Comparing patients' and clinicians' perceptions of elective single embryo transfer using the attitudes to a twin IVF pregnancy scale (ATIPS)

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Abstract

Background This study evaluated a questionnaire originally developed for use with health professionals to explore and compare patients' and clinicians' perceptions of elective single embryo transfer and twin births.

Methods IVF clinicians and patients attending an independent Fertility clinic were surveyed using the Attitudes to a twin birth scale (ATIPS) comprising two subscales: attitudes to twins (A-Twin) and attitudes to elective single embryo transfer (A-SET). After refinement total sample scores showed both subscales were reliable with Cronbach's $\alpha > 0.8$ and item-total correlations > 0.35 .

Results Questionnaires were completed by 100 female IVF patients and 17 IVF clinicians. A-Twin subscale scores indicated neither the IVF clinicians nor female IVF patients demonstrated very positive attitudes to a twin birth although the IVF female patients were more in favour ($t = 5.29$, $n = 117$, $p < 0.001$). Responses suggest both groups would benefit from increased information about the risks of a twin birth for the baby. First cycle IVF female patients were significantly more positive about

eSET ($z = 3.94$, $n = 100$, $p < 0.001$). Clinicians perceive both their colleagues' and female patients' negativity towards eSET; suggesting a role for education.

Conclusions This study found the ATIPS to be a reliable measure which could be useful in evaluating interventions to promote single embryo transfer.

Keywords Twins · Elective single embryo transfer · IVF

Introduction

Rates of multiple births increased in the UK to an all time high of 15.3 per 1,000 births in 2006 and remained at that level in 2007 [1]. The increase is particularly evident in women over 40. International studies show twin birth rates also continue to increase, although multiples beyond twins have declined [2]. One contributory factor is mothers delaying their child bearing until later in life [3]. However, the most important factor is the increasing use of Assisted Reproductive Technologies (ART) to achieve conception and it has been estimated that 40% of twin births can be attributed to ART and that 40% of children born after IVF will be twins [4].

The Human Fertilisation and Embryology Authority (HFEA) have identified a multiple birth as the biggest risk from IVF [5] with a twin IVF baby at significantly greater risk of neonatal morbidity and mortality than a singleton mainly because of the increased likelihood of being born prematurely or at a low birth weight [6, 7]. Although there is some debate about whether an IVF twin infant is at greater risk than a naturally conceived twin when factors such as zygosity and mother's age and parity are controlled for, [4, 8] there is clearly a greater risk to their mother's health than to mothers' of singleton infants, [9] and some evidence of a greater risk

Capsule The ATIPS is a useful and reliable measure for exploring patients' and clinicians' perceptions of eSET and twin births

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compared to mothers of naturally conceived twins [10]. There is also clear evidence of the increased risk of a multiple birth to parental emotional and financial well-being [11–13].

Despite the growing evidence of the risks of a twin birth and the increased success of elective single embryo transfer (eSET) programs, [14] the transfer of two embryos is still routine practice in most UK and USA clinics [15, 16]. One frequently quoted argument in the long running debate about embryo transfer has been that prospective parents want a twin birth. Although a review of 13 studies found the majority of infertile couples favoured a multiple birth [17] studies had used non-standardised and often hypothetical questions. There is growing evidence that couples' preferences are dominated by their desire to achieve pregnancy [18] and a preference for multiple embryo transfer is largely driven by a perception that the chance of pregnancy is increased after double embryo transfer [19–21]. Studies have explored attitudes towards a multiple birth and single embryo transfer at different time points and this may also have had an impact on their findings. For example, one might expect women who had conceived twins after IVF treatment to prefer twins and disagree with single embryo transfer (SET) compared to IVF mothers of singletons or mothers of naturally conceived twins [22].

