

## ORIGINAL RESEARCH

## Fertility Treatment, Use of in Vitro Fertilization, and Time to Live Birth Based on Initial Provider Type

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**Purpose:** To explore the relationship between the type of clinician (generalist vs subspecialist) initially seen by infertile women, the treatment received, and the time to pregnancy.

**Methods:** We analyzed mixed-mode questionnaire data from 867 women with primary infertility enrolled into a retrospective cohort through population- and fertility clinic–based sampling. We compared women presenting first to generalist providers with women presenting first to fertility subspecialists, with the main outcomes of receiving in vitro fertilization (IVF), time to pregnancy, and live birth.

**Results:** The first contact for most (84%) women with infertility was a generalist provider. Only 8% of women sought care first from a fertility subspecialist, and these women were older and had been trying longer to conceive. Women who presented first to a generalist provider were less likely to receive IVF (adjusted odds ratio, 0.48; 95% confidence interval, 0.28–0.82), were equally likely to achieve pregnancy, and had similar times to pregnancy (adjusted hazard ratio, 1.11; 95% confidence interval, 0.80–1.53) compared with women who presented first to a subspecialist.

**Conclusions:** Generalist providers are frequently the first point of care for women with difficulty conceiving and are uniquely positioned to promote the balanced management of infertility. (J Am Board Fam Med 2017;30:230–238.)

**Keywords:** Fertilization; Fertilization in Vitro; Infertility, Female; Live Birth; Point-of-Care Systems; Pregnancy; Retrospective Studies; Surveys and Questionnaires; Time-to-Pregnancy

The management of infertility (defined clinically as  $\geq 12$  consecutive months of sexual intercourse without contraception and without achieving pregnancy) is part of comprehensive primary care. Fer-

tility care is a fundamental part of the family planning spectrum, involves both women and men, and provides insight into a patient's overall health, including underlying health problems that increase women's long-term risk of ischemic heart disease or cancer.<sup>1–4</sup> Infertility is common, with prevalence estimates ranging from 7.4% of married women of reproductive age<sup>5</sup> to 15.5% of women who are trying to conceive,<sup>6,7</sup> and it has major effects on the physical and emotional health of affected women and men.<sup>8–11</sup>

The frequency of contact and longitudinal relationships in primary care make generalist providers well positioned to assess a woman's pregnancy intentions and provide guidance to improve the likelihood of achieving a pregnancy and healthy live

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**Conflict of interest:** none declared.

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birth.<sup>8,12</sup> While the value of care before conception is well recognized, the role of a primary care provider in the diagnosis and treatment of infertility is not well studied. A better understanding of generalist providers' role in the diagnosis and treatment of infertility may provide insight into opportunities for enhanced management of infertility in primary care settings.

Using data from a retrospective cohort study, we sought to describe the types of providers women with a history of primary infertility first saw for fertility care, and to assess any differences in patient characteristics between women who sought initial fertility care from a generalist provider (including family physicians, obstetrician-gynecologists, and midlevel primary care providers), and those who sought initial care from a fertility subspecialist. We explored the association between the type of provider initially seen for infertility, the likelihood of receiving in vitro fertilization (IVF), and the time to pregnancy leading to first live birth.

## Methods

We analyzed data from the Fertility Experiences Study (FES), a retrospective cohort study conducted between April 2010 and September 2012. The FES enrolled women with a history of primary infertility, defined as 12 months of intercourse with a man without contraception and without a resulting conception. The primary purpose of the study was to examine time to pregnancy and pregnancy outcomes for different treatment strategies among women with primary infertility.<sup>13</sup> This study was approved by the University of Utah institutional review board (IRB no. 00027783).

The FES enrolled 2 parallel cohorts of participants: one cohort from the general population, and one cohort from 2 participating fertility specialty clinics. Potential participants from the general population were identified using the Utah Population Database, which houses data from Utah birth, death, marriage, and driver license records.<sup>14</sup> Potential population-based participants were women married in Utah between January 1, 2000, and December 31, 2002; age 18 to 30 years at time of marriage; and not listed as a mother on a live birth or fetal death certificate as of December 31, 2004 (the index date). We mailed letters to a random sample of potential participants inviting them to complete the screening questionnaire. The process

was repeated using the same criteria for women married between January 1, 2004, and December 31, 2006, with an index date of December 31, 2008.

