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ORIGINAL ARTICLE

The marketing of elective egg freezing: A content, cost and quality analysis of UK fertility clinic websites

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Abstract To the authors' knowledge, this is the first UK-based study to analyse the marketing of elective egg freezing (EEF) by fertility clinics. Analyses were based on the websites of the top 15 UK clinics, which together provided 87.8% of all egg freezing cycles in the UK between 2008 and 2017 inclusive. The analyses included three phases: content analysis; systematic cost analysis and comparison; and quality analysis examining the information available on egg freezing and its adherence to the guidelines of the Human Fertilisation and Embryology Authority (HFEA). The results show that clinics frame EEF according to four main themes: as a new and exciting technology; as a solution to (a modern woman's) life circumstances; as a means to gain control, freedom and more reproductive options; and as a means to avoid the reproductive risks of ageing. This study also found that most clinics are not sufficiently clear and transparent about the 'true' cost of an EEF cycle, present an unbalanced view of EEF, and do not provide satisfactory data or information. Most importantly, none of the clinics adhere adequately to the HFEA guidelines regarding advertising and the provision of information. As the EEF market continues to grow, offered exclusively by private clinics, these findings require urgent attention. Clinics must improve the type and quality of EEF information on their websites such that potential patients can make informed choices, and this article provides 10 basic criteria which can be used as a checklist. It is suggested that the time may have come to grant greater economic regulatory powers to HFEA to avoid overcommercialization of the fertility industry.

KEYWORDS: elective egg freezing, ethics, fertility clinics, informed consent, marketing, oocyte cryopreservation

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Introduction

Egg freezing, a 'cutting edge' reproductive technology that was almost unheard of 10 years ago, has now become not only a common topic of public and media discussions but a fast-growing form of fertility intervention. Although initially developed to preserve the eggs of women undergoing potentially fertility-threatening treatments (e.g. chemotherapy for cancer) or those at risk of premature menopause (ASRM, 2008; ESHRE Task Force on Ethics and Law, 2004), egg freezing has been increasingly marketed to and used by women who are concerned about age-related fertility decline and wish to increase their chances of having a baby in the future (Lockwood, 2011; Mertes and Pennings, 2011; Stoop, 2010). As such, the terms 'non-medical' and 'social' egg freezing have been used increasingly across both scholarship and media discussions to distinguish the growing use of the technology from its medically-indicated origins. This article uses the term 'elective egg freezing' (EEF), as proposed by Inhorn et al. (2018a), as this seems to be the most value-neutral, representative and comprehensive terminology to describe the current practice of egg freezing.

As a contemporary form of reproductive technology, EEF has several distinguishing and unique features that set it apart from other assisted reproductive technology (ART). Firstly, unlike fertility treatments in general, it is used not by persons who are seeking to conceive in the present, but rather by those seeking to increase their chances of having children at some point in the future. Secondly, the intended users of EEF are not women who suffer from infertility or subfertility, but rather those who are currently fertile and fear being less so in the future (Martin, 2010; van de Wiel, 2020). Thirdly, unlike many fertility treatments in many countries, EEF is usually only available through private clinics, and has no associated public funding or insurance provision. Although some ethicists have argued that this should not be the case (Mertes and Pennings, 2012), it is extremely unlikely to change; the authors foresee that EEF will continue to grow as a central offering of the private fertility sector, with some scholars even placing EEF at the heart of the growing logic and practices of the 'financialization of fertility' (van de Wiel, 2020). While there has been significant academic scholarship, with both ethicists and social scientists debating the appropriate parameters for EEF (Argyle et al., 2016; Baldwin et al., 2014; ESHRE Task Force on Ethics and Law, 2012; Lockwood, 2011; Mertes and Pennings, 2011), exploring the sociodemographic characteristics and motivations of its users (Baldwin et al., 2018; Inhorn et al., 2018a,b; Gurtin et al., 2018a), and seeking to identify best-practice guidelines to inform patient-centred care (Inhorn et al., 2019), less attention has been paid to the ways in which clinics have been advertising and marketing their EEF services.

Research has confirmed that websites and online content are a significant source of information for patients thinking about their fertility and considering the use of ART (Daniluk and Koert, 2015; Marriott et al., 2008). In fact, as early as 20 years ago, in the relatively early days of home internet use, Weissman et al. (2000) found that many fertility patients from different socio-economic backgrounds sought and gathered information online about their fertility problems. Despite this, there has been little scholarship analysing the online content of fertility clinics in different countries, and existing studies have suggested a cause for concern. In the USA, for example, analyses of the quality of fertility clinic websites, and the degree to which they comply with the guidelines of the American Medical Association and the American Society for Reproductive Medicine (ASRM), have indicated that none of the websites analysed were able to meet most of the health information guidelines (Abusief et al., 2007; Huang et al., 2005; Jain and Barbieri, 2005). In the UK, one review of fertility clinic websites showed that the quality of fertility-related information varied greatly between websites, with most scoring low on credibility, accuracy and navigability (Marriott et al., 2008). Another UK-based study found that most of the claims made about benefits and successes on UK fertility clinic websites were not quantified, with evidence rarely cited to support the claims made (Spencer et al., 2016). The authors concluded that more information was needed to support well-informed treatment decisions.

With regard to egg freezing services specifically (as opposed to ART in general), research has confirmed that women considering EEF are most likely to consult clinic websites and social media when making decisions (Stevenson et al., 2019), but little attention has been paid, to date, to the online marketing, advertising and commercial arrangements around egg freezing. The first US-based study to systematically assess the quality of information presented on clinic websites regarding their egg freezing services found that the majority of websites did not follow ASRM guidelines on oocyte cryopreservation and related advertising (Avraham et al., 2014). The authors stated:

> The guidelines aim to protect women from false hopes by recommending that clinics include information on the woman's age and its possible impact on success, as well as clinic-specific success rates, risks, and costs. All of these parameters were mentioned by very few of the websites, regardless of their affiliation (Avraham et al., 2014: 224–225).

