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Chapter 7

Additional value of decision aids in complex clinical situations:
Effectiveness of a decision aid about Fertility Preservation for
breast cancer patients.

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Abstract

Background A web-based decision aid (DA) was developed to improve information provision about fertility preservation (FP) in breast cancer patients. We aimed to assess the effect of this DA compared to brochures and usual care with regard to decision-making about FP.

Methods Multicentre RCT with female breast cancer patients, aged 18-40, randomized between DA or informational brochures; brochures were publicly available. Additionally, results were compared to usual care (no additional information). Measures were self-report questionnaires at diagnosis(T0), six weeks(T1), and six months(T2) on: decisional conflict, knowledge, regret.

Results Twenty-six women were randomized to brochures (n=13) or DA (n=13) and completed T0, 24 completed T1(12/12), 23 completed T2(11/12). Most women (91%) read brochures. Overall, knowledge increased between T0-T2 (22%). Women who received brochures reported more effective decision-making(T1) than women who received the DA. Otherwise there were no differences.

Ten women received usual care. They reported more decisional conflict, less values clarity, less support and less knowledge than women who received brochures, and less knowledge and support than women who received the DA.

Conclusions DA and brochures both increased knowledge. Compared to usual care, the information materials improved knowledge and feeling supported, but the DA introduced slightly more decisional conflict than brochures.

Introduction

Because survival rates for women with breast cancer have increased, quality of life after treatment is becoming more important. Infertility or concerns about (in)fertility due to cancer treatment have a negative influence on quality of life [1;2]. Therefore, interest in possibilities for fertility preservation (FP) has risen. At this moment, options to try to preserve fertility prior to oncologic treatment in the Netherlands are cryopreservation of in vitro fertilized embryos, oocytes and ovarian tissue, and suppression of the ovaries. Success rates of the options range from 5-25%. Despite an increasing number of studies and guidelines demonstrating the need for discussion of FP issues with young cancer patients, information provision about treatment-induced infertility and FP techniques and referral for FP is still not sufficient and often too late [3-10]. Adequate information fulfils psychosocial needs [11], increases women's coping with cancer [12] and enables informed decision making (DM) [13]. An informed decision is a decision based on relevant, good quality information that reflects the decision maker's values [14]. Informed DM is especially important in deciding on treatments with possible long term consequences for quality of life. Gonadotoxic treatments and FP options are such treatments.

To support informed DM and improve information provision about FP, a web-based Decision Aid (DA) was developed, with both textual information and an explicit values clarification exercise to clarify patients' values regarding the FP options [15]. With the availability of this DA, every patient who is eligible for counselling about FP can obtain optimal information about FP at any time and on any location in the Netherlands.

We conducted a randomized controlled trial to evaluate the DA on its effectiveness compared to brochures regarding outcomes of DM and the DM process. We hypothesize that use of the DA leads to an improved *decision process* (patients are better prepared to make a decision; and have less decisional conflict and better knowledge (primary outcome) [16]), which in turn leads to improved *decision outcomes* (more satisfaction with the decision made [17;18], decreased decisional regret), and improved health outcomes (reduced reproductive concerns; better quality of life). Since both arms were offered qualitatively good information about FP we secondarily compared both arms to an observational control group (historical) with women who did not receive additional written information about FP other than that provided orally by the oncologist and/or gynaecologist. We hypothesise that women who have not received additional information (besides a counselling consultation) report more decisional conflict, less knowledge, and worse preparation for DM.

Methods

Participants

Eligible participants for the RCT were female breast cancer patients (stage I-III), who were in prospect of receiving chemotherapy treatment, and who were eligible for FP. Patients had to be aged between 18-40 years old, to have sufficient knowledge of the Dutch language, and internet access/email at home to be able to view the DA and to complete online questionnaires.

Eligible patients for the usual care group were women (aged 18-40 years) who were diagnosed and treated for breast cancer in one of the participating medical centres, in the year before their medical centre started recruiting patients for the KEEP-study.