We recruited a parallel cohort of clinic-based participants through the 2 subspecialty fertility clinics providing IVF in Utah at the time of the study: the Utah Center for Reproductive Medicine and the Reproductive Care Center. We mailed recruitment letters to all female patients seen for their first infertility visit at the Reproductive Care Center between 2000 to 2009, and to all female patients seen for their first infertility visit at the Utah Center for Reproductive Medicine in 2004 or 2008 who were age 20 to 35 years at the first visit and had no known pregnancies before that visit.

Women who responded to the mailing were screened for eligibility by phone or online. Eligibility criteria for the study were the same for both population-based and clinic-based recruitment from both clinics: age 20 to 35 years at the index date, no pregnancies before the index date, in a sexual relationship with a man for at least 1 year without contraception and without pregnancy at the time of the index date, and living in Utah for the entire 3 years following the index date. Upon being found eligible, participants were sent an online (or paper) questionnaire. After completing the questionnaire, participants were contacted to complete a phone interview. Duplicate contacts to the same participant were identified during the screening or data analysis; women who were recruited through both population and clinic cohorts were included in the population cohort. The methods of the FES are reported in greater detail elsewhere.<sup>13</sup>

The written questionnaire and the phone interview included detailed questions regarding treatment choices and outcomes during each period of time during which the woman was attempting to conceive. Our previous validation study found high levels of correlation between patient self-report and medical records for time attempting to conceive (Pearson  $\rho = 0.61$ ), pregnancy and live birth histories ( $\kappa = 0.70$ ), and use of IVF ( $\kappa = 0.77$ ).<sup>15</sup> For each period of time during which a woman was attempting to conceive, interviewers asked, "During this period did you see a doctor or provider specifically for fertility-related issues?" If yes, she was then asked, "Did you meet or consult with:

- a general physician/provider (obstetrician, family medicine physician, physician assistant, nurse midwife, nurse practitioner)?
- a fertility specialist?
- Utah Center for Reproductive Medicine?
- Reproductive Care Center?
- a provider out of state?
- an alternative/holistic practitioner (chiropractor, acupuncturist, naturopath, etc.)?
- other?"

All positive responses were recorded. We classified women's initial providers according to the first type of provider they saw for fertility care. If a woman indicated that she saw both a generalist provider and a fertility subspecialist during the same period of time, we assumed she saw the generalist provider first. We compared the demographic characteristics of women presenting first to a generalist provider with those of women presenting first to a fertility subspecialist by stratifying the data for each characteristic and calculating the relative risk of presenting to a generalist provider first for each stratum.

Next, we compared the likelihood of receiving IVF among women presenting first to a generalist provider with that of women presenting first to a fertility subspecialist. We included any use of IVF, with or without intracytoplasmic sperm injection, at any time before the phone interview. We calculated unadjusted odds ratios and conducted a multivariate regression analysis. We considered potential confounders those variables consistent with prior knowledge of factors associated with fertility treatment choices<sup>16</sup> and variables that resulted in a >10% difference between the unadjusted and adjusted relative risks of receiving IVF.

We also compared time to pregnancy leading to a live birth by initial provider type, measured from the beginning of the woman's first attempt to conceive and counting all cumulative months attempting until the beginning of her first pregnancy leading to a live birth. We then conducted a multivariate Cox proportional hazard regression model, adjusting for the same potential confounders as in the multivariate regression analysis described above.

We conducted the analysis with Stata statistical software (Stata Corp., College Station, TX). We analyzed all eligible women in the population and clinic cohorts combined. To assess whether our

findings were biased by the half of the sample coming from fertility clinics, we also conducted a secondary analysis including only women recruited from the general population.

