Surviving mothers and lost babies - burden of stillbirths and neonatal deaths among women with maternal near miss in eastern Ethiopia

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Original article

Risk communication in a patient decision aid for radiotherapy in breast cancer: How to deal with uncertainty?

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ABSTRACT

Background and aim: Patient decision aids for oncological treatment options, provide information on the effect on recurrence rates and/or survival benefit, and on side-effects and/or burden of different treatment options. However, often uncertainty exists around the probability estimates for recurrence/survival and side-effects which is too relevant to be ignored. Evidence is lacking on the best way to communicate these uncertainties. The aim of this study is to develop a method to incorporate uncertainties in a patient decision aid for breast cancer patients to support their decision on radiotherapy.

Methods: Firstly, qualitative interviews were held with patients and health care professionals. Secondly, in the development phase, thinking aloud sessions were organized with four patients and 12 health care professionals, individual and group-wise.

Results: Consensus was reached on a pictograph illustrating the whole range of uncertainty for local recurrence risks, in combination with textual explanation that a more exact personalized risk would be given by their own physician. The pictograph consisted of 100 female icons in a 10 x 10 array. Icons with a stepwise gradient color indicated the uncertainty margin. The prevalence and severity of possible side-effects were explained using verbal labels.

Conclusions: We developed a novel way of visualizing uncertainties in recurrence rates in a patient decision aid. The effect of this way of communicating risk uncertainty is currently being tested in the BRASA study (NCT03375801).

Abbreviations: SDM, shared decision making; HP, health care professionals; PtDA, patient decision aid; DCS, ductal carcinoma in situ; BCSS, breast cancer specific survival; LRR, local recurrence risk.

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1. Introduction

In health care, the best treatment for the individual patient is a tradeoff between the medical advantages and disadvantages of different treatment options and the personal values and preferences of the patient. This tradeoff is most relevant in preference-sensitive decisions: treatment decisions where no best treatment exists [1–3].

Some breast cancer patients, e.g. with an intermediate risk local recurrence risk (LRR), face such a preference-sensitive decision when deciding on adjuvant radiotherapy. The benefits of radiotherapy consist of a decrease in the risk of recurrence and sometimes a small survival benefit [4–9]. The disadvantages are possible side-effects and treatment burden. In many cases however, the exact recurrence risks are unknown. This is amongst other reasons due to literature based on outdated trials; breast cancer clinical trials having a long follow-up whilst new treatment options develop fast. Another reason is that clinical trials use strictly defined patient categories and patients do not always fit in the trial population [7]. Therefore, estimated recurrence risks are surrounded by an uncertainty margin. Some guidelines reflect this uncertainty, advocating shared decision making with the patient [5].

There are two levels of uncertainty. First-order/aleatory uncertainty, is the uncertainty of an event taking place in the future. The risk estimate is known on group level, but it is difficult to predict whether it will happen yes or no in the individual patient. Second-order/epistemic uncertainty, is the uncertainty around the risk estimates [10]. There is even uncertainty on the risk estimate on group level. Little is known on the best way to communicate risks and uncertainties to patients [11,12]. Risks and aleatory uncertainty are hard to understand for patients [13]. Communicating epistemic uncertainty is even a bigger challenge. Therefore, if clinicians communicate risks to patients, point estimates are commonly used. From ethical and medical-legal considerations, it can be argued though that patients should be fully informed on their treatment options including the uncertainty around these point estimates [14,15].

There is also epistemic uncertainty around the prevalence and severity of the side-effects of radiotherapy for breast cancer patients. First, the available literature mentioning prevalence and severity of side-effects is inconsistent, partly due to the use of different scoring systems to record side-effects [16]. Consequently, literature gives a wide range of prevalence and severity estimates [17,18]. Second, long-term side effects occur months to many years after irradiation, such that not all side-effects may be captured by registries and that by the time late side-effects occur, new treatments have become the standard [19]. Third, patient and treatment characteristics influence the risk of developing certain side-effects, making it harder to translate general risk estimates to specific estimates for individual patients [20].

