Online access to male factor infertility care: the challenge of finding a specialist

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Objective: To investigate internet search results available to couples searching for a male factor infertility specialist.
Design: Cross-sectional.
Setting: Online search engine.
Patient(s): The phrase "male infertility specialist <state>" was searched in Google for 50 states and Washington D.C. The top 10 results (i.e., first page) of each search were evaluated for website content.
Intervention(s): None.
Main Outcome Measure(s): The first page of each search was evaluated for provider type (urology vs. obstetrics and gynecology), level of training (fellowship vs. none), male factor fertility information provided, and procedures offered. We compared search position rank (1–10) to determine the likelihood of finding an urologist versus a practitioner in obstetrics and gynecology.
Result(s): A total of 419 results were identified; the majority were obstetrics and gynecology-related (N = 229, 54.7%). Urology-related results appeared higher than obstetrics and gynecology-related results (median, 4 vs. 5). Andrology fellowship-trained urologists were identified in 153 (36.5%) results. Among 229 obstetrics and gynecology results, 152 unique practices were identified. A small portion (N = 38, 16.6%) of these practices had a fellowship-trained urologist identified on the website. Most obstetrics and gynecology websites did not mention vasectomy reversal (N = 116, 76.3%) or varicocele repair (N = 93, 61.2%). A minority of practices offered referral to urologists for sperm extraction (N = 23, 15.1%) or offered sperm retrieval themselves (N = 23, 15.1%).
Conclusion(s): When searching online for a male factor infertility specialist, most results identified obstetrics and gynecology physicians. A large proportion of obstetrics and gynecology websites lacked information on male factor fertility treatments and did not offer these treatments. These data indicate the need for a more robust online presence of male reproductive urologists to optimize online access. (Fertil Steril Rep® 2020;1:227–32. ©2020 by American Society for Reproductive Medicine.)
Key Words: Fertility, internet, male infertility, urologists

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Infertility affects 8%–15% of couples worldwide, and 40%–50% of infertile couples have a male factor (1). In addition, male fertility may be a window into overall male health, with growing evidence suggesting associations between male infertility and metabolic syndrome, cardiovascular disease, cancer, and mortality (2). Although male factor infertility is a common condition and an important biomarker for male patients, male partner evaluation is often overlooked or deferred during a couple's initial fertility evaluation (3). Analysis of data from the National Survey of Family Growth showed that up to 18% of couples undergoing fertility testing only had female partner evaluation (4).

Low rates of male evaluation may be, in part, due to barriers of access (5). Previous studies have investigated the epidemiologic, geographic (6), economic (7), health policy (8), and other socioeconomic barriers preventing equal and consistent access to male factor infertility care in the United States. Beyond these barriers, the internet is an understudied yet ubiquitous tool that can significantly impact patient access to fertility care. A 2013 study done by the Pew Research Center found that 59% of US adults searched online for health information in the previous year (9), and an older study from 2000 found that 55% of couples used the internet for fertility-related information (10). Two decades later, this proportion is, undoubtedly, even

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higher. However, there is a lack of data evaluating the online presence of male factor infertility providers and the ease with which men can identify reproductive specialists online.

We sought to evaluate the efficacy of internet searches for identification of a male fertility specialist to determine whether this constitutes a significant barrier. In addition, we aimed to characterize the information available through online provider websites. We hypothesized that internet search and referral patterns, as well as the quality of information available online, may be contributing to the underutilization of reproductive urologic evaluations.

MATERIALS AND METHODS

Internet Searches

The phrase "male infertility specialist <state>" was entered into Google for all 50 states and Washington, D.C. Incognito mode was used to ensure that search history, cookies, and cache would not impact search results. The first 10 results (i.e., first page) of each search were evaluated and assigned a score (1–10) according to search position (11). Each search result was evaluated for provider type (urology vs. obstetrics and gynecology [OBGYN]), practice type (academic, i.e. associated with a university or academic institution, vs. nonacademic), level of training of the urologist, if applicable (general urology, andrology fellowship, or other fellowship), information provided on male factor infertility, and procedures offered. Search results that were purely informational without any listed providers were excluded.