Study design

The study design was a multicentre randomized controlled trial, with randomization between informational brochures about FP only or a web-based DA in addition to informational brochures, stratified by medical centre. Additionally, results from both groups were compared to an (observational) usual care group. The study was approved by the Medical Ethics Committee of Leiden University Medical Centre (P11.027).

Procedure

Participants were invited for the study by their surgeon, oncologist or breast cancer nurse soon after diagnosis of breast cancer and before they were referred for counselling about FP. Additionally, some specialized gynaecologists and fertility specialists invited patients as well (as long as the final decision about FP was not taken yet).

Eligible patients received an envelope containing an invitation letter, a study brochure, a general brochure about breast cancer and fertility, a decline form and a return envelope. Patients either signed-up themselves, or let their breast cancer nurse/clinician sign them up. After signing up, they received the baseline questionnaire by e-mail. All patients gave their informed consent prior to their inclusion in the study. Randomization took place after completion of the baseline questionnaire with either a link to the DA or to the brochures. All brochures were also publicly available, since we did not want to withhold relevant information for patients who did not participate in this study. Most participating medical centres handed out the brochures to all eligible patients, including those in the DA group. Respondents received a 10 euro incentive for completing three questionnaires.

Twenty-six medical centres in the Netherlands recruited patients for this study, of which 13 included patients. Three centres additionally recruited patients via their gynaecology department (one centre via gynaecology only). Data were collected between June 2011 and December 2012. With the incidence for breast cancer in young women in the Netherlands being almost 1000 women a year, we expected to be able to include enough participants to find small effects in decisional conflict (Cohen's $d=0.2$; $\beta=0.2$; $\alpha=0.05$) between randomization groups within 18 months. After 18 months we stopped randomization for reasons of funding.

Women in the additional usual care group were sent invitations by mail, including the questionnaire, a decline form and a return envelope. They were asked to complete one questionnaire, similar to the T2 questionnaire, for which they received a 10 euro incentive. Data were collected between January and June 2013.

Measurements

Outcomes were assessed with online self-reported questionnaires at baseline (T0), 6 weeks later, since we then expected a decision to have been made (T1), and 6 months after diagnosis, since we expected women to be able to look back at the decision from this time on (T2).

Socio-demographic (age, marital status, parity, child wish, religion, ethnicity, and education) and *medical characteristics* (date of diagnosis, treatment, past fertility problems, FP preference and uptake).

Decisional conflict was measured with the 16-item Decisional Conflict Scale (DCS;

including its subscales DM uncertainty, informed DM, values clarity, DM support, effective DM), validated for a Dutch population [19;20]. The items are measured on a 5-point Likert scale ranging from 0 (totally disagree) to 4 (totally agree). Total scores range from 0-100. A higher score indicates more decisional conflict. Cronbach's α of the total decisional conflict scale (T1) was .82.

Knowledge about FP was measured with 10 statements about FP, with answering categories "true", "false", or "do not know" (for example: "Cryopreservation of embryos is possible until the age of 40 (true)"), with answering categories "true", "false", or "do not know". Total scores range from 0-10. Cronbach's α of the knowledge scale (T0) was 0.62.

Preparation for decision making was measured with the 10-item Preparation for DM scale [21], about the extent to which the available information was sufficient to decide about FP. Answering categories were a 5 point Likert scale ranging from 1 "not at all" to 5 "very much". Total scores range from 0-100. Cronbach's α for the scale was .94.

Risk perception was measured with one item asking respondents to indicate on a 10 point scale 'how large do you think your risk is to lose your fertility due to chemotherapy treatment' (1=very low, 10=very high).

Reproductive concerns were measured with a Dutch version of the Reproductive concerns scale[2;22](Garvelink et al submitted 2013). The Dutch version of the scale consists of 8 of the 14 original items, measured on a 5-point Likert scale ranging from 0 (not at all) to 4 (very much)[2]. Total scores range from 0-40. Cronbach's α (T0) was .79.