A patient decision aid (PtDA) may be used to support the decision process and communication of risks and uncertainty [21]. PtDAs are tools that provide evidence based information on the advantages and disadvantages of different treatment options, make clear that they can decide between these options, and help patients to clarify which attributes are most important to them when making a medical decision [21]. However, there is no clear guideline on how uncertainty should be communicated in a PtDA. Therefore, there is large heterogeneity in how this is done [22]. In a review by Bansback et al. [23] only half of the tools described epistemic uncertainty. If epistemic uncertainty was mentioned it was mostly referred to in a qualitative way (large, small etc.). Although it might seem that these qualitative labels are better-understood compared to quantitative risks [24], it is known that patients interpret qualitative labels in very different ways. For example Freeman describes that the term “common” in an information leaflet is used for a side-effect occurring in 1–10% of cases, while doctors interpret common as something occurring in 25% of cases and patients in 50% of cases [15].

Although several PtDAs have been developed for early stage breast cancer patients, deciding on different treatment options, to our knowledge there are only two PtDAs for breast cancer patients deciding on radiotherapy [25]. Both have been developed in Canada for patients deciding on radiotherapy after lumpectomy and do not include information on uncertainty around the point estimates or side-effects [26,27]. Therefore, the primary objective of this study was first to assess opinions and attitudes of breast cancer patients and professionals on if, and how, to communicate uncertainties in recurrence rates, survival, and side-effects. The second objective was to incorporate this knowledge in a PtDA for breast cancer patients to support their decision on radiotherapy.

2. Methods

For the content of the PtDA we followed the guidelines of the International Patient Decision Aid Standards (IPDAS) [28,29]. From the start, it was clear that the PtDA had to be made for four different pathways:

1) Patients with low risk ductal carcinoma in situ (DCIS) after breast conserving surgery deciding on (partial) breast radiotherapy or no radiotherapy.
2) Patients with low risk invasive ductal carcinoma after breast conserving surgery deciding on (partial) breast radiotherapy or no radiotherapy.
3) Patients with intermediate risk breast cancer after mastectomy deciding on thoracic wall radiotherapy or no radiotherapy.
4) Patients with intermediate risk breast cancer after breast conserving surgery deciding on whole breast radiotherapy with or without an additional boost dose to the tumor bed.

2.1. Phase one: qualitative interviews

A qualitative study was conducted to explore the patients and health care professionals (HPs) views on important attributes for shared decision making for breast cancer patients deciding on radiotherapy [30]. For this paper, we only report the data on the communication of uncertainties. Data on other attributes and preferences are published elsewhere [31].

2.2. Phase two: alpha testing the risk communication part of the PtDA

With information derived from the interviews, the research team developed a draft version of the risk communication part of the PtDA. The PtDA was developed with input from both patients and HPs in different rounds (Fig. 1).

2.2.1. Patient advocates recruitment

Patient advocates were recruited through the national breast cancer association, the patient advisory group of the national breast cancer research group and through the patient advisory board of Maastro, one of the participating hospitals.

2.2.2. Health care professionals' recruitment

Radiation oncologists, surgeons, radiotherapy physician assistants and trial managers, all specialized in breast cancer, from 15 radiotherapy centers in the Netherlands were invited through personal contacts.

2.2.3. Development rounds

The draft version contained a PowerPoint presentation with a schematic concept of the PtDA accompanied by a Word document for patient advocates feedback. In round 1, the feedback was used to make a first online PtDA version. In round 2, a live group meeting with HPs and patent advocates was organized to discuss this online version. The content and layout of the PtDA was discussed until consensus was reached in the most important topics. In round 3, thinking aloud sessions [32] were organized with new drafts of the PtDA: Patient advocates reviewed the PtDA while speaking out loud what they thought and understood. With this feedback a pre-final version was developed. Round 4 consisted of a second live group meeting with HPs and patients. Here the pre-final version of the PtDA was discussed until consensus was reached, on a version that was created for testing in the field.