Data search and compilation was performed by A.D., a trainee at an Accreditation Council for Graduate Medical Education-accredited urology residency. The search function within the internet browser was used to identify the terms sperm retrieval, varicocelectomy, varicocele, and vasectomy reversal. When these terms were not encountered, the website was manually searched for any additional mention of male fertility procedures.

Statistical Analysis

Descriptive statistics were used to report the percentage of all search results related to urology versus OBGYN providers and the median Google search result ranking for each. The Wilcoxon rank-sum test was used to compare average Google search result positions according to provider type. The American Community Survey 2018 data collected by the US Census Bureau (12) was used to determine state-level characteristics associated with increased number of urologists on the Google search results. State-level variables were extracted from this database including average population age, percent married, percent with insurance (public or private), percent with a high school education or equivalent, percent of White race, percent with internet access, and average family income. Multiple linear regression models were used to identify the variables associated with the number of urology search results per state search and controlling for number of andrology fellowships in the state and the presence of a state mandate for infertility coverage (13). Statistical significance for all tests was determined at a P value of .05. All statistical analysis was performed using RStudio, and graphs were created using GraphPad Prism 8.0.2. The study did not constitute human subjects research and therefore, was exempt from institutional review board approval.

TABLE 1

Google search results for male factor infertility providers.

Characteristics	Number of patients (%)
Total search results	419
Urology	190 (45.3%)
OBGYN	229 (54.7%)
SSMR urologist on website	97 (23.2%)
Andrology fellowship-trained urologist on website	153 (36.5%)
Average search position[a]	
OBGYN-related result[b]	5 (3–8)
Urology related result[b]	4 (2–8)
Fellowship-trained result	4 (2–7)
SSMR result	4 (2–7)

Note: OBGYN = obstetrics and gynecology; SSMR = Society for the Study of Male Reproduction.
[a] Median (interquartile range).
[b] Wilcoxon rank-sum for search position; OBGYN versus urology $P = .01$.

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RESULTS

Among 510 total search results, 419 (83.8%) identified specific providers and met inclusion criteria (Table 1). The majority of search results were OBGYN-related (N = 229, 54.7%) and the remaining were urology-related (N = 190, 45.3%) ($P = .007$). On average, urology-related results ranked higher on the results list compared with OBGYN-related results (median, 4 [interquartile range, 2–8] vs. 5 [interquartile range, 3–8]; $P = .01$). Andrology fellowship-trained urologists were identified in 153 (36.5%) search results, and urologists who were also members of the Society for the Study of Male Reproduction (SSMR) were identified in 97 (23.2%) of search results.

There was state-level variation in the proportion of search results leading to urologists (Table 2). States with a higher proportion of high school-educated adults (beta 0.163, standard error [SE] 0.054; $P = .004$) and higher average household income (beta 0.151, SE 0.055; $P = .009$) were more likely to have increased number of urology results on the Google searches. States with a higher proportion of married adults had fewer urology results on the Google searches (beta -0.401, SE 0.134; $P = .005$).

Among the 190 urology-related search results, 150 practices and 200 individual urologists were identified. Most urologists (N = 138, 69.0%) were fellowship trained in andrology or other men's health subspecialties. Approximately one third (N = 71, 35.5%) of identified urologists were registered members of the SSMR. Most urologists were nonacademic versus academic (60.0% vs. 40.0%). Fellowship-trained urologists were more likely to offer sperm extraction, varicocele repair, and vasectomy reversal on their website (all $P < .005$; Table 3).

Of the 229 OBGYN-related search results, 152 unique OBGYN practices were identified. Most OBGYN practices were either in vitro fertilization (IVF) centers or large OBGYN

TABLE 2

Multivariable linear regression examining the relationship between state-level characteristics and the number of urologist results on Google search for "male infertility specialist <state>."