Decisional regret with regard to decisions related to FP was measured with a 5-item decision regret scale[23], adapted to the FP-decision. Items were measured on a 5-point Likert scale ranging from 0 (totally disagree) to 4 (totally agree). Total scores range from 0-20. Regret was measured at T1 and T2. At baseline we measured *anticipated* regret, since we did not expect anyone to have made the decision yet. Anticipated regret was measured with 2 items asking after the extent to which women expected to have regret if they did/did not pursue FP now, when they would/would not appear to be fertile after cancer treatment (after van Dijk et al 2008[24]). Cronbach's α of the decisional regret scale (T1) was .61.

Symptoms of anxiety were measured with the 7-item subscale anxiety of the Hospital Anxiety and Depression Scale (HADS) ^{5;36}. A higher score indicates more anxious symptoms. Cronbach's alpha was good (T0 α =.87).

Use of the study materials Individual website statistics used. We measured time spent on each page and on the total DA, and number and type of pages viewed during the visit.

Analyses

To perform analyses on as many participants as possible, missing data on outcome measures at T1 and T2 were handled using Multiple Imputation[25;26]. This procedure uses linear regression to estimate a value for missing data on continuous variables, using the other variables as predictors. We used data on randomization, risk perception, reproductive concerns score, knowledge, preparation for DM, anxiety, decisional conflict score as predictors in the imputation model. Data were imputed 5 times, and combined using Rubin's (1987) rules for multiple imputation[27].

Differences between participants who completed all measurements and those

who missed measurements were calculated with Mann Whitney or Wilcoxon rank-sum tests (continuous outcomes), and χ^2 –tests (ordinal/categorical outcomes) between baseline characteristics.

Due to the small number of participants we used nonparametric tests for all statistical analyses. Data analyses were done with SPSS 20.0 for Windows. Outcomes were considered significant when $p \leq 0.05$. Means (*M*) and standard deviations (*SD*) or medians (*Mdn*), point estimates and p-values are reported.

Differences between randomization groups were calculated using Mann Whitney (continuous outcomes), and χ^2 –tests (ordinal/categorical outcomes). Differences between measurement moments were assessed with the Wilcoxon signed rank-tests. Effect sizes were calculated as Cohen’s d ($d = Z/\sqrt{n}$).

Differences between the three groups (secondary analyses) were analysed using Kruskal Wallis tests, using Mann Whitney tests for post-hoc analyses.

Results

Respondents RCT

Thirty-six patients participated, of whom six did not start the baseline questionnaire, two gave no informed consent and two did not complete the baseline questionnaire and could therefore not be randomized. Finally, 26 women (response rate 72%) completed the baseline questionnaire and were randomized to brochures ($n=13$) or the DA ($n=13$) (Figure 1). Eleven women were invited after they had spoken to a gynaecologist, 17 women before (just after seeing an oncologist/surgeon).

In both groups 12 women (92%) completed the T1 questionnaire, and respectively 12 (92%) and 11 (85%) women completed the T2 questionnaire (Figure 1). Women who completed all questionnaires were somewhat higher educated ($p < 0.05$) than women who missed measurements.