As a result, Avraham et al. (2014) suggested that the type and quality of information given about egg freezing on clinic websites needs to be improved in order to help women make well-informed and reliable decisions about their own fertility. They warned that an apparent lack of reported success rates for different age groups, in combination with the existing low awareness of fertility decline among women, might 'encourage women to falsely believe they can indefinitely delay childbearing through [oocyte cryopreservation]' (Avraham et al., 2014: 226). These findings were echoed in a study which replicated a similar methodology to analyse the websites of Australian fertility clinics, which found that 'women are not receiving the information they need to make well-informed choices' (Beilby et al., 2020: 1), and advised that 'more information is required for consumers to enable a true cost–benefit analysis' (Beilby et al., 2020: 5). A further US study found that many fertility clinics engaged in biased advertising regarding egg freezing, meaning that they advertised 'the service persuasively, not informatively, emphasising indirect benefits while minimising risks and the low chance of successfully bringing a child to term' (Barbey, 2017). Similarly, a study

based in Spain found that there was inconsistency in the clarity of information about egg freezing provided on clinic websites, and that the information available was framed to attract more women to freeze their eggs (Mohammadi, 2019).

Perhaps surprisingly, to date, there has been no similar study or other systematic analysis of UK clinic websites and the information they provide about EEF. This is an important omission that the current paper seeks to address. To be clear, there are currently no UK regulations concerning the cost and advertisement of EEF. The Human Fertilisation and Embryology Authority (HFEA), the UK's independent regulator of the fertility sector, has the power to license clinics and treatments, but has no control or power over the marketing, pricing or advertising of procedures. The 1990 Human Fertilization and Embryology Act, which first regulated egg freezing, was not set up to account for commercialization of the fertility industry, and as such provides little power to HFEA regarding these aspects of ART (Human Fertilization and Embryology Act, 1990). This is a particularly relevant oversight in the case of EEF, as this procedure is offered exclusively in the private sector and is currently the fastest growing fertility treatment in the UK (HFEA, 2019a). Having said that, as part of its regulatory role, HFEA publishes a Code of Practice for clinics which is periodically updated [for the latest version, see HFEA Code of Practice (2019b)], and as part of its guidance regarding information provision (Guidance Note 4.8), it ref-

Information about success rates

4.8 In line with the Advertising Standards Authority's Code, the centre should ensure that the information provided on its website complies with the following guidance. This also applies to other relevant marketing communications of the centre and associated satellite and transport centres.

a. The information should include the most recent data available from the past 3 years.
b. Centres are encouraged to display live birth rate data per embryo transferred where relevant and this may be displayed alongside other success rate measures. The information should not highlight a high success rate that applies only to a small, selected group of patients.
c. The data should show split by maternal age and, if appropriate, by treatment type.
d. The information should provide raw numbers rather than just percentages.
e. The website should provide the national rate and like-for-like comparisons (the same year, maternal age, treatment type, etc.).
f. The centre's published success rate data should refer to HFEA as the source of national information through its Choose a Fertility Clinic function.
g. The information must state clearly that information on success rates is of limited value in comparing centres and choosing where to seek treatment. It should include a link to the HFEA's advice on choosing a clinic: www.hfea.gov.uk/choose-a-clinic/learn-aboutchoosing-a-clinic/
h. If the information refers to comparative costs, it should indicate the likely total cost for a typical cycle, based on the actual costs for recent patients, not individual items in tariffs.

Human Fertilisation & Embryology Authority

Fig. 1 Guidance on the provision of information about success rates from the Human Fertilisation and Embryology Authority's Code of Practice (HFEA, 2019b).

erences the Advertising Standard Authority's Code and provides a list of the type and nature of information about fertility treatments that clinics should make available to patients on their websites (Fig. 1). Although HFEA does not currently possess the authority to require or insist that clinics follow these guidelines, there is an expectation that this will be the case. Therefore, the HFEA list (Fig. 1) has been used as a crucial benchmark to assess the extent to which the websites of UK fertility clinics adhere to the regulator's explicit guidelines and recommendations regarding the provision of information about EEF.

Materials and methods

In order to ascertain the parameters of this study, the first task was to identify all fertility clinics in the UK which offer EEF, and to gain a sense of their relative size within this private market. To this end, a freedom of information request was submitted to HFEA in May 2019, asking for a list of all UK clinics performing egg freezing and the number of cycles of egg freezing performed by each clinic from 2008 onwards. As HFEA conducts mandatory licensing and monitoring of all UK clinics, they were able to provide comprehensive information about all egg freezing cycles in the UK from 2008 to the end of 2017 (the latest date for which records were available at the time of the request). Once received, this information was cross-referenced with clinic websites to: (i) identify and exclude those clinics that only offer medical egg freezing (MEF) through the National Health Service; (ii) identify and group together 'satellite' or 'branch' clinics owned and operated by the same larger company or group which shared relevant website content; and (iii) identify and exclude any clinics that do not actively market egg freezing services, or only perform a negligible number of cycles. After the exclusion process (detailed in the Results section), 15 clinics were selected for inclusion in this website analysis, comprising three distinct phases: content analysis; cost analysis; and quality analysis.

Content analysis

The first phase of this research involved content analysis of the website of each of the 15 identified clinics. Web-based data are not static but dynamic, and the content and presentation of a website can change from one day to the next, making it challenging to perform content analysis. For this reason, each clinic's website (including all pages that provided information, advertising or links with reference to EEF) was downloaded and saved as PDF files in June 2019. Subsequent analysis was conducted on these files.