3. Results

3.1. Phase one: qualitative interviews

Most patients and HPs agreed that recurrence risks, survival data and side-effects in the PtDA should be communicated. While

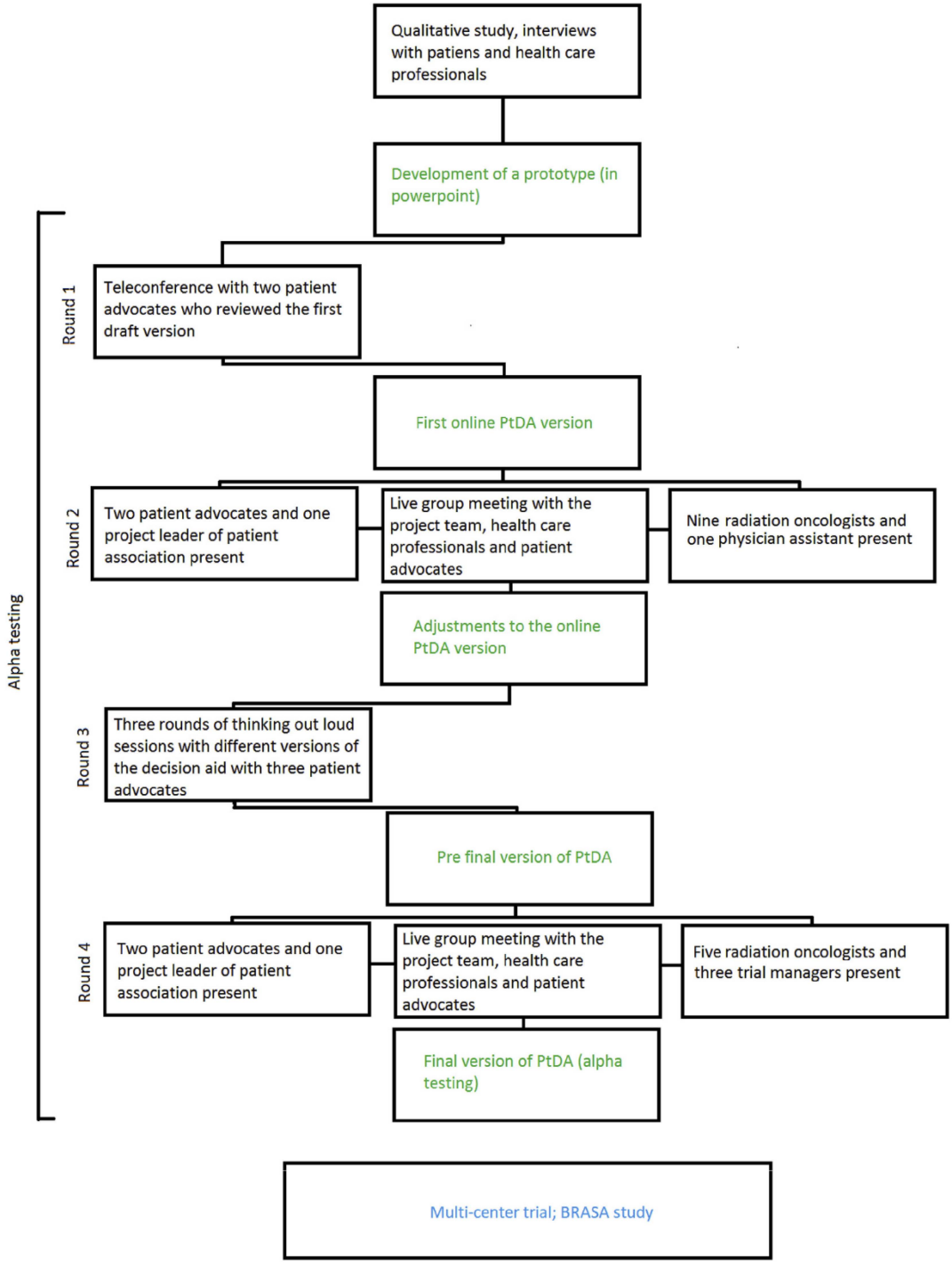

Fig. 1. Overview of the development of the Patient decision aid.

patients were only aware of aleatory uncertainty for recurrence risks, HPs also worried on how to communicate epistemic uncertainty. While patients did not express a specific preference for risk format, HPs agreed on communicating risks in a visual way. The treatment burden was not mentioned as an important attribute to decide on radiotherapy or not. The most relevant side-effects to both patients and HPs were extracted from the interviews [31].