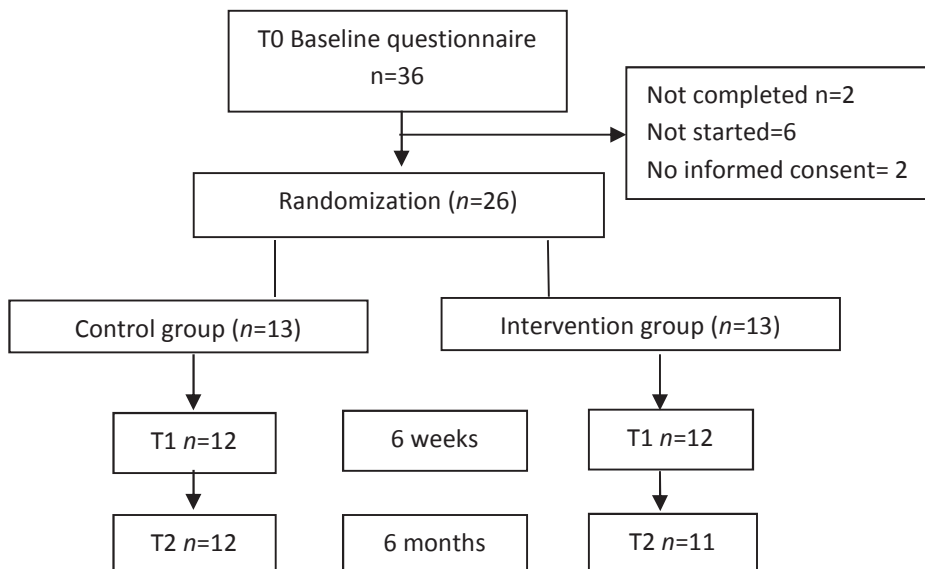


Figure 1. Flow chart of in- and exclusion of patients

Otherwise, we did not find differences between women who did or did not complete all questionnaires with regard to socio-demographic characteristics, or baseline outcome measures. Data on relevant outcome measures were therefore imputed for missing data at T1 (n=5) and T2 (n=5).

At baseline, there were no differences with regard to socio-demographic and medical characteristics between the randomization groups (Table 1). Women who received brochures had lower risk perception ($p=.05$) when compared to women who received the DA, otherwise there were no differences.

Table 1 Socio-demographic and medical characteristics of the participants

	Brochure (n=13)	DA group (n=13)	Usual care group (n=10)
Age, M (range)	32.9(28-39)	35.8 (30-40)	34.2 (27-39)
Male partner, n (%)	12/13 (92)	12/13 (92)	9/10 (90)
Of whom cohabiting n (%)	10/12 (83)	12/12 (100)	8/9 (88)
Parity 0<, n (%)	7/13 (54)	7/13 (54)	5/10 (50)
Child wish, yes (%)	13/13 (100)	13/13 (100)	10/10 (100)
Religious, no (%)	7/13 (54)	8/13 (62)	8/10 (80)
Cryopreservation option chosen*			
Embryos	6/12 (50)	5/11 (45)	1/10 (10)
Oocytes	1/12 (8)	-	-
Embryos+oocytes	-	1/11 (9)	-
Ovarian tissue	-	-	-
Wait and see	5/12 (42)	5/11 (45)	9/10 (90)
Educational level			
Low	1/13 (7)	-	-
Middle	3/13 (23)	3/13 (23)	3/10 (30)
High	9/13 (69)	10/13 (77)	7/10 (70)
Self reported breast cancer treatment*			
Surgery	12/12 (100)	11/11 (100)	10/10 (100)
Chemotherapy	12/12 (100)	8/11 (73)	10/10 (100)
Radiotherapy	7/12 (58)	10/11 (91)	6/10 (60)
Endocrine therapy	7/12 (58)	10/11 (91)	6/10(60)
immunotherapy	3/12 (25)	1/11 (9)	1/10(10)
Had a choice (yes)	10(91)**	8(80)***	7 (70)

*Due to missing values, percentages are calculated on a total of resp. 12 and 11 women in the brochure and DA groups (this data could not be imputed). **2 missings. ***3 missings.

Differences between women who received the DA or brochures

Use of the informational sources

Twenty-one women reported to have used any of the brochures about FP (91%; 3 missing) (Table 2). Five women used all available brochures. Of the 13 women who were randomized in the DA group, seven logged in to the DA, of whom 6 used the VCE. Mean time spent on the DA was 29 minutes (1 – 74 minutes). Women viewed on average 15 of the 26 informational pages (range 0-53), and 9 of the 9 VCE-pages (0-21; some pages were viewed more than once).