Content analysis is a method used to analyse the content of data and to organize it into defined categories to facilitate interpretation (Harwood and Garry, 2003). Although there are many different methods for performing content analysis, the main analytic strategy used in this study was summative content analysis (Hsieh and Shannon, 2005), which combines quantitative counts with qualitative interpretations of text (Ryan and Bernard, 2003). This method reviews text to identify themes and ideas — in this case, the themes and ideas communicated by the text on fertility clinic websites associated with EEF — which are then analysed and interpreted. This method is similar to that used by both Barbey (2017) and Johnson (2012) in their analyses of fertility clinic websites. The present approach differs slightly in that codes were developed by two researchers in the present study, whereas Barbey (2017) used a team and Johnson (2012) used a qualitative software program.

In order to develop the codes, the website PDFs were read in detail by both researchers. Specific codes, which were identified by selecting certain words or phrases that stood out, were noted independently. The next stage was to discover subthemes, overarching themes, and the underlying meanings and messages of the words and website content. This process was repeated until a core number of themes and concepts, used by the clinics to present, market and advertise EEF, were developed and agreed by both researchers. Keeping the clinics separate as individual coding units meant it was clear how many of them mentioned a certain theme in their egg freezing materials, making it possible to make comparisons across codes and across clinics. The focus was on themes that were present on multiple websites, as these were the most frequently cited ideas in the marketing of EEF.

Cost analysis

The second phase of the analysis focused on the cost of EEF, ascertaining both the advertised price of an EEF cycle on each clinic's website and comparing this with the 'true' cost of undergoing a cycle of EEF at that clinic. Each clinic website had an advertised cost for a single EEF cycle (and some websites included special offers for multiple cycles). These prices were noted and enquiries were made, first by examining the web-based information and then by e-mailing or telephoning the clinic in question regarding exactly which aspects of an EEF cycle were included and which were excluded from the advertised figure. In many cases, there were additional required costs, such as the HFEA fee or mandatory screening tests. For each clinic, the costs associated with these excluded aspects were determined and added to the advertised base price to arrive at what has been termed the 'true' cost of a cycle of EEF, noting the difference between the two. The advertised base price and the 'true' cost of EEF at each clinic were compared for all 15 clinics.

Quality analysis

The aim of the third and final phase of the analysis was to assess the overall quality of the information provided about EEF on each clinic's website. The HFEA guidance on the provision of information on clinic websites (HFEA, 2019b; Fig. 1) was used to create a quality assessment system, and translated into a scoring system. For instance, the HFEA guideline 'The information should include the most recent data available from the past 3 years' (Point 'a' in Fig. 1) was translated into the question 'Are any data from the past 3 years mentioned?' The websites that did mention recent data were given 1 point, whereas those that did not were given 0 points. Similarly, the guideline 'The information should provide raw numbers rather than just percentages' (Point 'd' in Fig. 1) was translated into the question 'Are

any raw numbers given?', with 1 point awarded if raw numbers were available. This process was applied to each of the eight points from the HFEA guidelines, except for Point 'c', 'The data should show split by maternal age and, if appropriate, by treatment type'. In the case of EEF, as the rate of return for electively frozen eggs is still very low and limited data are available, it was considered unfair to judge websites on this criterion at the present time (although, of course, it is extremely important and most useful to present success rate data split into age groups whenever possible). In total, seven questions based on the HFEA guidelines were derived, with a potential point that could be awarded for each of them.

Three further questions were added, derived from the authors' literature review of similar research analysing fertility clinic websites, particularly the study by Avraham et al. (2014) who examined the quality of egg freezing information on the websites of US fertility clinic. These three questions cover whether the source and date of any data are provided; whether the process of egg freezing is explained; and whether potential risks and safety concerns are mentioned. Each of these questions was also designated 1 point, giving a total maximum of 10 points from which to score each website. Together, these questions enabled the authors to evaluate both the quality of the information provided by clinic websites and their adherence to the HFEA guidelines. The full list of 10 questions that comprised the quality assessment system can be seen in Table 1.

The above-mentioned PDFs were used to analyse each clinic's website according to the 10 questions to generate an overall score for the quality of information presented. In regard to its information about egg freezing, a clinic's website was deemed to be 'excellent' if it gained a score of 9 or 10 points; 'good' for 6, 7 or 8 points; 'fair' for 3, 4 or 5 points; and 'poor' for 0, 1 or 2 points. As with the analysis of Avraham et al. (2014), on which the present methods were based, each website was scored independently by two researchers who were then able to discuss, compare and, where needed, agree ratings.

Results

The freedom of information request from HFEA resulted in a list of 82 UK fertility clinics which had carried out egg freezing cycles at any point between the start of 2008 and the end of 2017. Of these, 18 clinics offered MEF alone and were excluded. Twenty-one of the remaining clinics were identified as 'satellites' or 'branches' of larger clinic groups and were combined to create a single unit as appropriate, as their websites did not contain independent EEF information. This left 43 clinics (some of which represented clinic groups with multiple satellites) which were ranked in order of how many cycles they performed per year (as HFEA data did not include specific information if fewer than five cycles had been performed, any record stating '<5' was replaced by a value of '2').

Of these 43 clinics, 28 clinics had performed less than a total of 55 cycles of egg freezing across the 10-year period, and 25 clinics had performed between zero and 10 cycles of egg freezing in the latest year for which data were available. For many of these clinics, it was unclear whether they performed EEF or only froze eggs when required as part of an in-vitro fertilization (IVF) cycle [i.e. when a sperm sample was not available on the day of egg collection — for details, see Gurtin et al. (2018a)]. Although some clinics listed 'fertility preservation' and 'egg freezing' as services on their websites, no or very limited information was available. In sum, the participation of these 28 clinics in the egg freezing market was deemed to be so small as to be negligible, and the decision was made to exclude them from further analysis. Thus, this website analysis focused on the top 15 clinics (or clinic groups), which together accounted for 87.8% of all egg freezing cycles that took place in the UK from 2008 to 2017 inclusive. It is worth noting that of these 15 clinics, only six have ever conducted more than 50 cycles in any given year, and all six of these are based in London. In fact, over 70% of all egg freezing cycles were performed in London, which suggests that the EEF market is very focused and concentrated in the capital.