3.2. Phase two: alpha testing the risk communication part of the PtDA

LRR and breast cancer specific survival (BCSS) were illustrated by a pictograph, combined with textual explanation of the LRR/BCSS: x out of 100 women will have a local recurrence in 10 years (Fig. 2) and x out of 100 women will die from breast cancer in 10 years. No uncertainty was communicated.

Side-effects were divided in short term (red and sensitive skin, edema, tiredness, and pain of the breast) and long-term side-effects (fibrosis and change in breast shape, edema, (dark) skin discolouration, pain, rib complications, heart problems and lung problems). Due to lack of relevant data, no quantification on probability could be given other than that side-effects could occur.

In round 1 patients understood the risks communicated on the pictographs. The data on BCCS were experienced as confronting, although patients thought that it was important to communicate.

The online version of the PtDA was developed together with an e-learning company (EyeSpirations, Amersfoort, The Netherlands) (Fig. 3).

During the live group meeting in round 2, with both patients and HPs there was agreement on the 10-year time frame for LRR. For pathway 2 consensus was reached on point estimates. A debate emerged on the LRR estimates of the other three pathways. It was argued that no estimates could be given since the LRR depend on individual patient, tumor and treatment characteristics but validated nomograms are lacking. The relative risk reduction is independent of individual characteristics. Therefore, there was consensus on mentioning both the absolute and the relative reduction in recurrence risk in combination with a pictograph. The absolute recurrence risk was mentioned as a range in risk reduction with an explanation that the patient's clinician would personalise the patient's LRR. Two options were suggested for the pictographs. The first option was to use fading colours in the 10 × 10 pictograph to indicate a given risk with its uncertainty margin. The second option was to show two different pictographs, one with the smallest estimated recurrence risk, and another with the highest estimated recurrence risk. Another debate emerged on how to communicate survival risks. It was argued that BCSS is not preferable the patient is mainly interested in overall survival expectancy. Overall survival however, is impossible to generate for the whole group since it also depends on patient characteristics, such as age, and co-morbidity, In Pathway 1, 2 and 4 no gain in survival is expected from radiotherapy, therefore, it was decided to mention this fact in words without putting an overall quantitative figure on it. For the intermediate risk breast cancer after mastectomy (pathway 3) there is assumed to be a small in survival benefit (i.e. <2–3%), which was described in this way in the PtDA.

Consensus on the information on the side-effects was reached by adding only qualitative labels to indicate an estimation of the