Preferences and decision making

At baseline 16 women (62%) had a preference regarding FP. At T1 21 women (88%) reported to have a preference, and 23 women (96%) to have made a decision. At T2 all women ($n=23$) reported to have made a decision about FP: ten women chose not to pursue FP (43%), 11 cryopreserved embryos (48%), one cryopreserved oocytes (4%), and one cryopreserved both oocytes and embryos (4%). There were no differences in choices between study arms. Five women (22%) mentioned not to have had a choice in this.

Decisional conflict, Knowledge, Preparation for decision making

Women who received brochures perceived DM at T1 as more effective (an informed, values based decision that is likely to be implemented, and with which they are satisfied) than women who received the DA in addition to brochures (5.4 versus 16.1, $p=.03$). At T2 there was a trend towards more Decisional Conflict in the DA group (24 versus 14, $p=.12$). Otherwise there were no significant differences (Table 3).

With regard to knowledge, we found a significant difference between baseline and T1 ($\Delta M=1.35$, $p=.002$; $d=-.59$), and baseline and T2 ($\Delta M=1.25$, $p=.004$; $d=-.56$), indicating a relative knowledge increase of 22%. There were no differences between the groups within measurement moments.

There were no significant differences in preparation for DM between groups at T1. At T2, there was a trend towards better preparation for DM in the brochure group (81 versus 69, $p=.12$) (Table 3).

Regret

There were no significant differences in *anticipated* regret between measurement moments, nor were there differences in *regret* between groups. For both groups, there was a trend for a minor increase in regret between measurement moments T1 and T2 ($\Delta M=4.9$; $p=.15$; $d=-.29$). At baseline, both groups *anticipated* more regret when not undergoing FP and turning infertile, than when undergoing it and remaining fertile (indicating that it had not been necessary to pursue FP). Anticipated regret at baseline was correlated with deciding to undergo FP at T1 (Spearman's $Rho=.55$, $p<.01$). Decisional regret at T1 was correlated with T2-scores (Spearman's $Rho=.44$ $p=.03$). When comparing women who opted for FP to those who did not, we found that those who did not opt for FP reported higher regret scores at T1 (23.8 versus 10.4, $p=.04$; $d=-.44$) and T2 (32 versus 12.7, $p=.02$; $d=-.54$).

Reproductive concerns, Risk perception, Anxiety

There were no significant differences between groups or measurement moments with regard to reproductive concerns or risk perception (Table 3).

Levels of anxiety decreased significantly from baseline to T1 ($p=0$; $d=-.75$) and to T2 ($p=.001$; $d=-.67$). There were no differences in anxiety between groups at T1, but at T2 women who received the DA had significantly higher anxiety scores than women who received brochures only (9.5 versus 6.1, $p=.02$)(Table 3).

Comparison with usual care

Forty women who received usual care were approached; twenty-two responded (55%), of whom 8 were eligible. Additionally, two women completed the questionnaire spontaneously online.

Women in the usual care group ($n=10$) were comparable to the other groups with regard to socio-demographic characteristics, although more women reported to be religious. They opted less often for FP; nine women chose to wait and see (90%), and one chose to cryopreserve embryos (10%; Table 1).

Women in the brochure group ($M=6.6$) and women in the DA group ($M=7.1$) reported better knowledge than women in the usual care group ($M=4.8$; $p=.01$). Furthermore we found differences in decisional conflict ($\Delta M=17.1$ $p=.025$) and values clarity ($\Delta M=19.7$, $p=.03$), with women who received brochures scoring better than usual care, and in decisional support ($p=.02$) with both women who received brochures ($M=12.6$) or the DA in addition to brochures ($M=21.3$) scoring better than usual care ($M=39.2$).