Table 1 Quality assessment questions for clinic websites.

	Question	Possible score
1	Are any data from the past 3 years mentioned?	1 point
2	Are live birth rates mentioned?	1 point
3	Are any raw numbers given?	1 point
4	Is the national success rate for egg freezing mentioned?	1 point
5	Is HFEA referred to as a source of data?	1 point
6	Is the lack of reliable data mentioned?	1 point
7	Is the advertised cost the likely total cost of a typical cycle?	1 point
8	Is the source and date of any presented data referenced?	1 point
9	Is the process of egg freezing explained?	1 point
10	Is there any mention of potential risks and safety concerns regarding egg collection and the egg freezing process?	1 point

HFEA, Human Fertilisation and Embryology Authority.

Content analysis

As a result of the content analysis of fertility clinic websites, four main themes which appeared across the egg freezing content were identified, forming the four major ways in which EEF was presented to its potential users. These were: (i) EEF as a new and exciting technology; (ii) EEF as a solution to (a modern woman's) life circumstances; (iii) EEF as a means to gain control, freedom and more reproductive choices; and (iv) EEF as the means to avoid the reproductive risks of ageing.

Fourteen of the 15 clinic websites presented egg freezing explicitly as a new and exciting technology, with the use of phrases such as 'advanced technology', 'ground-breaking', 'pioneering', 'innovation', 'cutting edge' and 'latest technique'. Many clinics also used scientific and technical words, with nine websites using the term 'oocyte vitrification' rather than egg freezing. Examples of this first theme can be seen in the following quotes:

> The development of egg vitrification is a ground-breaking development. (CREATE Fertility)
> Advances in egg freezing techniques have dramatically improved survival rate, and recent developments in the field have allowed our laboratory to adopt a new technique called vitrification. (Harley Street Fertility Clinic)

Fourteen of the 15 clinic websites included lists of reasons for women to freeze their eggs, or the potential life circumstances with which EEF could help, such as those mentioned below:

> If you're still waiting to find the right partner, have a successful career, or not ready to be a mother right now. (London Women's Clinic)
> You may have other life plans, a career, or have not met 'Mr Right' yet. (Harley Street Fertility Clinic)

In line with the third theme, 11 of the 15 clinic websites referred to EEF as a means to gain control over one's reproduction, to attain freedom from the tyranny of the biological clock, or to have more reproductive options. Statements that are illustrative of this theme include:

> Start a family later without worrying about your biological clock. (London Fertility Centre)
> [Egg freezing] provides women with the freedom to choose when they have their children. (CREATE Fertility)
> [Egg freezing] offers women the choice of when to become a mother and provides more flexibility around fertility decisions. (IVI Midland)

In line with this theme, two clinics specifically mentioned the concept of 'empowerment' in relation to EEF:

> This empowering process gives you a choice to make a decision to start a family when the time is right for you. (London Women's Clinic)
> The development of egg vitrification is a groundbreaking development in its ability to empower women and provide them with the freedom to choose when they have their children. (CREATE Fertility)

Illustrative of the fourth and final theme, 10 of the 15 clinic websites discussed potential risks and fears around reproductive ageing and later motherhood in the context of egg freezing information, presenting EEF either explicitly or implicitly as a means to avoid these risks and dangers:

> It is harder to get pregnant when older, and chance of miscarriage increases. (The Fertility Partnership, Boston Place)
> Egg quality declines as you grow older, and risks are associated with having a family when you're older such as miscarriage and genetic conditions. (CARE)
> Women in their late 30 s and early 40 s have an increased risk of age-dependent changes in egg quality, sometimes resulting in miscarriage and/or genetic abnormalities. (Glasgow Royal Infirmary)

Cost analysis

The cost of an egg freezing cycle was found on the website for each clinic, usually alongside a list of prices for other treatments, such as IVF. This cost ranged from £2800 for one cycle of EEF (City Fertility) to £3895 (The Fertility Partnership). However, the elements included in the advertised price differed between clinics. For instance, while some clinics included essential blood tests, scans, sedation for egg collection and the first year of egg storage as part of their advertised price for one cycle of EEF, other clinics only included the cost of egg collection and vitrification, meaning that compulsory elements of a cycle would need to be paid for in addition to the advertised amount. On most clinic websites, it was very difficult to ascertain exactly which elements were included or excluded (even by experienced researchers), and in most cases, these points were clarified through direct telephone or e-mail enquiries with clinics. For four clinics (marked with an asterisk in Fig. 2), it was not possible to obtain precise costs for some of the missing elements, despite repeated requests to these clinics.

Most of the clinics included monitoring scans, sedation for egg collection, the egg freezing procedure and the first year of egg storage as part of their advertised cost for one cycle of EEF. However, none of the advertised prices included fertility testing (i.e. a scan to determine the antral follicle count and an anti-Müllerian hormone test), compulsory screening (for human immunodeficiency virus and hepatitis) or the initial doctor consultation — all necessary elements that must be undertaken before beginning a cycle of egg freezing. In addition, very few clinics included a review consultation which is, or should be, an essential element of an EEF cycle. The additional costs required to fulfil these essential and excluded parts of an EEF cycle ranged from £330 (IVI Midland) to £1345 (CARE). In fact, when the 'true' cost of a single cycle of EEF was calculated for each clinic, it ranged from £3755 (King's Fertility) to £4728 (The Fertility Partnership).

Fig. 2 shows the advertised price for a single cycle of EEF on each clinic's website, as well as the cost of additional required procedures to arrive at the 'true' cost of an EEF

cycle. It is possible to see the variation in cost between clinics, as well as the striking difference between the price that is advertised and the 'true' cost of EEF. Overall, the average advertised price for one cycle of EEF was £3320, with an average additional cost of £923 (almost one-third extra) amounting to the average 'true' cost of £4244. The seven most expensive clinics were all based in London, and included all six of the clinics providing more than 50 cycles of egg freezing per year.