Variable	beta	Standard error	*P* value
Population (per 10,000)	0.001	0.000	.29
State insurance mandate	−0.790	0.672	.24
Number of fellowship programs	0.213	0.359	.55
Mean age	0.030	0.191	.87
% married	−0.401	0.134	.004
% with insurance	−0.070	0.104	.50
% with high school education or higher	0.163	0.054	.004
% White	0.063	0.034	.07
% with internet access	0.059	0.121	.63
Mean income (per $1,000)	0.151	0.055	.009

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TABLE 3

Proportion of urologists offering sperm extraction, varicocele repair, and vasectomy reversal online, according to fellowship training status.

	Fellowship-trained in male factor infertility		
Characteristics	Yes (N = 138)	No (N = 62)	*P* value
Procedures offered			
Sperm extraction	137 (99%)	56 (90%)	.001
Varicocele repair	136 (98%)	56 (90%)	.005
Vasectomy reversal	136 (98%)	50 (81%)	<.001

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groups with reproductive endocrinologist (REI) specialists on staff (141/152, 92.7%). Only 20 (13.2%) OBGYN practices offered male fertility evaluation by a fellowship-trained urologist. All of these practices were either IVF centers or large OBGYN groups with REI specialists on staff.

Most OBGYN practices did not mention vasectomy reversal (N = 116, 76.3%) or varicocele repair (N = 93, 61.2%) on their websites (Fig. 1). The IVF centers or large OBGYN groups with REI specialists were more likely to mention vasectomy reversal (χ^2, $P = .04$) or varicocele repair (χ^2, $P = .03$) on their website than general OBGYN groups. A small portion of these practices stated they would provide a referral to an urologist for vasectomy reversal (N = 22, 14.5%) or varicocele repair (N = 24, 15.8%), when appropriate. Information on vasectomy reversal and varicocele was provided on 13 (8.6%) and 34 (22.4%) practice websites, respectively. None of the practice websites offered vasectomy reversal or varicocele repair themselves.

Approximately half of the OBGYN practice websites had no mention of sperm extraction (N = 79, 51.6%) and a minority of practices offered referral to a urologist for sperm extraction (N = 23, 15.1%) or offered sperm retrieval themselves (N = 23, 15.1%). The IVF centers or large OBGYN groups with REI specialists were more likely to mention sperm extraction on their webpage (χ^2, $P<.001$). In-house sperm retrieval was only offered at IVF centers or large OBGYN groups with REI specialists.

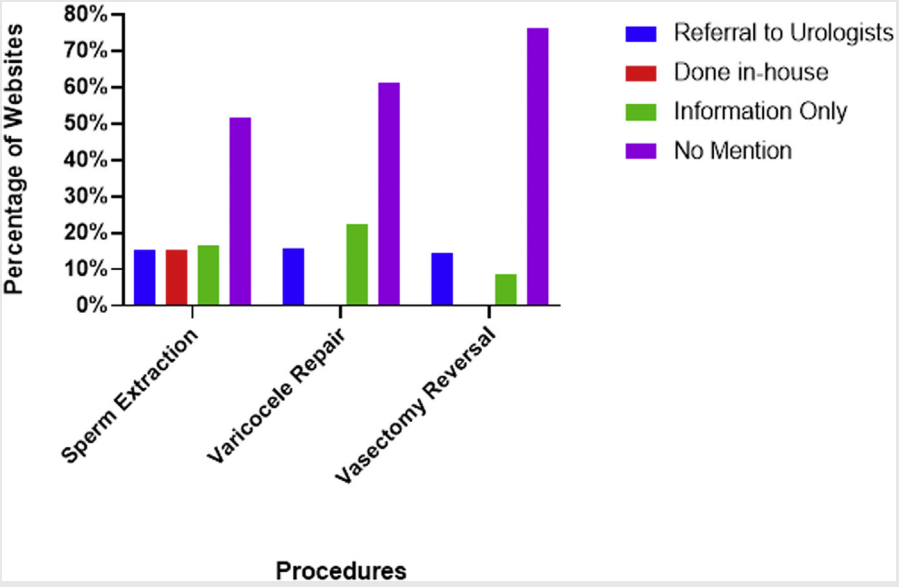
DISCUSSION

In this observational study examining the efficacy of internet searches for identification of male fertility providers, we found that most websites identified led to an OBGYN practice. Furthermore, most OBGYN websites identified through this search omitted important information regarding surgical management options for male factor infertility.