Despite widespread condemnation among clinicians of a multiple birth beyond twins, attitudes towards twins appear less clear cut. Although a recent survey of Nordic IVF doctors found almost all thought twins was a less favourable outcome than a singleton pregnancy [23]. Van Wiley and colleagues have argued that typically twin pregnancies result in the successful birth of two babies and should not be seen as an adverse outcome [24]. Furthermore two American clinicians maintain twin pregnancies should be seen as a favourable and cost effective outcome if couples want more than one child [25]. Given that advice from their physician is reported by couples as strongly influencing their decision about the number of embryos to transfer [17, 26, 27] it is important to explore the attitudes of clinicians. A recent survey of Dutch IVF professionals sought to identify factors predicting a willingness to perform eSET [28]. The study found clinicians who received their initial fertility training at a university hospital were more willing to perform eSET suggesting the importance of appropriate early training. Willingness to perform eSET was also influenced by the number of barriers to eSET the clinicians perceived in their clinical practice. The higher the total number of perceived barriers the less willing the clinicians were to perform eSET. Examples of barriers included not perceiving twin pregnancies as a complication of IVF and doubts about the consequences of implementation of eSET. The authors suggest seeking to change attitudes towards eSET could increase willingness to perform it supporting the need for a valid and reliable measure.

Studies have found that a number of factors, including mother's age, parity, length of infertility and knowledge of the risks of a multiple birth, affect expressed attitudes towards a multiple birth [29–31]. Such findings have prompted researchers to try to influence attitudes towards multiple births and eSET using information and educational materials about the associated risks [21, 32, 33]. To date research in this area has used quite lengthy questionnaires developed for each individual project. Couples have been asked to rate risk, to rank their preference for different treatment outcomes or even to indicate their preference for hypothetical choices [33–35]. There is a need for a short easily completed questionnaire to assess attitudes to multiple births in order to meet patients' information needs and to evaluate the impact of interventions to promote eSET. This study aims to establish the reliability and construct validity of the ATIPS questionnaire in patients undergoing IVF treatment. It further aims to compare the clinicians' attitudes with those of patients' and to explore factors influencing attitudes.

Materials and methods

Study design and participants

The study was a cross sectional survey of IVF clinicians and patients attending one of the UK's largest independent fertility clinics. Ethics approval was given by the clinic's internal review committee. IVF clinicians involved in IVF treatment at the fertility clinic who attended an internal medical meeting in 2007 were asked to complete the questionnaire. There were no exclusion criteria.

All male and female IVF patients visiting the clinic for treatment between June 2007 and May 2008 were given a pack containing an information sheet describing the study and the study questionnaire which they were asked to complete and return in the envelope provided. There were no exclusion criteria. Target sample size was 100 completed questionnaires from female patients.

Attitudes to twin pregnancy scale (ATIPS)

This questionnaire was initially developed to assess the attitudes of health professionals towards twins and eSET [36]. Informed by research literature, expert opinion and HFEA publications, 44 statements were generated. Participants were asked to indicate the extent to which they agreed with each using a Likert scale from 1 to 7 with 1 indicating "I strongly agree" and 7 indicating "I strongly disagree". The scale was piloted with health care professionals interested or actively involved in obstetrics, gynaecology or multiple pregnancies, as well as medical students from one UK medical school and delegates interested in

population studies attending an UNESCO conference. The 411 completed questionnaires received from health professionals ($n=141$), medical students ($n=249$), and delegates ($n=21$) were subjected to item analysis. Items with high uncertainty ($>30\%$ respondents were uncertain whether they agreed or disagreed with the statement) and items with poor discrimination ($<10\%$ or $>90\%$ agreement with the item) were excluded. Item-total correlations were

calculated for the remaining items and items with an item-total correlation of less than 0.3 were also excluded. This reduced the scale to 20 items consisting of two sub-scales: the 12 item Attitudes Towards Twins (A-Twin) and the eight item Attitudes towards eSET (A-SET) both assessed using the Flesch-Kincaid grade level as having item readability suitable for readers aged 12 years and under (see Fig. 1).