Quality analysis

According to this analysis, most clinic websites scored very low with regards to the quality of information provided and its adherence to the HFEA (2019b) guidelines. Of the 15 clinic websites analysed, three clinics scored 0 points, meaning they did not fulfil any of the 10-point criteria; seven clinics scored 1 point; and two clinics scored 2 points. This means that 12 of the 15 clinic websites were rated as 'poor' with regards to their egg freezing information. Of the remaining three clinics, two clinics were rated as 'fair' (3 points each; London Women's Clinic and St Mary's Hospital) and one clinic was rated as 'good' (6 points; Lister Fertility Clinic). The details of scoring for each clinic as part of the quality assessment system can be seen in Table 2.

In general, there was a lack of data on egg freezing success rates across the websites, with only two clinics providing any verified information. In some cases, clinics provided what appeared to be objective success rates or data, but without any reference to sources or calculations; for example, the website for Boston Place, part of The Fertility Partnership, provides what it calls 'simple statistics based on a single treatment cycle producing enough eggs to provide a reasonable chance of success', and goes on to say:

> If you respond well to stimulation treatment so that we collect 10 eggs, we would expect that 8 of these, on

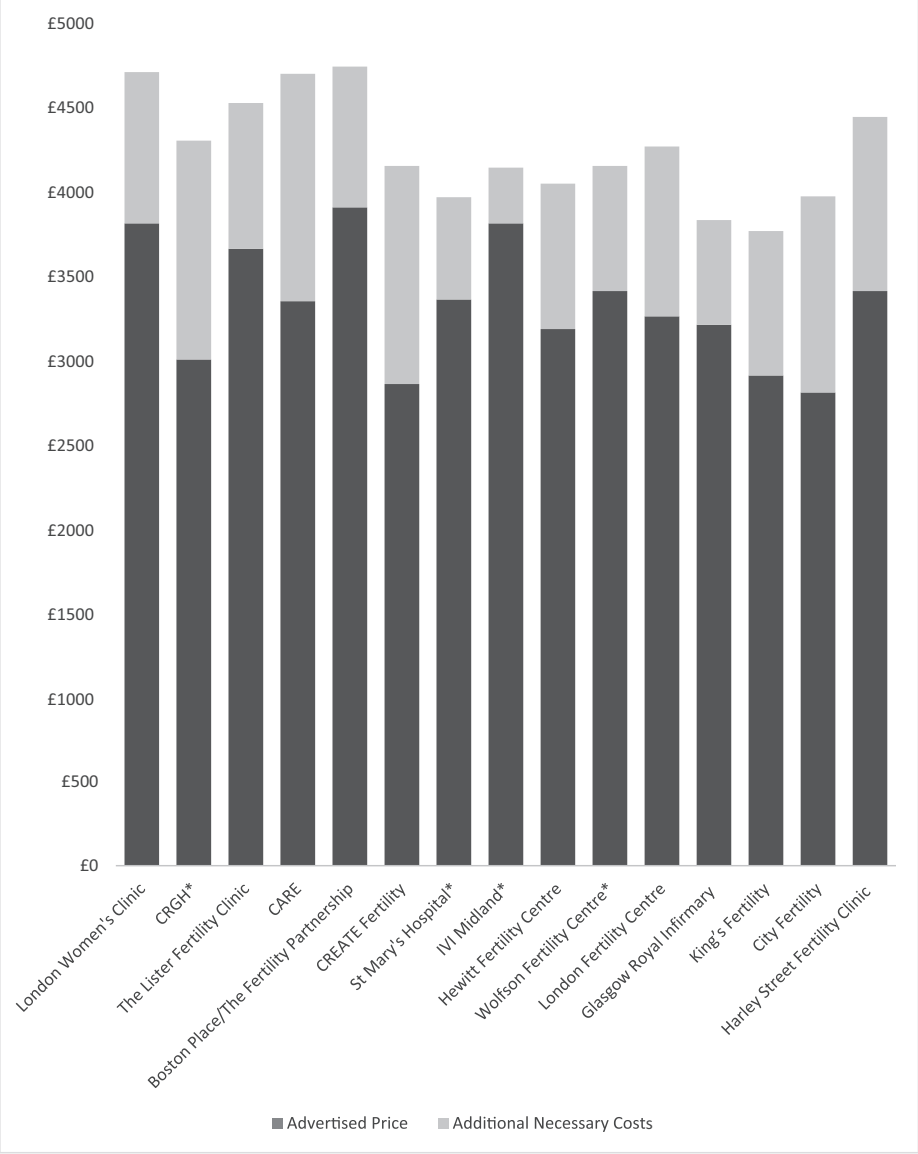

Fig. 2 Advertised price for one cycle of elective egg freezing at each clinic, with additional necessary costs added.

Table 2 Quality analysis scoring for each clinic's website.