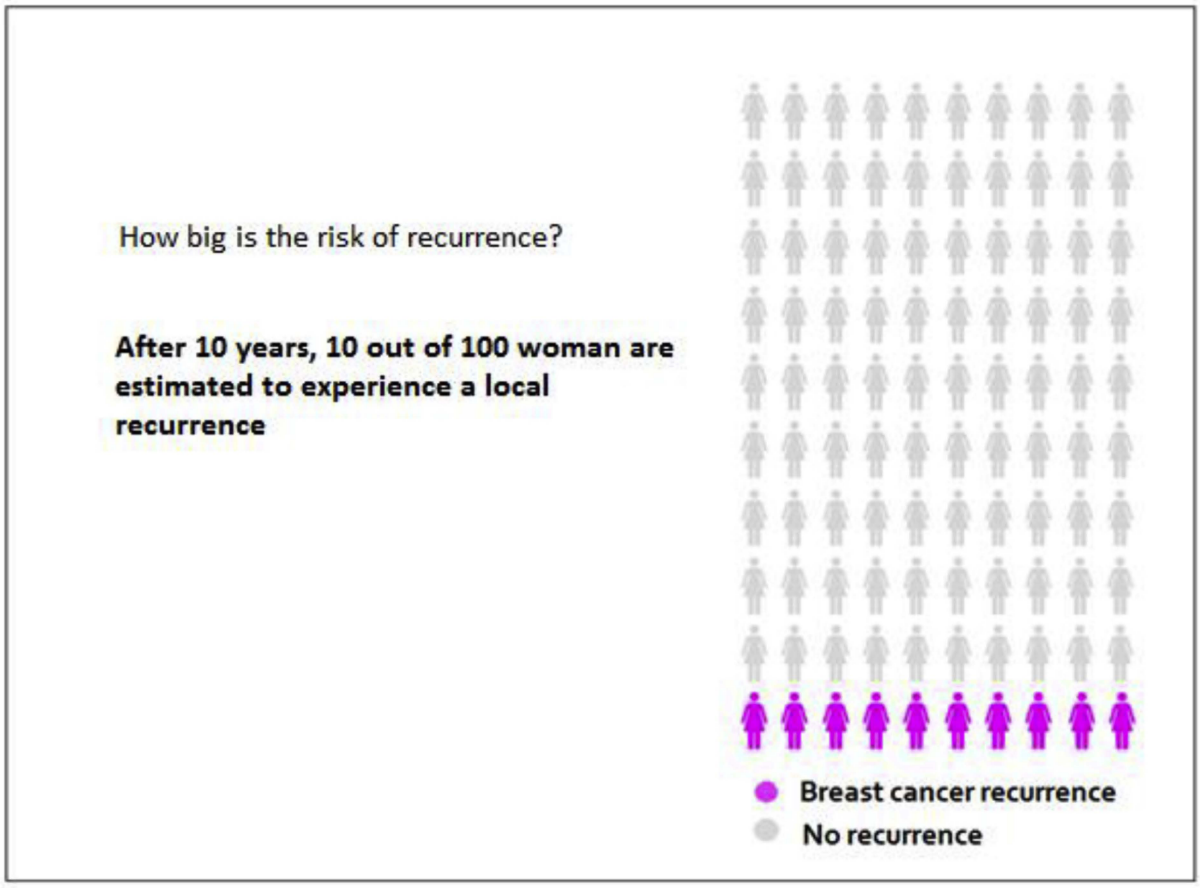

Fig. 2. Pictograph in first draft version of the PtDA: Local recurrence risk for low risk breast cancer after breast conserving surgery without radiotherapy.

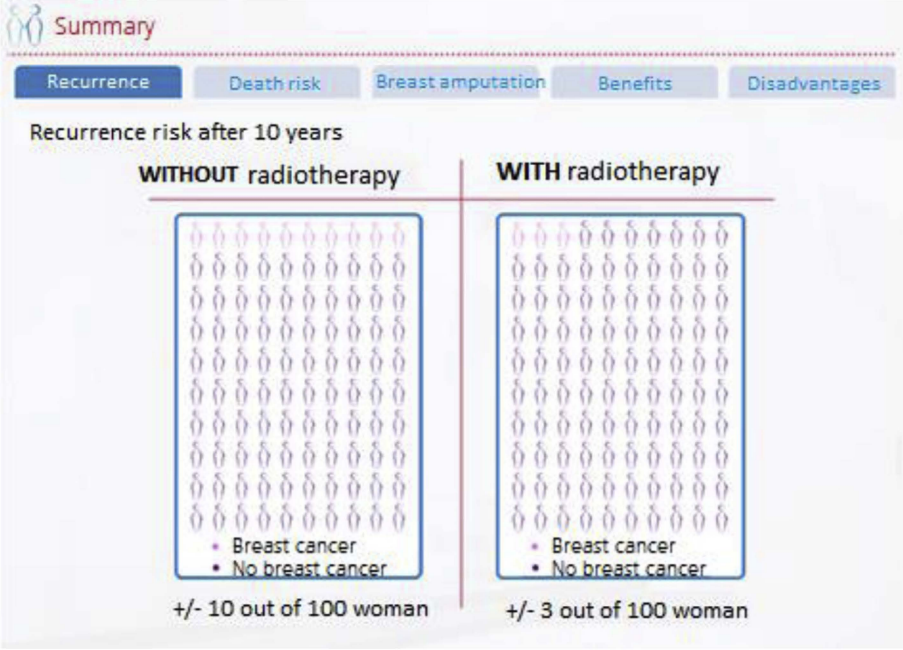

Fig. 3. Study-logo adapted pictographs with local recurrence risk with and without radiotherapy, in the first online version: Local recurrence risk for low risk breast cancer after breast conserving surgery with and without radiotherapy.