Access to male factor infertility care in the United States remains sporadic and understudied. Previous reports have suggested that a large proportion of subfertile couples do not undergo appropriate male factor evaluation (4). In 2016, Mehta et al. (5) defined six barriers to access to male factor infertility care, as follows: epidemiologic, geographic, knowledge, financial, socioeconomic, and governmental/health policy. The internet is an important resource for patients to learn about medical conditions, yet the information found on the internet is often inaccurate or altogether missing, contributing to the knowledge barrier that prevents equitable access to male factor infertility care. A 2016 study (14) evaluated 428 infertility treatment center websites and found that only 78% had any mention of male factor infertility and only 63% listed treatment options for male factor infertility. Beyond the availability and accessibility of online information regarding the disease of infertility, the simple challenge of finding a male reproductive urologist online may play an important role in access to care. A study (15) of >1,000 patients found that 63% chose a provider due to their strong online presence, underscoring the importance of physician online presence in access to care. We sought to characterize the online presence of male factor infertility providers to determine the extent to which this may be impacting access to care and to identify potential areas for improvement.

First, we found that male factor infertility providers have a relatively weak presence on internet search engines, as represented by Google, which accounts for >90% of internet searches (16). Surprisingly, less than half of Google search results for male factor infertility specialists in the United States actually led directly to a urologist. Young patients most often use the internet to identify a physician, and the average male patient with infertility is approximately 40 years of age (17, 18). As such, the inability to easily locate a reproductive urologist online constitutes a significant barrier to healthcare access. Recently, Samplaski et al. (19) found that a very small but significant proportion (4.2%) of men seeing male fertility specialists were self-referred. This small number could be, in part, attributable to the difficulty of finding a male factor infertility specialist online. Although the SSMR does have an online "physician finder," most patients are unaware that such a resource exists, rendering it difficult to find the "finder" (accessed at https://ssmr.org/find-a-doctor.aspx).

FIGURE 1



Proportion of obstetrics and gynecology physicians mentioning sperm extraction, varicocele repair, and vasectomy reversal in online content.

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Second, we found that OBGYN websites identified in our searches often lacked sufficient or accurate information on male factor infertility, specifically regarding procedural interventions. Most OBGYN websites had no mention of vasectomy reversal or varicocele repair, both of which are considered standard treatment approaches for appropriately selected patients. This is consistent with prior data from Leung et al. (14) demonstrating that surgical treatment was mentioned on only 61% of websites, and specific mentions of varicocele or vasectomy reversal were found on only 21.3% and 26.6% of websites, respectively.

Third, we found that a significant portion of OBGYN groups perform their own sperm retrieval procedures. About 15% of OBGYN groups stated they would perform sperm extraction procedures themselves, which is consistent with a recent study by Nassiri et al. (20) of 225 community infertility clinics across the country, finding that postvasectomy sperm retrieval was offered by 9.4% of REIs. We echo many of the same concerns brought by Nassiri et al. (20) regarding these data. Reproductive urologists are best-equipped to properly assess male factor infertility, appropriately select the patient and surgical approach for sperm retrieval, and medically optimize the patient before sperm extraction. Surgical sperm retrieval procedures have potential risks and complications, and REIs are not specifically trained in either the male reproductive anatomy or the specific surgical skills (e.g., microsurgery) and approaches pertaining to sperm retrieval, nor are they experienced in the identification and management of scrotal surgical complications. One circumstance where this expertise is particularly important is microdissection testicular sperm extraction for men with nonobstructive azoospermia, wherein careful microdissection by an experienced microsurgeon is critical for optimization of outcomes (21). Even urologists who have not received fellowship training in male reproductive urology recognize the expertise required for these procedures, as evidenced by the significantly lower proportion of general urologists offering these procedures in the current study. Ultimately, studies are needed to determine whether sperm retrieval procedures done by REIs or general urologists harbor similar success and complication rates compared with those performed by reproductive urologists.