Clinic name	Quality assessment question										Total score
	1	2	3	4	5	6	7	8	9	10	
London Women's Clinic	1	0	0	0	0	1	0	0	1	0	3
CRGH	0	0	0	0	0	0	0	0	1	1	2
The Lister Fertility Clinic	1	1	1	1	0	1	0	0	1	0	6
CARE	0	0	0	0	0	0	0	0	1	0	1
The Fertility Partnership	0	0	0	0	0	0	0	0	1	0	1
CREATE Fertility	0	0	0	0	0	0	0	0	1	0	1
St Mary's Hospital	0	0	0	0	0	1	0	0	1	1	3
IVI Midland	0	0	0	0	0	0	0	0	0	0	0
Hewitt Fertility Centre	0	0	0	0	0	0	0	0	0	0	0
Wolfson Fertility Centre	0	0	0	0	0	0	0	0	1	0	1
London Fertility Centre	0	0	0	0	0	0	0	0	1	1	2
Glasgow Royal Infirmary	0	0	0	0	0	0	0	0	1	0	1
King's Fertility	0	0	0	0	0	0	0	0	1	0	1
City Fertility	0	0	0	0	0	0	0	0	0	0	0
Harley Street Fertility Clinic	0	0	0	0	0	0	0	0	1	0	1

average, will be mature and suitable for freezing. We would expect all of them would survive the freezing and thawing processes successfully. When thawed, the eggs are injected with an individual sperm (ICSI). We estimate that about 6 of these might fertilise and go on to divide. On average, depending upon the age of the egg at freezing, each of those viable embryos has a 15–30% chance of leading to a live birth. Therefore, the original group of 10 eggs should lead to a 60–80% chance (cumulative) of a live birth.

Discussion

Clinic websites are likely to be one of the first points of contact for women considering EEF; in fact, when the words 'egg freezing' are entered into the search engine 'Google' from London, 10 of the 14 hits that appear on the first page refer to the websites of private fertility clinics, with the remaining four hits referring to the HFEA website, a newspaper article, a blog post, and a sponsored link to a fertility information website by Gideon Richter (accurate as of 30 March 2020). As such, it is extremely important for fertility clinic websites to provide information that is as clear, accurate, comprehensive and evidence-based as possible. The aim of this study was to assess the type and quality of information about EEF on UK fertility clinic websites through a three-stage analysis, comprising a content analysis, a systematic cost analysis and comparison, and a quality analysis examining the available information and its adherence to the HFEA guidelines.

To the authors' knowledge, this is the first UK-based study to analyse the marketing of EEF by UK fertility clinics on their websites, making an important addition to similar work undertaken in the USA (Avraham et al., 2014; Barbey, 2017) and Australia (Beilby et al., 2020). The present results echo Barbey's conclusion that fertility clinic websites 'advertise the [elective egg freezing] service persuasively, not informatively, emphasising indirect benefits while minimising risks and the low chance of successfully bringing a child to term' (Barbey, 2017: 195). The present authors agree with Beilby et al. that this is likely because, in the UK – as in the US and Australia – 'commercial environments [...] have influenced the way [EEF] is advertised' (Beilby et al., 2020: 4–5). Ultimately, the conclusions reached by Avraham et al. for US clinics also apply to UK clinics, and 'there is a need to improve the type and quality of information' available on clinic websites (Avraham et al., 2014: 222).

The content analysis revealed four key themes according to which EEF was presented in various positive, attractive and even compelling ways to women considering their present and future reproductive options. Firstly, EEF was presented by almost all clinics as a 'cutting edge' technology, with technical terminology used to highlight the associated scientific developments. Many of the websites mentioned specifically that their clinic used 'new vitrification technology' as if this gave them a market edge, somewhat obfuscating the fact that this technology has now been in use for a decade (Almodin et al., 2010; Grifo and Noyes, 2010; Kim et al., 2010), and is used by all clinics offering EEF. Moreover, technical details presented on some fertility clinic websites – such as 'vitrification minimizes crystal formation and limits damage to the oocyte' – could potentially create the illusion of providing clarity or transparency about the technology, without actually providing women with useful context or information.

Secondly, the presentation of EEF as the solution to a modern woman's life circumstances – such as not being in a relationship, or having a career – which preclude her from wanting or being able to have a child at the moment, paints not only a portrait of the type of woman that the clinics imagine will be interested in egg freezing, but also a particular picture of how one might think about life priorities and timings, reproductive options and responsibilities. Although this particular framing of EEF as the solution to the modern,

educated, successful woman's incommensurable dilemmas between singledom and/or career progression on the one hand, and motherhood on the other may accurately reflect some of the various 'pathways' which lead women to freeze their eggs (Inhorn et al., 2018b), and has become extremely common in media debates as well as marketing materials, it is worth noting that it subscribes to only one specific (albeit seemingly 'obvious') logic. Indeed, the positing of egg freezing as an obvious or logical solution to these modern dilemmas has been criticized by feminist scholars for underplaying the social aspects of the use of technology and the concomitant pressures that may be created for women (Browne, 2018), for advancing an elitist and individualist solution to accommodate suboptimal social and structural realities (Cattapan et al., 2014), and for ultimately generating an atmosphere of increased reproductive anxiety (Faircloth and Gurtin, 2017).

The last two themes are conceptually related, forming essentially two halves of the same argument. According to the third theme, EEF was presented as a means for women to gain control over their reproduction, to achieve freedom from the tyranny of their biological clocks and to give themselves more options, whilst the fourth and final theme framed EEF as the means to avoid the various risks and dangers associated with reproductive ageing and later motherhood, such as miscarriage, having babies with 'genetic abnormalities' and, of course, the increased difficulties of getting pregnant in the first place. It was particularly interesting to note that the discussions regarding risks associated with reproductive ageing appeared on websites as part of the egg freezing information, alongside an almost complete absence of any discussion regarding the potential risks that may be associated with the egg freezing procedure itself. Although this absence of a discussion of potential procedural risks has also been found with regards to other types of ART, including, for example, egg donation (Keehn et al., 2012) and preimplantation genetic diagnosis (Klitzman et al., 2009), it is particularly striking in the case of egg freezing, as the framing clearly delineates a range of risks associated with *not* opting for the procedure while ignoring any risks that may arise as a result of undergoing it. As has been argued previously with reference to representations of egg freezing on US and Australian clinic websites, the authors agree that this not only fails to adhere to ethical and legal standards for truth in advertising (Bayefsky and King, 2019), but also amounts to deceptive marketing (Reis and Reis-Dennis, 2017), which makes it difficult for users to make 'a true cost—benefit analysis' (Beilby et al., 2020: 5).