prevalence and severity of the possible side-effects. There was agreement that no estimates on frequency or severity of the expected side effects could be given, since there is a large variation in experienced side effects between patients and there is no adequate data available to predict this outcome for the individual patiënt. For the late side effects, distinction was made between common (fibrosis and change in breast shape, edema and pain) and rare side-effects ((dark) skin discolouration, rib complications, heart problems and lung problems). Severity of the side-effects was qualified as varying between patients between almost no discomfort to very annoying. Smoking was added as an important risk factor for heart problems and secondary lung cancer after breast irradiation. Also, more information was added to the consequences of the different side-effects.

For the thinking aloud sessions in round 3, new pictorial charts were made. For pathway 2, pictographs with point estimates were made (Fig. 4). For the other three pathways, there was a preference for the pictographs with fading colours, ultimately a choice was

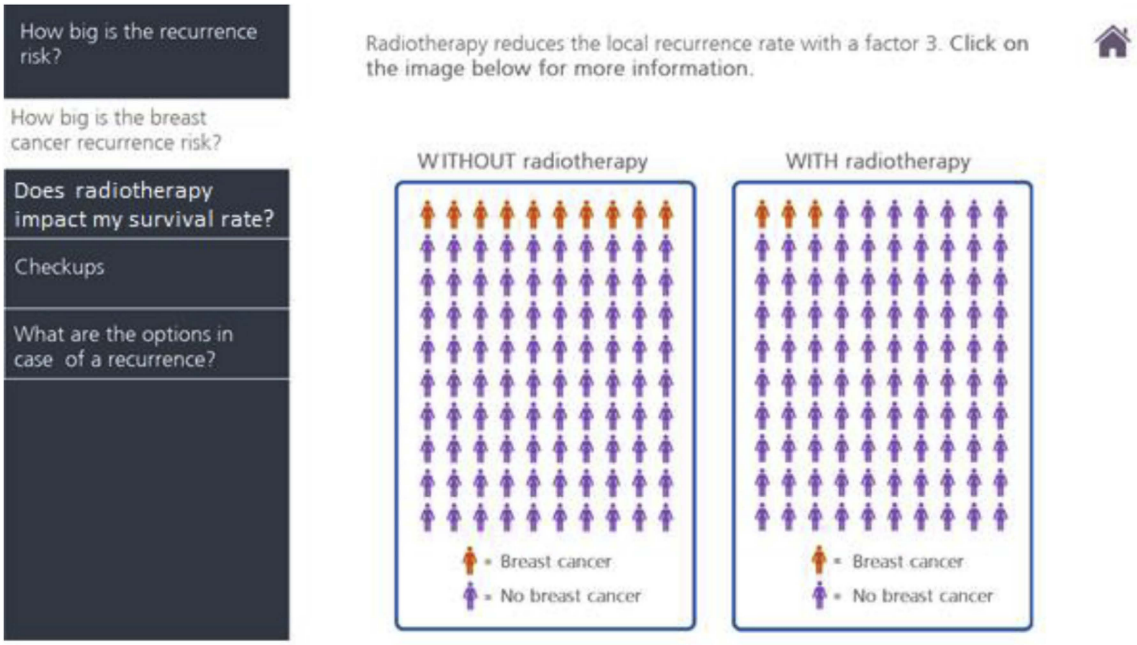

Fig. 4. Pictograph without uncertainty range before round 3: 10 years local recurrence risk for low risk breast cancer after breast conserving surgery with and without radiotherapy, with the BRASA logo pictographs replaced.

made for orange and purple icons. The textual explanation was placed on the virtual back of the pictographs. They were visualized when patients clicked on the pictographs (Fig. 5a and b). It was proposed to add more possible treatment options for the side-effects to the PtDA, such as physiotherapy.