Fig. 1 Attitudes to twin pregnancy scale (ATIPS)

Attitudes to Twin Pregnancy Scale (ATIPS)

1. The best outcome of IVF treatment is a twin pregnancy. **1R**
2. A twin pregnancy increases the risk of medical complications for the mother during the birth. **1**
3. Younger patients should have single embryo transfer. **2**
4. A twin pregnancy is bad for the health of the baby. **1**
5. If IVF treatment was government funded patients would choose single embryo transfer. **2**
6. A twin pregnancy avoids the need for further IVF treatment. *** 2**
7. Doctors involved in IVF treatment favour single embryo transfer. **2**
8. A single pregnancy is better for the woman's body. **1**
9. Caring for twin babies is very stressful for mothers. **1**
10. Patients undergoing IVF treatment favour single embryo transfer. **2**
11. The rewards of a twin birth are worth any risks to the babies. **1R**
12. Twin infants are hard to care for. **1**
13. Mothers of twin infants find it harder to return to work. **1**
14. All patients undergoing IVF treatment should have single embryo transfer. **2**
15. There are plenty of hospital facilities to cope with a twin birth. **1R**
16. The best outcome of IVF treatment is a single pregnancy. **1**
17. A twin birth carries very little additional risk to mother and babies. **1R**
18. Better to have more treatment cycles than risk a twin birth. **2**
19. The risks associated with a twin pregnancy are not so great. **1R**
20. The more embryos replaced the better the chance of pregnancy. *** 2 R**

1 = Attitudes towards twins (A-Twin subscale)

2 = Attitudes Towards eSET subscale (A-SET subscale)

R = Scoring for this item is reversed

* Item removed from final scale to improve internal consistency

Attitudes towards twins (A-Twin subscale)

The 12 items in this scale are phrased to reflect both the positive benefits and negative risks of a twin birth, with scores reversed where appropriate so that higher scores reflect a more positive attitude towards a twin birth (see Fig. 1). Scores for each statement are summed to give a possible range from 12–84. The authors report the scale had good internal consistency (Cronbach's $\alpha=0.7$) [36].

Attitudes towards eSET subscale (A-SET subscale)

This scale comprises eight statements all, except one which is reversed for scoring, reflecting a positive attitude towards single embryo transfer (see Fig. 1). Scores are summed to give a possible range from 8–56 with higher scores indicating a less positive attitude towards SET. The scale was shown to have satisfactory internal consistency by the authors (Cronbach's $\alpha=0.53$) [36].

Demographic questionnaire

IVF clinicians and patients were asked to complete a short demographic questionnaire. In addition patients were asked about their infertility treatment and history.

Procedure

Questionnaires were distributed to IVF clinicians attending a medical meeting at the IVF clinic. These were completed and given back at the end of the meeting. The receptionists distributed questionnaires to all male and female patients in the clinic waiting room. These were returned in the freepost envelope provided either the same day or after completion at home.

Analysis

Data were analysed using the Statistical Package for Social Sciences (SPSS) version 15.0, with a P value of <0.05 considered significant. The subscales were explored for internal consistency and item-total correlations calculated.

Results

Reliability of subscales

The internal consistency of the A-Twin subscale was good Cronbach's α for the total sample ($n=138$) was 0.88 and the item-total correlation was >0.35 for all 12 items. Scores for the total sample showed a good range (15–71) with no apparent floor or ceiling effects. However, analysis of the

A-SET revealed internal consistency was poor. Scrutiny of the results suggested item-total correlations were poor for two items and removal would improve internal consistency. These items were removed and Cronbach's α for the new six item A-SET recalculated. For the total sample ($n=138$) Cronbach's α was 0.82 and the item-total correlation was >0.4 for all six items. The six item subscale was therefore used for all the remaining analyses (see Fig. 1). Scores for the total sample ranged from 17 to 42 demonstrating that while neither the patients nor the IVF clinicians were extremely positive about eSET, the female patients were very negative with four scoring maximum marks indicating they strongly disagreed with all the statements in favour of eSET. Examination of the distribution of the two subscales showed that while the A-Twin subscale was normally distributed for both the patients and IVF clinicians, the A-SET subscale was not normally distributed for the patients and so non-parametric analyses which do not assume normal distribution were used for analysing their scores on the A-SET.

Response rates

All 17 IVF clinicians asked to complete a questionnaire did so. Completed questionnaires were received from 100 female patients; this response rate was estimated as 50% of the patients attending the clinic during the time period of the study. Responses were also received from 21 male partners. There were no significant differences between the male and female patients' subscale scores for the A-Twin or the A-SET and so to avoid over representation of the views of couples when both partners had responded only female patients' data are included in the analyses.