## Results

### *Participant Characteristics*

In the general population cohort, 16,001 letters were sent, to which 1,903 women (12%) responded with interest; of these, 570 women (30%) were eligible, of whom 434 (76%) completed the online questionnaire and the telephone interview. Among those recruited through the clinic, 10,677 letters were sent, which resulted in 1,303 (12%) interested responses, 526 eligible women (40%), and 433 (82%) who completed the questionnaire and interview.<sup>13</sup> Thus, 867 women were included in the analysis. Participant demographic characteristics are shown in Table 1.

### *First Provider of Infertility Care*

Among all 867 study participants, a majority (84%) presented first to a generalist provider for fertility care. Only 8% presented first to a fertility subspecialist, and 8% never saw any type of provider specifically for fertility care despite failing to achieve a pregnancy after being in a sexual relationship with a man without use of contraceptives for at least 1 year. Women were equally likely to achieve a live birth regardless of first provider type ( $P = 0.39$ ,  $\chi^2$  test). Figure 1 displays the number of women in each category who had a live birth. This analysis was repeated for the 434 women recruited from population sampling alone, with similar results shown in Supplementary Figure 1.

Women who began receiving care from a subspecialist were older at the beginning of their first attempt to conceive, were older at the time of their first fertility visit, and had been trying longer to conceive at the time of their first fertility visit, as shown in Table 2. These results were not statistically significant when restricted to women recruited from population sampling alone, as shown in Supplementary Table 1.

### *Likelihood of Receiving IVF*

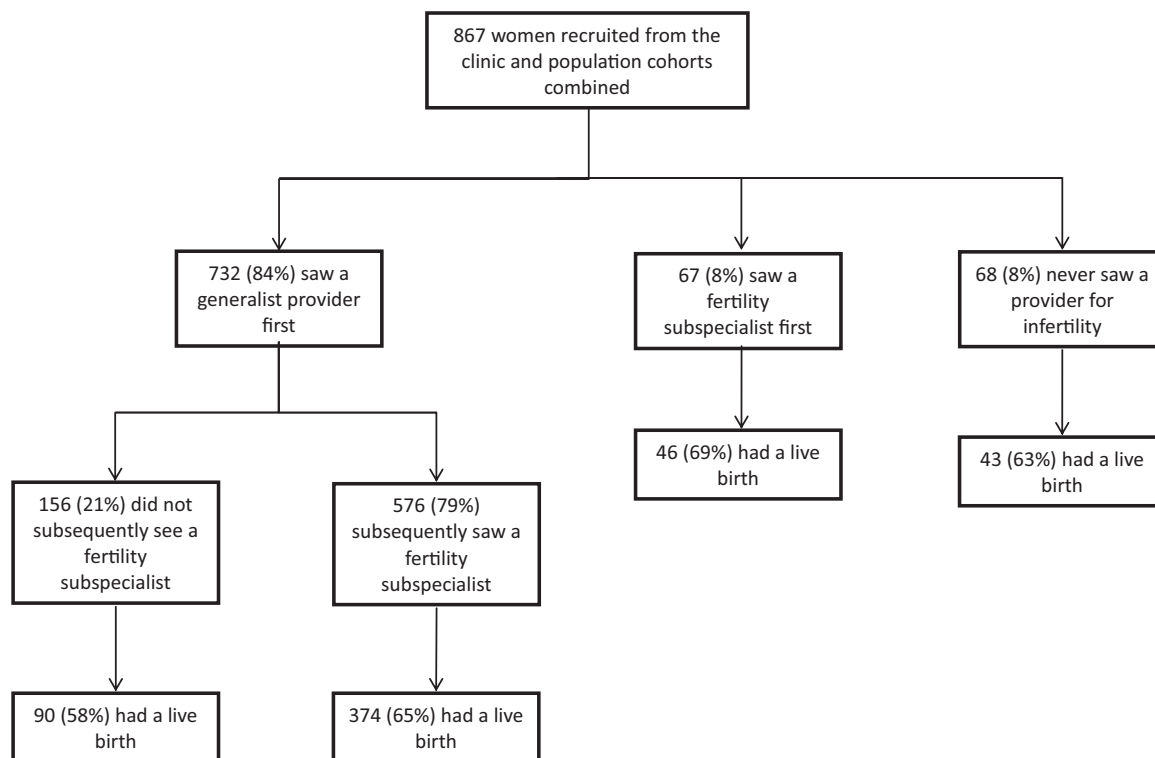
Women who presented first to generalist providers were less likely to receive IVF than women who presented first to fertility subspecialists (odds ratio [OR], 0.42; 95% confidence interval [CI], 0.26–