Fourth, we found that states with lower average income and overall educational status were less likely to have urology search results. Interestingly, there was no significant variation in urology search results according to the presence or absence of state-mandated infertility coverage. Although the prohibitive cost of male factor infertility care in the absence of insurance coverage may represent a major barrier for low income families, the diminished online presence of male factor infertility specialists in states with lower average income may represent a stumbling block in accessing information. As such, improving the online presence of male factor infertility specialists may be an important initial step toward improving access for men in these states.

As changes in practice patterns and insurance mandates lead to increased utilization of assisted reproductive technology, the number of couples seeking fertility care is likely to increase (22, 23). The current data add to a body of literature suggesting that a significant portion of subfertile men will never see a male factor infertility specialist, even if they are specifically searching for one. Beyond these concerns, there is a missed opportunity for general health assessment in subfertile men, who are at significantly increased risk for comorbidity and even death (2, 24, 25). As such, we believe that urologists should be the primary physicians

for the evaluation, management, and follow-up of male factor infertility.

There are multiple ways to address the issue of access to care for patients with male infertility. Establishing closer collaboration and referral patterns with reproductive endocrinology colleagues locally can lead to coordinated care, but systemic initiatives to stimulate collaboration on a national level may be challenging. Improving access to reproductive urologists in underserved or rural areas through use of telemedicine or other outreach initiatives also offers great potential (26). In light of the current data, more easily accessible online search databases may be a simple and effective solution. This would likely represent a joint effort between individual practices and larger organizations such as the American Society for Reproductive Medicine and the SSMR. These organizations have already created search tools that are comprehensive and easy to use, but additional efforts to publicize the availability of these tools, along with targeted efforts from individual practices, could improve online access to providers.

Our findings must be considered within the context of certain study limitations. First, we limited our search to Google and did not use any other online search engines. However, Google accounts for >90% of online searches and is undoubtedly representative of most internet searches (16). Second, websites may not accurately reflect actual physician practice. The omission of a surgical procedure in the website content does not necessarily imply that a particular physician or practice does not routinely discuss this procedure with patients. Nonetheless, website content does, at the very least, reflect the relative importance placed by the physician or practice on various management strategies. Third, physician websites are very infrequently updated, and therefore, the content examined may be outdated and not reflective of a physician's current practice. Fourth, although a significant proportion of OBGYN websites offered sperm retrieval, it is possible that some of these practices use or consult with a reproductive urologist to perform sperm retrieval and do not actually perform the procedure themselves. Last, we could not specifically identify those specialized urologists who either underwent training in the era before fellowships in this field were established or who completed residency training at an institution with high volume care for male factor infertility. These urologists are likely experts in this field but would be characterized as general urologists for the current analysis. Nonetheless, this probably accounts for a very small proportion of urologists, given the prevalence of fellowships in the past 3–4 decades. As such, most urologists who would have trained in the era before fellowships would likely be either approaching retirement or retired.

In conclusion, in a study of online searches for male factor infertility specialists, we found that >50% of search results led to OBGYN-related websites, which often lacked critical information regarding the evaluation and management of male subfertility. These findings suggest that poor online access to male factor infertility specialists could be a major contributing issue to the relatively low rates of male partner evaluation in the United States. With mounting evidence suggesting that male factor infertility is associated with overall health, further collaboration with reproductive endocrinologists and innovative efforts are needed.

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