Female patients

The women were in their mid thirties, predominantly white European and all except one were married or living with a partner. Forty percent were in managerial or professional occupations and the majority were educated to degree level or beyond. Only a minority of women (27%) were having their first cycle of IVF and a third had children already (see Table 1).

Scores for the A-Twin showed women to have slightly negative perceptions towards twins (mean=43.25 / 84, SD=11.45) since a mean of 48 would indicate a neutral position. Exploration of responses to some of the individual statements making up the scale revealed that while 59% of the women agreed that the best outcome of IVF is a twin pregnancy the women's responses to statements about the risks of a twin pregnancy showed they did recognise some of the risks involved. For example, 84% of women agreed twin pregnancy increases the risk of medical complications for the mother during the birth, and 70% agreed that caring

Table 1 Female patients' demographic characteristics

	<i>n</i> =100
Mean age (range)	35.9 (27–47)
White European	95
Black/ Black British	1
Other	4
Married / cohabiting	99
Divorced/ separated	1
Highest level of education ^a	
Degree level or higher	53 (54%)
Occupation ^b	
Managerial or professional	40
Children	33
First cycle of IVF	26
Mean number of previous IVF cycles if applicable (range)	3.5 (1–13)

^a Information missing for two participants^b Information missing for one participant

for twin babies is stressful. However, only 30% agreed that a twin pregnancy is bad for the health of the baby and only 38% that mothers of twins find it harder to return to work.

A number of factors previously found to influence attitudes towards twins were explored. Neither age nor social class were associated with A-Twin scores but women having their first cycle of IVF were significantly less positive about twins than women on their second or subsequent cycle of IVF ($t=2.52$, $n=100$, $p=0.013$). Furthermore, women with no previous children were significantly more positive about twins than women with previous children ($t=2.21$, $n=100$, $p=0.031$). (See Table 2). In particular existing parents were more likely to recognise that a twin birth would make it harder for them to return to work (57.5% vs 28.4%; $X^2=8.1$, $df=2$, $p=0.017$).

The A-Twin was positively correlated with the A-SET ($r=0.544$, $n=100$, $p<0.001$) indicating that more favourable attitudes towards twins were associated with more negative attitudes towards eSET. Scores on this six item

scale revealed that, overall, patients' attitudes towards single embryo transfer were skewed to the negative (median=33.0, interquartile range=21.0–31.00) since a median of 24 would indicate a neutral position. This attitude is clearly revealed in the responses to individual statements with only 5% agreeing that patients favour single embryo transfer, and 2% that all IVF patients should have single embryo transfer. Women's age was negatively correlated with scores on the A-SET indicating younger women had more positive attitudes towards eSET although this failed to reach significance ($r=-0.18$, $n=100$, $p=0.076$). This is supported by the finding that 24% of women agreed with the statement "younger patients should have single embryo transfer". Women who were having their first IVF cycle were significantly more positive about single embryo transfer ($z=3.94$, $n=100$, $p<0.001$) (see Table 3). Experience of fewer previous cycles of IVF was also associated with significantly more positive attitudes towards eSET ($r=0.31$, $n=100$, $p=0.002$).

IVF clinicians

Only three (17.6%) of the IVF clinicians who completed the questionnaire were female. The majority of the clinicians had extensive experience of IVF with 58.8% having more than 20 years experience.

IVF clinicians' scores on the A-Twin are low (mean=27.94, SD=7.96) indicating that as a group they do not favour a twin birth. This is further illustrated by their response to some of the individual statements with 100% agreeing the best outcome of IVF treatment is a single pregnancy and over 80% agreeing that caring for twins is stressful and that it will be harder for the mother to return to work. Interestingly they seem a little more ambivalent about the risks for the babies themselves with 17.6% agreeing the rewards of a twin birth are worth any risks to the baby and 23.5% that the risks associated with a twin pregnancy are not so great. Comparison with the female patients' scores on the A-Twin reveal that the IVF clinicians have significantly less favourable attitudes towards twins than the patients ($t=5.29$,

Table 2 Factors influencing attitudes towards twins (A-twin subscale)