Table 2. Used information materials

	Brochure group (n=13*)	DA group (n=13*)	Usual care group (n=10)
Brochures, n(%)			
All brochures	5(42)	3(27)	-
General brochure	10(83)	10(91)	1(10)
Cryopreservation of embryos	10(83)	8(73)	-
Cryopreservation of ovarian tissue	7(58)	4(36)	-
Cryopreservation of oocytes λ	6(50)	3(27)	-
Other	-	-	-
Use of the DA, n(%)			
Textual information	-	7 (100)	-
VCE + textual information	-	6 (86)	-
Website + brochures	-	6 (86)	-
Counseling consultation n(%)			
Fertility/Gynaecology	11 (92)	12 (100)	6 (60)
Oncology	4 (33)	5 (42)	7 (70)

*Due to missing values, all percentages are calculated on a total of resp. 12 and 11

Table 3 Decision making processes and outcomes for the participants divided per randomization group

Brochures (A)		Brochures + DA (B)		Usual Care (C)		A vs B		A vs B vs C	
M (sd)	Mdn	M (sd)	n	M (sd)	Mdn	p-value/ z-value/Cohen's d	p-value/ χ^2 -value	Post hoc	Cohen's d
Risk perception		N=13 (after imputation)		N=10 (after imputation)					
T0	6.7 (1.7)	7.3	8	n/a		P=.046/Z=-1.994/d=-.42			
T1	7.3 (1.8)	7.1	7.5	n/a		P=.705/Z=-.393/d=-.08			
T2	6.1 (2.9)	6.6	8	7.1 (2.0)	6.5	P=.852/Z=-.187/d=-.04	P=.752/ χ^2 =-.57		
Knowledge									
T0	5.7 (1.8)	5.7	5	n/a		P=.772/Z=-.289/d=-.06			
T1	6.9 (1.5)	6.7	7	n/a		P=.668/Z=-.576/d=-.12		B > C	-0,46
T2	6.6 (1.2)	6.6	7	4.8 (1.8)	5	P=.264/Z=-1.1448/d=-.24	P=.005/ χ^2 =10.42	A > C	-0,45
Total decisional conflict scale									
T1	15.9 (8.9)	17.8	23.4	n/a		P=.256/Z=-1.137/d=-.24			
T2	14.2 (10.6)	14.1	28.1	31.3 (12.9)	29.7	P=.115/Z=-1.585/d=-.34	P=.025/ χ^2 =7.37	A < C	
Values clarity									
T1	14.3 (15.4)	8.3	25	n/a		P=.105/Z=-1.625/d=-.32			
T2	15.3 (13.5)	16.6	25	35 (14.6)	29.2	P=.147 /Z=-1.47/d=-.25	P=.034/ χ^2 =6.85	A < C	-0,45
Decision making Support									
T1	16.9 (16.0)	15.7	25	n/a		P=.465/Z=-0.736/d=-.14		A < C	-0,55
T2	12.6 (13.4)	8.3	25	39.2 (16.7)	37.5	P=.145/Z=-1.468/d=-.25	P=.002/ χ^2 =12.23	B < C	-0,39
Effective decision making									
T1	30.3 (20.8)	33.3	25	n/a		P=.531 /Z=-.629/d=-.12			
T2	21.3 (18.8)	25	25	35.8 (9.6)	37.5	P=.616/Z=-.504/d=-.08	P=.18/ χ^2 =3.43		

(Table 3 continued)