In the second live meeting in round 4, the fading colouring indicating the uncertainty margin of the female icons was found to be unclear since the contrast was lost because of the fading scheme.

Fig. 5. a Turning pictograph with fading colours: 10 years Local recurrence risk intermediate risk breast cancer after mastectomy with and without radiotherapy.**5b** Turning pictograph with textual explanation on the back: 10 years Local recurrence risk intermediate risk breast cancer after mastectomy with and without radiotherapy.

It was proposed to adjust the fading colouring into changing the color of the icons step by step from orange to purple (Fig. 6), leading to the final version of the pictograph for the PtDA.

4. Discussion

In the development of a PtDA for breast cancer patients deciding on adjuvant radiotherapy, we created a way to communicate epistemic uncertainties when estimating LRR. Consensus was reached between HPs and patients on a pictograph illustrating the whole range of uncertainty, in combination with textual explanation and information that their own physician would estimate a more exact risk for the individual patient. The final pictograph consisted of 100 female icons in a 10 x 10 array. The female icons indicating the uncertainty margin of the LRR were displayed as step by step decolouring icons, from orange to purple (Fig. 6). The absent or small gain in survival benefit of radiotherapy was communicated by words without a quantitative number. Due to lack of reliable evidence, the prevalence and severity of the possible side-effects was only expressed in qualitative labels.

We used pictographs, they are known to improve patients understanding in risk communication [15,33–36]. Textual risk communication is better understood in combination with visual support [13]. The guideline on risk communication for PtDAs, developed by the IPDAS collaboration, advises to use natural frequencies and clear denominators over time and to be consistent, using the same denominator in all examples [34]. The first online version of the decision aid was therefore consistent with the known literature.

In three of the four pathways, no consensus was reached on an absolute value of a point-estimate for the LRR. Consequently, we had to develop a way of communicating the epistemic uncertainty. Although some effort has been put in researching how to communicate aleatory uncertainty, less research has been done on how to communicate epistemic uncertainty [22,23,34,37,38]. Communicating epistemic uncertainty may lead to more cancer worries and may reduce trust, although available literature is inconsistent to this point [37,39]. Communicating epistemic uncertainty in a way that will not cause a negative impact therefore seems important. We are not aware of other examples of PtDAs communicating epistemic uncertainty in a visual way. In our study consensus was reached on two-tone icons, showing the whole width of epistemic uncertainty in combination with textual explanation, and with the explanation that their own physician would inform them further. Whether this is an effective method of communicating epistemic uncertainty in a PtDA needs further investigation in a clinical setting. At this moment, this way of communicating epistemic uncertainty is being used in a pre-and post-intervention study, the BRASA-study (clinical.trials.gov: NCT03375801). In this study, we ask patients to fill out questionnaires to test their knowledge on their disease, to evaluate the PtDA, and the process of shared decision-making.

As discussed earlier, qualitative risk labels are well understood by patients but have the disadvantage of being interpreted in different ways [15]. No clear data are available on the prevalence and severity of side-effects of current radiotherapy for breast cancer patients. There is difference in the definition endpoint of side-effects and different studies use different parameters to measure the same outcome. For example to measure change in shape due to fibrosis as a consequence of radiotherapy, cosmetic outcome has been evaluated in several trials. Some studies use patient reported outcome measures while others use scoring systems scored by physicians or even computer systems evaluating photographs [16,40]. Low agreement has been found between these different methods [41,42]. Consequently, we could not include reliable estimates for side-effects in the PtDA, not even using uncertainty margins. Although we were aware of the shortcoming of communicating risks by qualitative labels, we felt we had no other option and consensus was reached on using qualitative labels when communicating both the frequency as well as the severity of the