		Mean	SD	P value
Group	IVF clinicians ($n=17$)	27.94	7.96	<0.001
	Female patients ($n=100$)	43.25	11.45	
Education to degree level or higher ^a	Yes ($n=53$)	42.40	12.07	0.305
	No ($n=45$)	44.78	10.53	
Managerial or professional occupation ^a	Yes ($n=40$)	42.65	12.45	0.655
	No ($n=59$)	43.71	10.91	
First IVF cycle ^a	Yes ($n=27$)	38.63	12.45	0.013
	No ($n=73$)	44.96	11.75	
Previous children ^a	Yes ($n=33$)	39.48	12.61	0.031
	No ($n=67$)	45.10	10.44	

^a Female patients only

Table 3 Factors influencing Attitudes towards single embryo transfer (A-SET subscale)

		Median	Inter-quartile range	P value
Group	IVF clinicians (<i>n</i> =17)	25.0	28–36	0.001
	Female patients (<i>n</i> =100)	33.0	21–31	
Education to degree level or higher ^a	Yes (<i>n</i> =53)	33.0	27.5–36	0.963
	No (<i>n</i> =45)	33.0	28.5–36	
Managerial or professional occupation ^a	Yes (<i>n</i> =40)	32.5	27.3–36	0.650
	No (<i>n</i> =59)	34.0	28–36	
First IVF cycle ^a	Yes (<i>n</i> =27)	28.0	23–32	<0.001
	No (<i>n</i> =73)	35.0	30.5–37	
Previous children ^a	Yes (<i>n</i> =33)	32.0	24–36	0.295
	No (<i>n</i> =67)	33.0	29–36	

^a Female patients only

n=117, *p*<0.001) (see Table 2). How favourable IVF clinicians are towards twins does not appear to be related to either their age or number of years of experience: both correlations were non-significant.

Scores on the A-SET correlate significantly with IVF clinicians' scores on the A-Twin (*r*=0.611, *n*=17, *p*=0.009) indicating that the less they favour a twin birth the more they favour single embryo transfer. However, the group's median score for the A-SET indicates a slight bias to negative attitudes (median A-SET=25.0 interquartile range 28–36) indicating they are not as expressive of positive attitudes towards eSET as they are towards a single pregnancy. Responses to individual statements reveal some of the contrasting attitudes towards eSET; for example, although 64.7% agree young patients should have eSET only 17.6% agree that all patients should have eSET. Moreover, less than half (41.2%) agree it is better to have more treatment cycles than to risk a twin birth. IVF clinicians perceive their colleagues as not favouring eSET with only 23.5% agreeing that doctors involved with IVF favour eSET. They also regard patients as very against single embryo transfer, with only two clinicians agreeing patients favour eSET. Scores on this subscale do not correlate significantly with either the clinicians' years of experience or their age. IVF clinicians have significantly more positive attitudes towards eSET than female patients (*z*=3.54, *p*=0.001) (see Table 3). However, they do not have significantly more favourable attitudes towards eSET than female patients having their first cycle of IVF (median score 25.0 Vs 28.0, *z*=1.22, *p*=0.22)

Discussion

The study showed that a questionnaire originally developed for use with health professionals was acceptable to both IVF patients and clinicians and was able to detect differences within and between the two groups. This suggests the

questionnaire's two sub-scales could become useful resources for exploring attitudes towards twin births and single embryo transfer.

IVF clinicians who took part in this study were not in favour of a twin birth despite some clinicians arguing that a twin birth should not be seen as an adverse outcome [24, 25]. Female IVF patients also held slightly negative attitudes towards a twin birth but were significantly more in favour of a twin birth than the clinicians. Examination of responses to the individual statements indicates both the IVF clinicians and the female patients seemed to be more ambivalent about the risks of a twin pregnancy to the baby than to the mother. Providing couples with more information about the potential risks to the babies may be an effective strategy to change their attitudes towards a twin birth as they appear knowledgeable about the risks for the mother and prepared to accept these. Given that as already mentioned, advice from their physician is reported by couples as strongly influencing their decision about the number of embryos to transfer [17, 26] this advice may be best received from clinicians. However, clinicians themselves may need to be provided with additional evidence about the possible risks of a twin birth, and of transferring more than one embryo such as the increased risks for a singleton delivery associated with a vanishing twin. For example a Danish study found one in ten singleton deliveries had originated from a twin pregnancy and that these singleton survivors had an increased risk of low birth weight, with all obstetric risks increasing the later in pregnancy the spontaneous reduction occurred [37]. The authors argue this is one reason for the poorer outcomes associated with an IVF singleton compared to a spontaneously conceived singleton.