Combined, these discourses highlight EEF, whether implicitly or explicitly, as the responsible and forward-thinking option, contributing to an increasingly neoliberal, accountable, time-sensitive and risk-reduction-based approach to reproduction (Faircloth and Gurtin, 2017), according to which women are expected to '[anticipate] infertility' (Martin, 2010) and to proactively manage their consumer choices accordingly (van de Wiel, 2020). Thus, reproductive ageing is transformed from a natural and inevitable part of the life course, into a liability requiring monitoring and management (Balwdin, 2018), and EEF is transformed into a management strategy. According to this logic, EEF is unequivocally associated with 'empowerment', bolstering the one-sided public image of egg freezing, which has already led many commentators to question the extent to which this technology actually creates 'false hope' and even 'delusion' (Lockwood, 2011; Mohapatra, 2014; Stern, 2015).

Further to the findings of the content analysis, the results of the cost analysis were also found to be biased towards presenting EEF as an attractive option. As noted in the Results section, none of the clinics advertised the 'true' cost of an egg freezing cycle on their website, excluding the costs of essential and mandatory elements from their advertised prices. The costs associated with these excluded elements ranged from an additional one-tenth (£330) of the cost in the most reasonable case to a staggering additional £1345 in the most extreme case. On average, the true cost of a cycle was approximately one-third (£923) higher than advertised. It is particularly worrying that this information was not usually clear on the clinic websites, and that, in most cases, the researchers had to make multiple direct enquiries to the clinics to establish the true cost of a cycle of EEF. Moreover, as noted, despite repeated enquiries, the exact costs of excluded elements could not be obtained from three clinics, suggesting that women are expected to commit to or begin their egg freezing cycle, or at least pay for a consultation, without clear and exact information regarding the total cost of the procedure. These advertised prices clearly do not indicate the likely cost for a typical cycle, as recommended by the HFEA guidelines, and instead provide a potentially misleading lower figure. It is worth noting, in addition, that the analysis did not take account of the costs of hormone injections or drugs, which are a necessary aspect of the ovulation induction stage of egg freezing, and which may range between £1000 and £2500 per cycle depending on the particular brand and dosage used. This lack of clarity regarding the true cost of an EEF cycle may impact the ability of women to budget appropriately for what is already an expensive procedure, and is likely to add additional stress which could easily be avoided.

Having discussed the findings from the content and cost analysis, it is probably not surprising to add that the key finding from the quality analysis was the inadequacy of the overall information about egg freezing on clinic websites and their lack of adherence to the HFEA guidelines. However, it is fair to note that the authors were taken aback by just how poorly clinics scored on the quality assessment system. The fact that three clinics could not be given a single credit point for the information on their websites, and that 12 of 15 clinics were rated as 'poor' indicates that clinics neglect their responsibilities towards potential patients. In addition to serious omissions, the provision, in some cases, of unsubstantiated or 'estimated' success rates without any reference to data is likely to give women unrealistic expectations and is therefore a serious cause for concern. The claim provided by the website of Boston Place, part of The Fertility Partnership, for example, that there is 'a 60—80% chance (cumulative) of a live birth' is not only unsubstantiated but is three to four times higher than suggested by the existing data, which show a cumulative live birth rate of 21% for women attempting conception with their frozen eggs in a London clinic (Gurtin et al., 2019), and a national success rate of 18% across the UK (HFEA, 2018).

Although one might have expected UK fertility clinics, which come under the regulatory purview of HFEA, to adhere to better standards of information provision and advertising than US-based clinics, often considered as operating in a more commercialized fertility industry, it seems that the HFEA's current lack of powers to control the marketing and pricing of procedures has resulted in very similar outcomes and practices regarding EEF on both sides of the Atlantic. However, unlike the USA, the UK currently has a 10-year storage limit on eggs that have been frozen for 'social' reasons. While this law has been compellingly deemed 'not fit for purpose' (Jackson, 2016) and criticized for putting undue pressure on women nearing the end of their storage periods (Gurtin et al., 2018b), it has probably also acted as a brake in the expansion and commercialization of the UK egg freezing market, disincentivizing the uptake of EEF by younger British women. While the authors strongly support the current UK-based campaigns to extend this arbitrary storage limit (Norcross, 2020), and hope that women who freeze their eggs in the UK will be able to store them for longer than 10 years in the near future, there is a need for UK clinics to provide clearer, more accurate and more transparent information about EEF on their websites before their target market is expanded to include younger women.

There are compelling arguments, both empirical and ethical, for the importance of good-quality information about egg freezing to ensure the welfare of patients. Greenwood et al. (2018) conducted a retrospective cohort study of 201 women who underwent EEF in the USA, and noted that although satisfaction rates were high, one in two of the women (49%) reported some degree of decision regret. This was associated with perceived lower adequacy of information and emotional support provided to the women, suggesting that better-quality information can help women in their deliberations about egg freezing and reduce the incidence of feelings of regret. Echoing this sentiment in the findings of their detailed qualitative interview study with 150 women who froze their eggs in the USA and Israel, Inhorn et al. (2019) also highlighted the importance of making accurate and detailed information available. In fact, they identified the provision of clear and detailed information as a key component of their 11 specific dimensions constituting 'best practice' in 'patient-centred elective egg freezing'. Egg freezing is an 'ambiguous' technology (Jackson, 2018) at the best of times, fraught with uncertainties about the present and about the future, and legal scholar Emily Jackson (2018) has clearly outlined 'the challenges of obtaining informed consent when so little is known about the long term utility of egg freezing'. She has argued for the importance of including as much accurate data as possible, as well as a discussion of remaining uncertainties as part of informed consent processes, writing, 'Perhaps most important of all, potential egg freezers need to understand that even if eggs survive the thawing process, there are no guarantees that a future IVF cycle will be successful'. Currently, there is very little information about egg freezing on UK fertility clinic websites that would fulfil either the patient-centred criteria explained by Inhorn et al. (2019), or the legal and ethical requirements outlined by Jackson (2018).

