk prediction tools?

Yes
No

If yes, Please tell us about your previous training in genetics and or cancer risk prediction tools

Open text box

Q9: Do you have a specialization or special interest in any of the following?

Women's health and breast cancer
Genetics and risk assessments

<u>"Objective knowledge" questions: (correct answers in bold)</u>

Q1: Breast cancer risk is influenced by the following factors:

a) Genetic risk factors only
b) Age only
c) Lifestyle, hormonal and reproductive risk factors only
d) Genetic, lifestyle, hormonal, reproductive factors, mammographic density and cancer family history
e) Family history of cancer only

Q2: Which of the following statements about breast cancer polygenic scores is CORRECT?

a) Polygenic scores describe the combined effects of a large number of common genetic variants that are individually associated with breast cancer risk.
b) Polygenic scores describe the joint effects of rare pathogenic variants in high-risk breast cancer susceptibility genes.
c) Polygenic scores include the effects of high-risk pathogenic variants in the *BRCA1* and *BRCA2* breast cancer susceptibility genes.
d) Polygenic scores describe the effect of a single common genetic variant that is associated with low risk of breast cancer.
e) The predicted risk of breast cancer decreases with increasing breast cancer polygenic score.

Q3: Which of the following confers the highest risk for breast cancer?

a) BRCA1 mutation
b) ATM mutation

c) CHEK2 mutation
d) RAD51C mutation
e) Top 1% polygenic score

Q4: Which one of these is the least important when assessing a family history for hereditary breast and ovarian cancer panel testing?

a) Young age of onset of breast cancer
b) Many affected relatives with breast or ovarian cancer
c) Individuals with more than one cancer e.g. bilateral breast cancer
d) The number of skin cancers in the family
e) Several men with prostate cancer

Q5: Which of the following statements about risk communication is CORRECT?
a) The best way to communicate risk to individuals is to use percentages
b) The best way to communicate risk to individuals is to use graphs
c) Risk of breast cancer is conceptually very different from risk of cardiovascular disease and so needs a different set of skills
d) There is no single best way to communicate risk
e) Most individuals will understand their risk without needing any additional explanation

Q6: Which of the following statements about presenting cancer risk results is INCORRECT?
a) Presenting risk information so that it is understood by different audiences (i.e. patients and healthcare professionals) is be challenging
b) Organising the information into sections that are most relevant for different audiences can support understanding
c) Presenting risk information in multiple formats facilitates understanding
d) Risk information should be general in order to be understandable
e) All risk information, no matter how complex, can be presented in accessible ways

Q7: Which of the following statements about management of women in primary care is CORRECT?
a) All women with Jewish ancestry should be referred to clinical genetic
b) Women at moderate risk do not need referral and can be managed within primary care
c) The clinical details of each family member with a history of cancer should be confirmed in primary care before referring to clinical genetics
d) Only women at high risk or with a complex family history of cancer should be referred to clinical genetics
e) Women at moderate or high risk should be offered referral to clinical genetics

Q8. Which of the following statements about breast cancer risk management options is INCORRECT?

a) Women over 40 at moderate or high risk are eligible for additional breast screening
b) Women referred to clinical genetics will all be offered genetic testing
c) Women at moderate risk are eligible for tamoxifen
d) Women should be advised to return for a repeat assessment if their family history changes
e) Women at population level risk should be advised to be breast aware

Q9: Multifactorial breast cancer risk assessments can help stratify risk and target prevention and early detection interventions better than family history alone.

a) True
b) False

Q10: Managing and supporting women's decision-making process around breast cancer risk is mostly the responsibility of clinical genetics services.

a) True
b) False

<u>"Subjective knowledge" questions:</u>

Please tell us which of the options below best describe how you feel about the following 5 statements

1: "I have the knowledge I need to complete breast cancer risk assessments in my routine practice"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

2: "I know when it is appropriate to conduct breast cancer risk assessment in primary care"
a) Strongly disagree
b) Somewhat disagree

c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

3: "I have the knowledge I need to understand breast cancer risk assessments reports"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

4: "I have the knowledge needed to answer women’s questions about what their risk score means for them and their family members"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

"I have the knowledge needed to discuss management options with women at moderate an high-risk of developing breast cancer"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

<u>“Confidence” questions:</u>

Please tell us which of the options below best describe how you feel about the following 5 statements

1: "I can complete breast cancer risk assessments in my routine practice"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree

d) Somewhat agree
e) Strongly agree

2: "I would check with a colleague before deciding to do a breast cancer risk assessment"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

3: “I can discuss the outcomes of a breast cancer risk assessment with my patient"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

4: "I would check the guidelines before discussing management options with women at moderate an high-risk of developing breast cancer"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

5: "I can answer my patient’s questions about their risk of developing breast cancer and what this means for family members"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

Material S2:

Training evaluation questionnaire (post): after completing the 'Multifactorial breast cancer risk assessment in primary care' online training programme

"Objective knowledge" questions: (correct answers in bold)

Q1: Breast cancer risk is influenced by the following factors:

f) Genetic risk factors only
g) Age only
h) Lifestyle, hormonal and reproductive risk factors only
i) Genetic, lifestyle, hormonal, reproductive factors, mammographic density and cancer family history
j) Family history of cancer only

Q2: Which of the following statements about breast cancer polygenic scores is CORRECT?