Brochures (A)		Brochures + DA (B)		Usual Care (C)		A vs B		A vs B vs C	
M (sd)	Mdn	M (sd)	Mdn	M (sd)	Mdn	p-value/ z-value/Cohen's d	p-value/ χ^2 -value	Post hoc	Cohen's d
Decision making uncertainty									
T1	16.9 (16.3)	16.6	23.8 (21.2)	25	n/a	P=.307/Z=-1.022/d=-.20			
T2	11.9 (10.0)	13.5	20.8 (13.8)	25	30 (23.3)	P=.07/Z=-1.792/d=-.30	P=.07/ χ^2 =5.25	A < C	-0.34
Decisional regret									
T1	13.9 (11.3)	10.6	18.6 (16.3)	15	n/a	P=.438/Z=-.783/d=.016			
T2	17.6 (11.2)	18.6	24.7 (20.6)	22.5	29 (20.9)	P=.499/Z=-.068/d=.014	P=.423/ χ^2 =1.72		
Anticipated regret (T0)									
No FP*	1.85 (1.2)	2	2.23 (.93)	2	n/a	P=.461/Z=-.738/d=-.15			
FP**	.15 (.38)	0	.23 (.44)	0	n/a	P=.626/Z=-.488/d=-.10			
Preparation for DM									
T1	75.5 (14.1)	75	69.7 (22.2)	73.1	n/a	P=.408/Z=-.864/d=-.18			
T2	81.4 (12.0)	80.6	68.8 (24.9)	71.0	60.8(23.8)	P=.124/Z=-1.561/d=-.33	P=.096/ χ^2 =4.76		
Reproductive concerns									
T0	13.1 (7.3)	11	13.4 (7.9)	15	n/a	P=.918/Z=-.103/d=-.02			
T1	12.3 (7.1)	12.5	11.1 (4.8)	12.8	n/a	P=.799/Z=-.263/d=-.05			
T2	10.7 (4.9)	9	13.4 (6.4)	15	14.6 (5.3)	P=.180/Z=-1.347/d=-.28	P=.215/ χ^2 =3.09		
Anxiety (HADS)									
T0	10.2 (5.8)	11.7	12.5 (5.1)	12.8	n/a	P=.439/Z=-.774/d=-.16			
T1	6.3 (3.0)	6.8	7.7 (3.1)	7.4	n/a	P=.376/Z=-.091/d=-.02			
T2	6.1 (3.3)	6	9.5 (2.9)	9.6	6.4 (4.2)	P=.018/Z=-2.3906/d=-.49	P=.031/ χ^2 =7.15	B > C	-0.36

Minimum-maximum scores: risk perception 1-10, knowledge 0-10, total DCS 0-100, decisional regret 0-5, preparation for decision making 0-100, reproductive concerns 0-40, anxiety 0-21, depression 0-21. n/a= not applicable. Interpretation of cohen's d: negligible effect (>= -0.15 and <.15), small effect (>=.15 and <.40), medium effect (>=.40 and <.75), large effect (>=.75 and <1.10). FP=fertility preservation. * anticipated regret from not undergoing FP, ** anticipated regret from undergoing FP.

Discussion

Women in our sample experienced relatively low levels of decisional conflict, with indication of slightly less effective decision making at T1 and higher levels of decisional conflict at T2 in women who received the DA in addition to brochures, compared to women who received brochures only (Cohen's $d=.34$). Mean levels of decisional conflict in the DA group were only low to moderate [19]. Perhaps these women felt there was not be much to be decided: over 20% of the women in our study mentioned they did not experience a choice in this decision. Moreover, the preferred FP option was often determined by a woman's possibilities in combination with the highest possible success rates [28]. The difference between the arms is in contrast to what we expected based on other DA evaluations. For example, a review by Stacey et al (2012) found a medium beneficial effect (Cohen's $d=.43$) of more detailed compared to simpler DAs with regard to decisional conflict in several screening and treatment decisions [29]. However, the decision about FP is a different type of decision when compared to screening- or treatment decisions. Future fertility is important for many women [28], and the decision about FP has to be made in a difficult (and short) time frame with competing demands from other medical decisions related to surviving the cancer [28;30;31]. Explicit confrontation through a DA may therefore increase decisional conflict in case of FP. However, Peate et al (2013)[32] compared a fertility related DA (a C5 booklet with information and values clarification exercises) to usual care, and found less decisional conflict in the DA group (Cohen's $d=.52$). This could indicate that the different formats of their and our DA (web-based or on paper) may have an impact [32]. Further, the design and content of our DA may have already suggested a difficult decision to the women (in an implicitly normative way [33]). Indeed, we only found significant differences in decisional conflict (effective DM) at T1, and not in the longer term (T2). Furthermore, all FP options are mentioned in the DA, which will not be optional for all patients. For some patients the availability of information about irrelevant options might be confusing, while others want to see as much information as possible. A similar phenomenon has been found before in a study in abdominal aneurysm patients [34], in which a DA with (more) information about treatment options resulted in fewer patients who were able to decide[33;34]. Additionally, a slight increase in decisional conflict is not necessarily disadvantageous [35;36]. This may for example also indicate that women are strongly involved in the decision [36].