**Table 1. Participant Characteristics**

	Population Cohort (n = 434)		Clinic Cohort (n = 433)		Combined Cohorts (n = 867)	
	No.	%	No.	%	No.	%
Household income						
<\$12,000	8	2	4	1	12	1
-\$12,001-\$25,000	20	5	14	3	34	4
-\$25,001-\$50,000	129	30	87	20	216	25
-\$50,001-\$75,000	159	37	124	29	283	33
-\$75,001-\$100,000	67	15	108	25	175	20
>\$100,000	35	8	76	18	111	13
No answer	16	4	20	5	36	4
Insurance coverage for infertility testing and/or treatment						
None, unsure, or no answer	310	71	358	83	668	77
Some coverage other than IVF	111	26	62	14	173	20
IVF coverage	13	3	13	3	26	3
Religious preference						
None	38	9	37	9	75	9
Latter-Day Saint	343	79	319	74	662	76
Catholic	6	1	17	4	23	3
Other Christian	21	5	40	9	61	7
Other non-Christian	13	3	10	2	23	3
No answer	13	3	10	2	23	3
Religious attendance						
Never	58	13	46	11	104	12
Monthly or less	56	13	63	15	119	14
Weekly or more	310	71	315	73	625	72
No answer	10	2	9	2	19	2
Body mass index (kg/m <sup>2</sup> )						
<25	194	45	206	48	400	46
25–30	107	25	97	22	204	24
>30	97	22	94	22	191	22
No answer	36	8	36	8	72	8
Age (years) at beginning of first attempt to conceive						
<25	274	63	201	46	475	55
25–30	141	32	161	37	302	35
>30	19	4	67	15	86	10
No answer	0	0	4	1	4	0
Age (years) at first infertility visit						
<25	151	35	145	33	296	34
25–30	173	40	168	39	341	39
>30	35	8	112	26	147	17
Not applicable or no answer	75	17	8	2	83	10
Cumulative months attempting to conceive before first infertility visit						
≤11	125	29	156	36	281	32
12–23	156	36	190	44	346	40
24–35	47	11	41	9	88	10
>36	31	7	42	10	73	8
Not applicable or no answer	75	17	4	1	79	9

IVF, in vitro fertilization.

**Figure 1. Provider types and outcomes.**



0.70). This remained significant after adjusting for household income, age at the first fertility visit, and length of time trying to conceive at the time of the first fertility visit (adjusted OR, 0.48; 95% CI, 0.28–0.82). In the analysis limited to women recruited from the population-based sample, women were similarly less likely to receive IVF (OR, 0.24; 95% CI, 0.10–0.59); this finding remained significant after the same multivariate adjustment (adjusted OR, 0.25; 95% CI, 0.10–0.63).

### Time to Pregnancy

Among the 553 women who had a live birth, the median time to pregnancy ending in a live birth was 35 months for women who first visited a generalist provider and 31 months for women who first visited a subspecialist ( $P = 0.97$ , rank-sum test). Of women who initiated care with a generalist provider, 51.2% achieved pregnancy within the first 5 years of attempting, compared with 50.7% of women who initiated care with a subspecialist ( $P = 0.94$ ,  $\chi^2$  test). Figure 2 shows the time to pregnancy leading to a live birth by first provider type.

No statistically significant difference in time to pregnancy was found between women who pre-

sented first to a generalist provider and women who presented first to a fertility subspecialist based on a comparison of hazard ratios (HRs) (combined cohorts: HR, 0.93; 95% CI, 0.69–1.27; population cohort only: HR, 1.00; 95% CI, 0.57–1.76). This remained the case after adjusting for household income, age at the first fertility visit, and length of time trying to conceive at the time of the first fertility visit (combined cohorts: adjusted HR, 0.94; 95% CI, 0.68–1.30; population cohort only: adjusted HR, 1.08; 95% CI, 0.60–1.94).