Although some earlier studies have reported finding a more favourable attitude towards a multiple birth was associated with increased age in female IVF patients [29, 38] this study did not find a significant correlation. However, in accord with previous studies [29–31, 38] parity and previous cycles of IVF were associated with a more

favourable attitude towards twins. This may reflect the desire for an instant family. For IVF clinicians neither age nor years of experience were associated with more favourable attitudes towards twins. Given the increasing research and publicity about the risks of a twin birth one might have expected younger and less experienced clinicians to have less favourable attitudes towards a twin birth. However, the Dutch study by van Peperstraten and colleagues also found age and experience of the IVF professionals did not predict willingness to perform eSET [28].

Female IVF patients did not express very favourable attitudes towards elective single embryo transfer (eSET). Although younger age was correlated with lower scores (more favourable attitudes towards eSET) on the A-SET this did not reach significance. This attitude was reflected in their response to the statement “younger patients should have single embryo transfer” with nearly a quarter of women agreeing. Women having their first cycle of IVF were significantly more positive about eSET than women who had had previous cycles and this is in accord with the finding that experience of fewer previous cycles of IVF was associated with significantly more positive attitudes towards eSET. Previous research has also found experience of past IVF treatments to be a significant predictor of choosing to have two embryos transferred [26]. These findings suggest that women having their first cycle of IVF may be most receptive to education about eSET or interventions to promote eSET.

IVF clinicians are, like the female IVF patients, less positive about eSET than they are towards a single pregnancy. However, they are significantly more positive about eSET than the female IVF patients. Of interest is their response to individual statements which show they do perceive IVF patients’ negativity towards eSET with only two clinicians agreeing patients favour SET. Clinicians also perceive other clinicians to be against eSET with less than a quarter agreeing with the statement “doctors involved in IVF treatment favour single embryo transfer”. Furthermore, there was no relationship between attitudes and either years of experience or age. These findings suggest a possible role for education and training in order to improve clinicians’ attitudes concerning the acceptability of eSET and to facilitate effective communication with patients. An idea supported by the previously reported Dutch study’s finding that undergoing training at a university hospital was predictive of willingness to perform eSET [28]. Furthermore research in the Nordic countries exploring attitudes towards gamete donation found discrepancies between IVF clinicians’ attitudes and national legislation [39]. This highlights the importance of changing attitudes and that simply changing legislation or clinic guidelines may not be sufficient to achieve a change in practice.

This study found that not only was the ATIPS acceptable to IVF patients it was also able to detect differences in

subscale scores in accordance with previous research demonstrating construct validity. One potential criticism of the measure is that it conveys a bias towards elective single embryo transfer. To some extent this is an artefact of the development of the measure, in that items reflecting negative views about eSET had poorer psychometric properties and were not retained in the final scale. However, despite this potential bias, the SET subscale did discriminate between clinicians and patients, with neither group revealing strongly positive attitudes to eSET. The Twin scale contained a mix of items reflecting both risks and benefits. A further limitation of the study is that it sampled clinicians and patients in only one infertility service and this meant it was possible to survey only a small sample of clinicians. It would be useful to compare responses from different centres in order to explore factors associated with more positive attitudes to single embryo transfer. However, using only one service does permit comparison with national average pregnancy and multiple pregnancy rates. Figures from the HFEA suggest both rates were above or consistent with the national average for women of similar ages suggesting success rates should not have made the service averse to eSET [40]. The questionnaire was anonymous which is likely to have enhanced the validity of the responses. However, this meant that it was not possible to determine how representative the sample was.