Studies have found a role for personality in the preferred amount of information; i.e. having a blunting information seeking style was related to (less) DA-use (Garvelink et al submitted) [37;38] and neurotic and conscientious personalities were related to more uncertainty and less perceived DM support. These different information needs suggest the need for tailored information. It is possible that some women may have more benefit from DAs than others, but in our small sample size we were not able to evaluate this. Moreover, in this study the randomisation dictated which information patients should use, but it is possible that patients' would have chosen for or benefitted from other information had they been able to choose their own information source. The recruiting clinicians indicated that indeed some patients did not want to participate, because of the possibility that they would be randomized to the brochures. Additionally, a majority of women in this study mentioned that they considered the information of the fertility expert to be most relevant in DM[39]. Therefore, besides additional written information, referral to a fertility

expert for counselling about FP is still of utmost importance. Moreover, the aim of our DA and brochures was to *prepare* women for a counselling consultation with a gynaecologist or fertility specialist. Information provision about FP has been found to be important throughout the process of DM, during and after treatment [4], which can be facilitated with these brochures and DA as they are available at all times. In clinical practice, patients should be able to choose between available informational sources and choose when the informational sources are used (prior to, during, or after the consultation).

The benefit of additional information is clear, since both information sources led to a significant increase in knowledge between baseline and follow-up (Cohen's $d=0.61$), comparable to the increase in knowledge that was reported by Peate et al (2012)[32]. Unlike other studies ([29;32]) the knowledge scores in our study did not differ between groups. However, the information in the brochures and DA was highly overlapping, and the majority of women in both randomisation groups read the brochures. Moreover, compared to usual care, we did find higher knowledge scores in women who received either brochures or the DA [32].

Some important limitations must be taken into consideration in interpreting these results. Our sample size is very low. Fewer patients than anticipated were eligible for the study (a majority of newly diagnosed patients had complete families or no desire for children), and the combination of the difficult timing in which patients had to be invited, the increasing number of studies for breast cancer patients, and the burden of a cancer diagnosis made recruiters sometimes hesitant to invite patients, or made patients unwilling to participate. Due to the small sample size, results are based on non-parametric tests only, and we had not enough power to control for possible confounders. Therefore existing baseline differences between groups should be kept in mind in interpreting the results. Additionally, we did not adjust for medical centre or department through which patients were invited, although it could have made a difference whether somebody is invited via their oncology department (early in the trajectory), or via their gynaecology department (shortly before, or even after counselling).

It should be noted though, that despite small sample sizes we were able to show some important significant differences between the groups. The low number of participants as well as the overlapping information in, and use of, the brochures and DA, made us decide to add an extra observational control group of 10 women who did not receive information. No important differences with regard to socio-demographical characteristics were found between these women and the randomized women, but caution should be adopted in interpreting results of comparisons, since these women were not randomized.

In conclusion, the results of this study indicate a beneficial effect with regard to knowledge and decisional support of receiving either brochures or a DA in addition to brochures, compared to usual care. Brochures were also beneficial with regard to reducing decisional conflict compared to usual care, but explicitly clarifying ones values with the DA seemed to introduce slightly more decisional conflict than reading brochures.

Practice implications

It is of utmost importance that patients are offered timely information about FP in addition to counselling. The DA as well as brochures improved knowledge and had no disadvantageous effects, and can thus be used to inform future patients. However, since

use of the DA slightly increased decisional conflict, additional assistance in DM (during counselling consultations) should be available.

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