### Discussion

The first point of contact for most women seeking fertility care in this population was a generalist provider. Presenting first to a generalist provider was associated with a decreased likelihood of receiving IVF and a similar time to pregnancy leading to a live birth. These findings do not necessarily imply a causal relationship between first provider type and likelihood of receiving IVF. Women who seek infertility care from different types of providers likely differ beyond the factors we measured, such as cause of infertility. Further research is

**Table 2. Association between Select Characteristics and Likelihood of Seeing a Fertility Subspecialist First**

	General Provider First		Fertility Specialist First		Relative Risk of Seeing a Fertility Specialist First (95% CI)
	No.	%	No.	%	
Overall	732	92	67	8	—
Recruitment method					
General population	346	94	22	6	ref.
Fertility clinic	386	90	45	10	<b>1.74 (1.07–2.85)</b>
Household income					
≤\$50,000	218	94	14	6	ref.
-\$50,001-\$75,000	241	92	21	8	1.32 (0.69–2.55)
>\$75,000	243	90	28	10	1.71 (0.92–3.17)
Insurance coverage for infertility testing and/or treatment					
None or unsure	546	91	54	9	ref.
Some coverage other than IVF	161	93	12	7	0.77 (0.42–1.41)
IVF coverage	25	96	1	4	0.43 (0.06–2.97)
Religious preference					
None	56	88	8	13	ref.
Latter-day Saint	570	92	47	8	0.61 (0.30–1.23)
Other than Latter-day Saint	86	89	11	11	0.91 (0.39–2.13)
Religious attendance					
Never	83	90	9	10	ref.
Monthly or less	95	92	8	8	0.79 (0.32–1.97)
Weekly or more	537	92	49	8	0.85 (0.43–1.68)
Body mass index (kg/m <sup>2</sup> )					
<25	337	91	32	9	ref.
25–30	176	93	13	7	0.79 (0.43–1.47)
>30	159	91	16	9	1.05 (0.59–1.87)
Age (years) at beginning of first attempt to conceive					
<25	406	93	29	7	ref.
25–30	251	91	26	9	1.41 (0.85–2.34)
>30	71	86	12	14	<b>2.17 (1.15–4.07)</b>
Age (years) at first infertility visit					
<25	279	94	17	6	ref.
25–30	316	93	25	7	1.27 (0.70–2.32)
>30	123	84	24	16	<b>2.84 (1.58–5.12)</b>
Cumulative months attempting to conceive before first infertility visit					
≤11	266	95	15	5	ref.
12–23	311	90	35	10	<b>1.89 (1.06–3.39)</b>
≥24	145	90	16	10	1.86 (0.95–3.66)

Bolded values in RR (95% CI) are those which are statistically significant. CI, confidence interval; IVF, in vitro fertilization; ref., reference category.

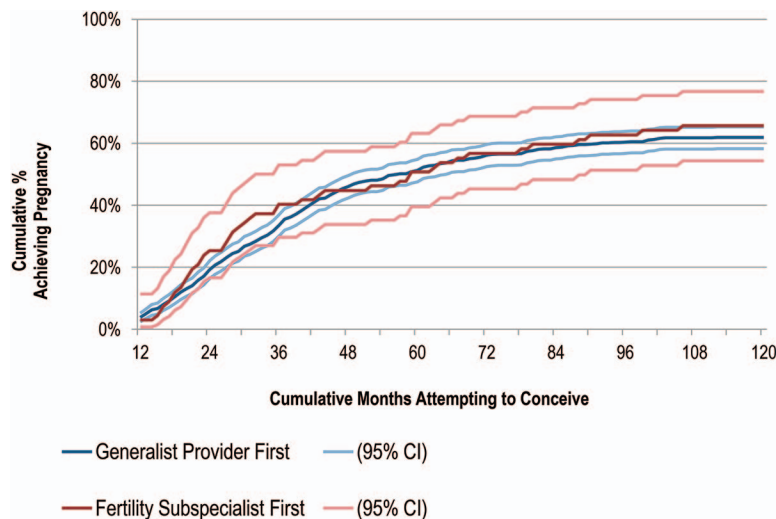
needed to determine the underlying reasons for the association detected in this study.