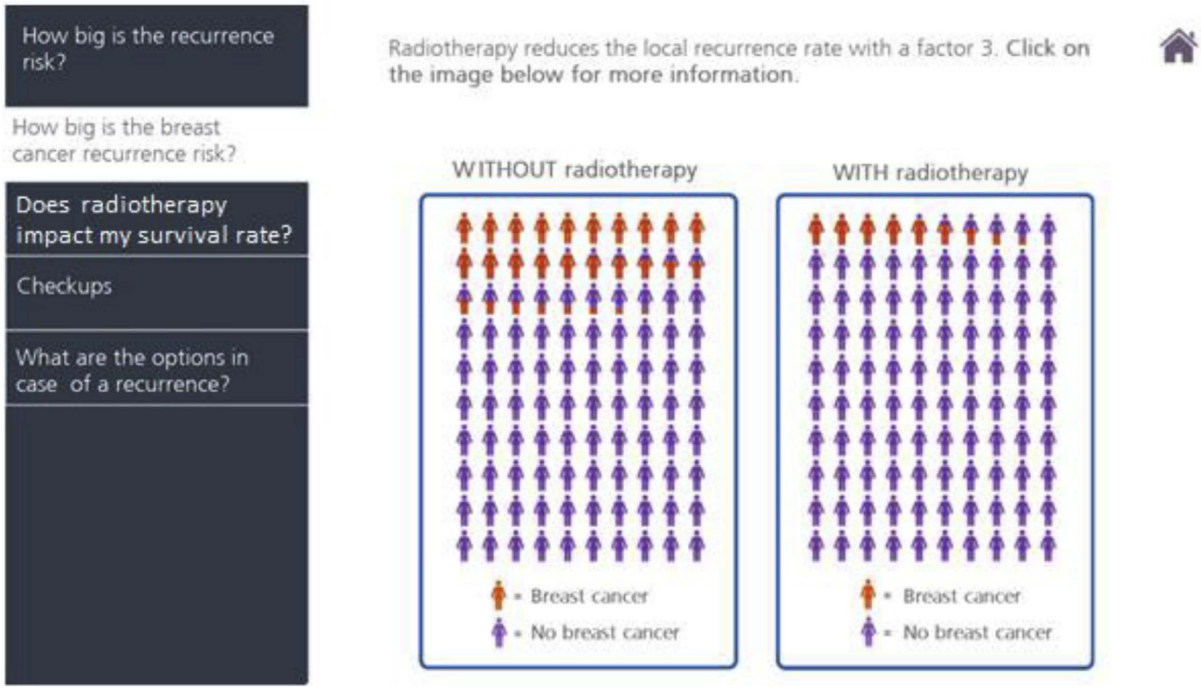

Fig. 6. Pictograph with uncertainty margins, final version of PtDA: 10 years Local recurrence risk for intermediate risk breast cancer after mastectomy with and without radiotherapy.

possible side-effects. Further research is needed to overcome this problem. With modern radiotherapy techniques radiotherapy dose to the heart and lungs have been reduced, reducing long-term side heart disease and lung cancer. For patients who smoke these risks are substantially higher than for non-smokers [20]. Since in this smoker-group the disadvantages might therefore outweigh the advantages, this was mentioned separately.

Strengths and limitations: we were only able to include four patient advocates in the development team who were mostly highly educated. Patient advocates are trained patients [43] and from literature we know that both patients and HPs involved in the development of a PtDA have a learning curve. Patient advocates are in a different situation, than patients looking at the PtDA for the first time when making a decision on their treatment [44]. Despite this shortcoming, the patient advocates took an active part in the development team.

Conclusion: We incorporated pictographs with stepwise gradient color icons indicating the uncertainty margin in combination with text, to communicate epistemic uncertainty in a PtDA breast cancer patients deciding on radiotherapy. The prevalence and severity of possible side-effects were communicated by qualitative labels. Currently the PtDA is being tested in a multi-center, pre-and post-implementation study in the Netherlands, the BRASA study.

Ethical approval

The study was approved by the Institutional Review Board of the Netherlands Cancer Institute and Maastro-clinic and was registered at clinical.trials.gov (NCT02934126).

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Declaration of competing interest

All authors declare to have no conflict of interest.

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