It is hoped that the 10 criteria used in the quality assessment of websites (Table 1) will be considered as a checklist by clinics, not only to help them improve their information provision and adherence to the HFEA guidelines, but ultimately to help them enable women — potential patients — to make informed decisions regarding whether or not to pursue egg freezing. The EEF market is undoubtedly set to grow, but it is still possible to encourage it to do so in a responsible manner. As political theorist and gender scholar Jude Browne concluded in her comprehensive structural analysis of egg freezing:

> If fertility insurance services rise as they are predicted to do, it is imperative that effective regulatory bodies, independent of industry, are maintained and well resourced, not only so they can license and regulate medical and technological practice but also so that they can encourage the public to exercise its political responsibility to assess and influence the ways in which we engage with new technologies and the effects they have in terms of structuring the 'choice architecture' of individuals (Browne, 2018: 161—162).

Limitations of this study

The current study has three key limitations. First and most important among these refers to the nature of the entity under question: websites are dynamic, not static, and therefore this analysis refers to the information and prices that were available on clinic websites at one particular moment in time (June 2019). Website content is liable to change, as are the prices of fertility treatments, and some of the data discussed here may already be out of date. Indeed, it is hoped that if clinics have not updated and improved the egg freezing information available on their websites over the last year, they will do so as a matter of urgency upon reading these findings.

The second limitation of this study is that only the written information that appears on clinic websites was analysed, meaning that any external advertising materials (such as print adverts that might appear in newspapers or posters in public places), egg freezing information events hosted by clinics, and non-text website content were excluded. These all contribute to the overall marketing of egg freezing by clinics. The main reason for excluding these elements was to ensure standardization of the analysis across all clinics, and to limit the focus to the most essential form of information provision. Although videos with egg freezing information appeared on three clinic websites (London Women's Clinic, CRGH and IVI Midland) alongside text content, and may have provided useful additional information, these were not included in the analyses as the study aimed to assess the key text content which is most accessible, available and easy to process for potential patients.

The third limitation refers to the fact that the data regarding the volume of egg freezing cycles performed by each clinic, as obtained from HFEA, only extend to the end of 2017. Later data were not available because official records take time to collect and compile. As mentioned, egg freezing is a fast-growing technology, and it is possible that the volume or share of egg freezing cycles practised by different clinics may have changed since this time. However, even if such changes have taken place, these will not alter

or impact the overall conclusions regarding the provision of egg freezing information by the main UK clinics.

Conclusion

In conclusion, the marketing of egg freezing by fertility clinic websites in the UK is of a poor standard and needs to be urgently and comprehensively addressed. The study results show that most clinics present an unbalanced view of EEF, do not provide satisfactory information about egg freezing, are not sufficiently clear and transparent about the 'true' cost of an EEF cycle, and do not adhere adequately to the HFEA guidelines regarding advertising and the provision of information. These findings are extremely important for two reasons: firstly because egg freezing is the fastest growing form of fertility treatment in the UK (HFEA, 2019), increasingly advertised to an ever-larger target market according to a newly developing ethos of 'proactive fertility management' (van de Wiel, 2020); and secondly because this is a reproductive technology that is practised exclusively within the private sector, which normalizes the for-profit structures that are built around it and makes it particularly susceptible to the pitfalls of commercialization.

While it is understood that private fertility clinics are for-profit businesses and their websites are aimed primarily at advertising their services and increasing their clientele (Jain and Barbieri, 2005), this must take place within acceptable parameters. The guidelines published by HFEA (2019b) regarding success rates and the provision of information, in line with the Advertising Standards Authority's Code, are very clear and also advance the requirement for compliance by clinics. Although detailed data on egg freezing are less available than data on IVF, as the former is a more recent and less used technology, there is no excuse for clinics failing to provide the most comprehensive and accurate information possible. As such, there is great scope for clinics to improve the information and data about egg freezing on their websites by endeavouring to fulfil the basic criteria outlined in this article as part of the quality assessment. It is suggested that each clinic website should: (i) include data from the past 3 years; (ii) note the live birth rate from egg freezing; (iii) provide raw numbers associated with the data; (iv) provide national success rates for egg freezing (as available through HFEA); (v) refer to HFEA as a source of data; (vi) note the lack of comprehensive or reliable data on egg freezing (e.g. in relation to different age groups); (vii) advertise the typical cost of a complete cycle of egg freezing rather than excluding essential and mandatory elements with associated additional costs; (viii) reference the source of any data presented (including published journal articles or national databases); (ix) adequately explain the process of egg freezing; and (x) mention the potential risks and safety concerns regarding the egg freezing procedure itself, including the lack of long-term studies.

Moreover, if clinics are not willing to self-regulate to ensure a good quality of EEF information in adherence to the HFEA guidelines, the need for external regulation, monitoring and enforcement must be recognized. At present, clinic inspections by HFEA include checking website content about IVF for adherence to Guidance Note 4.8 (information about success rates), but do not include content about egg freezing. At the very least, it would be sensible to bring such content under the inspection remit of HFEA. Furthermore, 30 years since the original HFE Act (1990), it may now be time to consider extending the powers of HFEA to match the growing commercialization of the fertility sector, and thus to enable them to regulate the financial aspects of ART, including pricing and advertising. Speaking in 2018 at the Progress Educational Trust Conference, the Chair of HFEA, Sally Cheshire, spoke of the increasing provision of UK fertility treatments and services by the private sector, and stated that she 'would welcome giving the HFEA powers of economic regulation' because she argued, 'in a niche sector we can make a real difference for patients' (Cheshire, 2018). Based on the results presented here, the authors are inclined to agree. However, it is hoped that clinics will be proactive without the need for regulatory changes, and that their websites will exhibit more accurate, balanced and informative marketing of EEF in the very near future.

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