Specialized fertility treatments such as IVF can be medically invasive and are associated with a number of adverse health implications for the resulting children, including an increased risk of birth defects, low birth weight, and preterm birth.<sup>8,17–19</sup>

They are also costly. If similar live birth outcomes can be achieved with lower rates of IVF use, it may be beneficial for both patients and society.<sup>20</sup>

This study's strengths include the use of data from population-based participants, rather than clinic-based participants only, increasing the ability to represent the general population and the popu-

**Figure 2. Time to pregnancy leading to live birth. CI, confidence interval.**



lation that generalist providers see in practice. Other strengths include a moderately large sample size, inclusion of all ( $n = 2$ ) subspecialty fertility clinics in the state of Utah at the time of the study, collection of detailed time-related data for attempts to conceive and pregnancy outcomes, and the use of a validated questionnaire for assessing fertility treatments and time to conception.

Several limitations should be noted. First, the questionnaire did not differentiate between various types of generalist providers; instead, family physicians, obstetrician-gynecologists, physician assistants, and nurse practitioners were combined into 1 category. Experience and training for infertility may vary considerably among these providers. Second, the questionnaire relied on participants to classify their provider type as a generalist provider or a fertility specialist. As a result, it is possible that some obstetrics-gynecology clinics that advertise a focus on infertility may have been misclassified as fertility subspecialists, which for the purpose of this study were defined as reproductive endocrinologists. Third, several unique characteristics of the women in this study and of the Utah population may limit generalizability to other populations. The Utah population has higher fertility among women and a younger average age at childbearing compared with other states (23.9 years at first birth in Utah vs 25 years nationally).<sup>21</sup> In addition, 76% of women in this study self-identified as Latter-Day Saint, and the pronatalist stance of the Church of Jesus Christ of Latter-Day Saints may influence

women's experience and treatment decisions.<sup>21,22</sup> We believe it is unlikely that this cultural influence would change the impact of generalist versus specialist care initially for women <35 years of age. Finally, we previously reported that women who responded to the original recruitment letter were somewhat more likely than nonresponders to have had a live birth, be older (in the clinic group), and be more educated (in the population group).<sup>13</sup> It is theoretically possible that the relationship between time to pregnancy and type of first provider could be different among the nonresponders who would have been eligible for the study.

This study highlights the importance of primary care and generalist providers in the treatment of infertility. Infertility is relatively common, and the majority of women in our study sought medical care for this condition. Further, a large majority of women who sought care presented first to a generalist provider. Many generalist providers might perceive infertility as a relatively infrequent complaint, despite them being the initial source of advice for patients with this condition.<sup>23</sup> There may be some discrepancy between patients' and providers' perceptions of what constitutes seeking infertility care, and this may contribute to some patients feeling as though their fertility concerns are not taken seriously by generalist providers.<sup>24</sup> Despite its high prevalence, infertility may be an infrequently addressed topic in family medicine residencies and other primary care training programs.

More comprehensive care by family physicians has been associated with lower costs.<sup>25</sup> Generalist providers who perform the initial workup and management of infertility may confer cost savings to their patients and to the health care system. They may also improve patient access to infertility care, especially for patients who, as a result of health care reform efforts, may now have increased access to primary care without increased access to subspecialty infertility care. Generalist providers are uniquely positioned to promote the balanced management of infertility and may help some patients avoid unnecessary medical complications, costs, and stress associated with invasive fertility treatments.

Suggestions for further research include studies comparing the outcomes of fertility care provided by various types of generalist providers and fertility subspecialists among samples representative of the US population, the current and potential economic impact of fertility care by generalist providers, generalist providers' perspectives and self-perceived readiness to provide fertility care, and patient satisfaction of fertility care by various provider types.

To see this article online, please go to: <http://jabfm.org/content/30/2/230.full>.

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