Patients at this infertility service are funded both privately and by the National Health Service. However, it was not felt appropriate to ask patients to disclose these details so the impact of method of payment on attitudes towards eSET and twin pregnancies could not be explored. Recent research exploring global variations in single embryo transfer has identified public funding as an important factor in the uptake of single embryo transfer [41]. Moreover, the review suggests the duality of funding which operates here in the UK whereby the couple will be responsible for the costs of a failed embryo transfer but the NHS will be responsible for the costs of neonatal care for a multiple birth will inevitably act as a disincentive for couples to choose eSET.

Conclusion

Patients have more positive attitudes to a twin birth and are more negative about single embryo transfer than clinicians in the same service. However, both clinicians and patients were less likely to endorse the risks for the infants associated with a twin birth. The women also failed to recognise the social impact of a twin birth. As patients are particularly negative about single embryo transfer this suggests that interventions could focus on promoting the effectiveness of single embryo transfer and its advantages for infant health. ATIPS could prove a useful tool for

evaluating interventions to promote single embryo transfer and for identifying patients who need more information to help them make an informed decision about eSET.

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References

1. National Statistics. Birth Statistics: Review of the Registrar General on births and patterns of family building in England and Wales 2006 Series FMI no 36. 2007 [cited 07.07.2009]; Available from: http://www.statistics.gov.uk/downloads/theme_population/FM1_36/FM1-No36.pdf.
2. Hamilton BE et al. Annual Summary of Vital Statistics. *Pediatrics*. 2005;119(2):345–60.
3. Beemsterboer SN et al. The paradox of declining fertility but increasing twinning rates with advancing maternal age. *Hum Reprod*. 2006;21(6):1531–2.
4. Pinborg A. IVF/ICSI twin pregnancies: risks and prevention. *Hum Reprod Update*. 2005;11(6):575–93.
5. HFEA. Fertility problems and treatment—facts and figures. 2006 [cited 2006 27.06.2006]; Available from: <http://www.hfea.gov.uk/PressOffice/Factsandfigures/>.
6. Marlow N et al. Neurological and developmental disability at six years of age after extremely preterm birth. *New Engl J Med*. 2005;352(1):9–19.
7. ESHRE. Prevention of twin pregnancies after IVF/ICSI by single embryo transfer. *Hum Reprod*. 2001;16(4):790–800.
8. McDonald S et al. Perinatal outcomes of in vitro fertilization twins: a systematic review and meta-analyses. *Am J Obst Gynecol*. 2005;193(1):141–52.
9. Campbell DM, Templeton A. Maternal complications of twin pregnancy. *Int J Gynaecol Obstet*. 2004;84(1):71–3.
10. Smithers PR et al. High frequency of cesarean section, antepartum hemorrhage, placenta previa, and preterm delivery in in-vitro fertilization twin pregnancies. *Fertil Steril*. 2003;80(3):666–8.
11. Olivennes F et al. Behavioral and cognitive development as well as family functioning of twins conceived by assisted reproduction: findings from a large population study. *Fertil Steril*. 2005;84(3):725–33.
12. Ellison MA et al. Psychosocial risks associated with multiple births resulting from assisted reproduction. *Fertil Steril*. 2005;83(5):1422–8.
13. Glazebrook C et al. Parenting stress in first-time mothers of twins and triplets conceived after in vitro fertilization. *Fertil Steril*. 2004;81(3):505–11.
14. Saldeen P, Sundstrom P. Would legislation imposing single embryo transfer be a feasible way to reduce the rate of multiple pregnancies after IVF treatment? *Hum Reprod*. 2005;20(1):4–8.
15. Reynolds MA, Schieve LA. Trends in embryo transfer practices and multiple gestation for IVF procedures in the USA, 1996–2002. *Hum Reprod*. 2006;21(3):694–700.
16. Braude, P. One child at a time: reducing multiple births after IVF. 2006, Expert group on multiple births after IVF.