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g) Polygenic scores describe the joint effects of rare pathogenic variants in high-risk breast cancer susceptibility genes.
h) Polygenic scores include the effects of high-risk pathogenic variants in the *BRCA1* and *BRCA2* breast cancer susceptibility genes.
i) Polygenic scores describe the effect of a single common genetic variant that is associated with low risk of breast cancer.
j) The predicted risk of breast cancer decreases with increasing breast cancer polygenic score.

Q3: Which of the following confers the highest risk for breast cancer?

f) BRCA1 mutation
g) ATM mutation
h) CHEK2 mutation
i) RAD51C mutation
j) Top 1% polygenic score

Q4: Which one of these is the least important when assessing a family history for hereditary breast and ovarian cancer panel testing?

f) Young age of onset of breast cancer
g) Many affected relatives with breast or ovarian cancer
h) Individuals with more than one cancer e.g. bilateral breast cancer
i) The number of skin cancers in the family

j) Several men with prostate cancer

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g) The best way to communicate risk to individuals is to use graphs
h) Risk of breast cancer is conceptually very different from risk of cardiovascular disease and so needs a different set of skills
i) There is no single best way to communicate risk
j) Most individuals will understand their risk without needing any additional explanation

Q6: Which of the following statements about presenting cancer risk results is INCORRECT?

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j) Women at moderate or high risk should be offered referral to clinical genetics

Q8. Which of the following statements about breast cancer risk management options is INCORRECT?

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g) Women referred to clinical genetics will all be offered genetic testing
h) Women at moderate risk are eligible for tamoxifen
i) Women should be advised to return for a repeat assessment if their family history changes
j) Women at population level risk should be advised to be breast aware

Q9: Multifactorial breast cancer risk assessments can help stratify risk and target prevention and early detection interventions better than family history alone.

c) **True**
d) False

Q10: Managing and supporting women's decision-making process around breast cancer risk is mostly the responsibility of clinical genetics services.

c) True
d) **False**

<u>"Subjective knowledge" questions:</u>

Please tell us which of the options below best describe how you feel about the following 5 statements

1: "I have the knowledge I need to complete breast cancer risk assessments in my routine practice"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

2: "I know when it is appropriate to conduct breast cancer risk assessment in primary care"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

3: "I have the knowledge I need to understand breast cancer risk assessments reports"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree

d) Somewhat agree
e) Strongly agree

4: "I have the knowledge needed to answer women's questions about what their risk score means for them and their family members"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

"I have the knowledge needed to discuss management options with women at moderate an high-risk of developing breast cancer"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

<u>"Confidence" questions:</u>

Please tell us which of the options below best describe how you feel about the following 5 statements

1: "I can complete breast cancer risk assessments in my routine practice"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

2: "I would check with a colleague before deciding to do a breast cancer risk assessment"

3: "I can discuss the outcomes of a breast cancer risk assessment with my patient"
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c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

4: "I would check the guidelines before discussing management options with women at moderate an high-risk of developing breast cancer"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

5: "I can answer my patient's questions about their risk of developing breast cancer and what this means for family members"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

<u>"Reaction" questions:</u>

Q1: What is your overall opinion of the 'Multifactorial breast cancer risk assessment in primary care' online training programme

a) poor
b) average
c) good
d) excellent
e) don't know

Q2: Did you have any issues accessing the 'Multifactorial breast cancer risk assessment in primary care' online training programme?
If yes, Please tell us what issues you had

Thinking about the 'CanRisk online training programme' overall, how strongly do you agree or disagree with the following 14 statements?

1: "I understood the learning objectives"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

2: "The learning objectives were relevant to me"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

3: "The learning objectives were covered in enough detail"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

4: "I was able to relate the learning objectives to the learning I achieved"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

5: "The programme will help me with my role"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree

d) Somewhat agree
e) Strongly agree

6: "I was appropriately challenged by the material"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

7 "The programme helped me to feel confident in conducting multifactorial breast cancer risk assessments"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

8: "I feel satisfied with the learning experience"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

9: "The programme was easy to navigate"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

10: "The programme was relevant to my role"
a) Strongly disagree

b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

11: "I was well engaged during the programme"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

12: "The programme was easy to understand"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

13: "The 10 multiple choice questions were relevant"
a) Strongly disagree
b) Somewhat disagree
c) Neither agree nor disagree
d) Somewhat agree
e) Strongly agree

Written feedback about the 'Multifactorial breast cancer risk assessment in primary care' online training programme:

Q1: What are your thoughts about the training? Please share in as much detail as you wish

Q2: How can we improve the 'CanRisk online training programme'? Please share any opportunities you may have identified