17. Glazebrook C et al. Attitudes of infertile couples to a multiple birth; a review of the literature and results from a survey. *Curr Womens Health Rev*. 2007;3(1):43–8.
18. Twisk M et al. Preferences of subfertile women regarding elective single embryo transfer: additional in vitro fertilization cycles are acceptable, lower pregnancy rates are not. *Fertil Steril*. 2007;88(4):1006–9.
19. Murray S et al. A randomized comparison of alternative methods of information provision on the acceptability of elective single embryo transfer. *Hum Reprod*. 2004;19(4):911–6.
20. Porter M, Bhattacharya S. Investigation of staff and patients' opinions of a proposed trial of elective single embryo transfer. *Hum Reprod*. 2005;20(9):2523–30.
21. Newton CR et al. Factors affecting patients' attitudes toward single- and multiple-embryo transfer. *Fertil Steril*. 2007;87(2):269–78.
22. Pinborg A et al. Attitudes of IVF/ICSI-twin mothers towards twins and single embryo transfer. *Hum Reprod*. 2003;18(3):621–7.
23. Bergh C et al. Attitudes towards and management of single embryo transfer among Nordic IVF doctors. *Acta Obstet Gynecol*. 2007;86:1222–30.
24. van Wely M et al. Is twin pregnancy necessarily an adverse outcome of assisted reproductive technologies? *Hum Reprod*. 2006;21(11):2736–8.
25. Gleicher N, Barad D. Twin pregnancy, contrary to consensus, is a desirable outcome in infertility. *Fertil Steril*. 2009;91(6):2426–31.
26. Blennborn M et al. The couple's decision-making in IVF: one or two embryos at transfer? *Hum Reprod*. 2005;20(5):1292–7.
27. de Lacey S et al. Factors and perceptions that influence women's decisions to have a single embryo transferred. *Reprod BioMed Online*. 2007;15(5):526–31.
28. van Peperstraten AM et al. Perceived barriers to elective single embryo transfer among IVF professionals: a national survey. *Hum Reprod*. 2008;23(12):2718–23.
29. Grobman WA et al. Patient perceptions of multiple gestations: an assessment of knowledge and risk aversion. *Am J Obstet Gynecol*. 2001;185(4):920–4.
30. Child T, Henderson A, Tan S. The desire for multiple pregnancy in male and female infertility patients. *Hum Reprod*. 2004;19(3):558–61.
31. Ryan GL et al. The desire of infertile patients for multiple births. *Fertil Steril*. 2004;81(3):500–4.
32. Hartshorne GM, Lilford RJ. Different perspectives of patients and health care professionals on the potential benefits and risks of blastocyst culture and multiple embryo transfer. *Hum Reprod*. 2002;17(4):1023–30.
33. Ryan GL et al. A mandatory single blastocyst transfer policy with educational campaign in a United States IVF program reduces multiple gestation rates without sacrificing pregnancy rates. *Fertil Steril*. 2007;88(2):354–60.
34. Hojgaard A et al. Patient attitudes towards twin pregnancies and single embryo transfer—a questionnaire study. *Hum Reprod*. 2007;22(10):2673–8.
35. Borkenhagen A, Braehler E, Kentenich H. Attitudes of German infertile couples towards multiple births and elective embryo transfer. *Hum Reprod*. 2007;22(11):2883–7.
36. Rai V, Glazebrook C. Abstracts and posters presented at the 27th annual conference of the Society for Reproductive and Infant Psychology: development and preliminary validation of the attitudes to twin pregnancies scale. *J Reprod Infant Psychol*. 2007;25(3):243.
37. Pinborg A et al. Consequences of vanishing twins in IVF/ICSI pregnancies. *Hum Reprod*. 2005;20(10):2821–9.
38. Gleicher N et al. The desire for multiple births in couples with infertility problems contradicts present practice patterns. *Hum Reprod*. 1995;10(5):1079–84.
39. Lampic C, Skoog Svanberg A, Sydsjo G. Attitudes towards gamete donation among IVF doctors in the Nordic countries—are they in line with national legislation? *J Assist Reprod Genet*. 2009;26(5):231–8.
40. HFEA. Success rates 2010 [cited 2010 18.03.2010]; Available from: <http://www.hfea.gov.uk/>.
41. Maheshwari A, Griffiths S, Bhattacharya S. Global variations in the uptake of single embryo transfer. *Hum Reprod Update*. 2010;00:1–15.