

# Data protection concerns are a statistically significant reason for refusal: Exploratory study of the patient perspective on telemedicine services based on 735 gynecological surgery patients

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## Abstract

**Objective:** Internet-based healthcare is a crucial facet of telemedicine. Here, we examine telemedicine methods in peri-operative care for gynecological surgery from a patient's perspective. We aim to understand the patients' needs during peri-operative gynecological care and suggest how to optimize telemedicine services based on these insights.

**Methods:** The data were gathered via self-report questionnaires from patients who came in for preparatory consultations for gynecological surgery from May to November 2022. This process involved questioning 735 women about their past usage of internet-based services, personal information, and their views on telemedicine services. The study, which assured full anonymity, had voluntary participation.

**Results:** This participant pool consisted of 735 females. Around half ( $n = 365$ , 49.66%) were preparing for outpatient surgery, while a significant number ( $n = 322$ , 43.81%) were slated for inpatient surgery. Statistically, data protection concerns were the only significant factor influencing consent to telemedicine. While nonsignificant results were found for individuals with minimal concerns ( $b = 0.08$ ; odds ratio [OR] = 1.09,  $p = 0.791$ ), markedly significant results ( $p < 0.001$ ) emerged for those expressing more concerns with  $b = 1.45$  and OR = 4.28. This suggests that the likelihood of refusing consent to telemedicine is 4.28 times higher for those with significant data protection concerns compared with those with no concerns.

**Conclusion:** The patient's perspective on telemedicine services for gynecological surgery is influenced by several factors. These include the patient's age, computer skills, travel distance, occupation, education level, severity of the disease, satisfaction with previous treatments, treatment location, and referral method. Of these, concerns about data security significantly impact patient satisfaction. Hence, it is critical to prioritize this factor when offering telemedical services to meet patients' needs.

## Keywords

Digital health, women's health, data protection, surgery, telemedicine

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## Introduction

Telemedicine is an integral part of internet-based healthcare, encompassing health apps, online patient records, and virtual consultations. These technologies can enhance patient health and decrease costs for healthcare systems.<sup>1</sup> In gynecology, telemedicine holds significant promise for

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improved women's care, although certain obstacles must still be addressed.<sup>2</sup> These include the absence of physical interaction, risk of misdiagnosis and legal complications, reimbursement and billing issues, state medical license limitations, and patient data security. Despite the recent growth of telemedicine, data on its impact on obstetrics and gynecology are limited. However, studies indicate that telemedicine in prenatal care and family planning can achieve outcomes similar to in-person care.<sup>3-5</sup>

One deficiency in the current body of research is the lack of studies on telemedicine use in gynecological surgery. An Ontario-based survey found that 74.5% of participating primary care physicians and nurses reported satisfaction with virtual visits, and 88% found they easily integrated into their usual workflow.<sup>6</sup> In terms of gynecological surgery, one trial found no difference in patient satisfaction, complication rates, or follow-up visits.<sup>7</sup> Siedhoff et al. affirm that telemedicine offers benefits for patients, clinicians, and health systems, an understanding that has been emphasized during the COVID-19 pandemic. These authors suggest that for telemedicine to grow further, permanent changes in policy concerning physician accreditation, licensing, and billing are needed.<sup>8</sup>

This study will focus on the patient's viewpoint in the perioperative care of gynecological surgery. It aims to tailor telemedical services to patients' needs in perioperative gynecological care. The assumption is that certain factors may affect the acceptance of telemedicine. Specifically, we hypothesize that an increase in various independent variables may be negatively correlated with the acceptance of telemedicine use.

## Materials and methods

### Recruitment

Between May and November 2022, we conducted an exploratory study in the outpatient ward of the University Women's Hospital Tübingen, Germany. Self-report physical questionnaires were given to patients who came for preoperative consultations for gynecological surgery between May and November 2022, which were then collected before their discharge. During this period, 735 women were queried about their past use of internet-based services, basic personal information, and their attitudes toward telemedicine services. By completing the questionnaire after being informed by a doctor, written consent to participate was obtained.

The study included all women who visited the relevant outpatient clinic during this period for a consultation related to preparing for inpatient or outpatient surgery or for other reasons. Questionnaires that were returned blank were excluded from the study. There were no exclusions, and even partially completed questionnaires were considered. Participation was entirely anonymous and voluntary.

Before the study commenced, an approved vote (544/2021BO2) from the University of Tübingen's ethics committee was obtained.

### Statistical analysis

Data archiving and processing were carried out using RedCap (V 9.8.5) and Microsoft Excel (Office 2019). Statistical analysis was conducted via DATAtab.de. For descriptive statistics of the study population, we presented relative or absolute frequency distributions for ordinal scale data. Meanwhile, we calculated mean values, standard deviation, and maximum and minimum values for rational scale data. We employed binary logistic regression analysis to examine possible factors affecting gynecological patients' consent to use perioperative telemedicine services. We set the significance level at  $p \leq 0.05$ .

## Results

### Study population

The study comprised 735 patients. Out of these, around half (365 or 49.66%) came for outpatient surgery preparation, while 43.81% (322 patients) were there for inpatient surgery prep. A small percentage of patients (5.31% or 39 patients) did not specify their reason, 0.95% (seven patients) were there for a consulting appointment, and a negligible 0.27% (two patients) had other reasons.

Most patients (35.65% or 262 patients) suggested a likely benign diagnosis, whereas 12.24% (90 patients) confirmed their condition as benign. There were also patients who reported either a confirmed (11.7% or 86 patients) or likely (5.99% or 44 patients) malignant condition. A significant percentage (19.32% or 142 patients) selected "other" while the remaining 14.97% (110 patients) did not respond.

The patients' average age was 46.3 years, with the oldest at 88 and the youngest at 12. The standard deviation in age was  $\pm 15.8$  years.

### Descriptive evaluation

The descriptive assessment recorded employment status, computer literacy, and travel effort to the clinic (Table 1). It also noted prior experience with computer and internet usage and the distance from home to the clinic (Table 2).

### Questions about telemedicine

The preferences and objections regarding telemedicine were recorded as shown in Table 3.

Participants were asked to rate the following three provided statements using a 6-point scale, with 1 indicating

**Table 1.** Table notes the descriptive evaluation of the patient population.

Descriptive evaluation	Frequency	%
Total	735	100
Occupational status		
Pensioner/retired	109	14.83
Housewife	62	8.44
Pupil/student	45	6.12
Unemployed	25	3.4
Other (including no statement)	404	54.97
Current employment		
Full-time basis	249	33.88
Part-time	241	32.79
Not gainfully employed	194	26.39
No statement	51	6.94
Own computer skills		
Professional skills	60	8.16
Advanced skills	316	42.99
Lay skills	172	23.4
Beginner skills	54	7.35
No statement	131	17.82
The journey to the clinic was found		
Not at all stressful	259	35.24
Somewhat not stressful	246	33.47
Somewhat stressful	136	18.5
Very stressful	20	2.72
No statement	73	9.93

strong agreement and 6 indicating strong disagreement. For simplicity, ratings of 1–3 were grouped as agreement and 4–6 as disagreement.

For the statement “Telemedicine services improve medical care in Germany,” 62.04% ( $n = 456$ ) of participants agreed, 18.37% ( $n = 135$ ) disagreed, and 19.59% ( $n = 144$ )

**Table 2.** Table notes the descriptive evaluation of the patient population.

	Valid statements	Mean value standard deviation (SD)
The length of time (in years) that patients had been using a computer or	551 (74.97%)	19.78 years SD = ±8.18 years
The length of time (in years) that patients had been using the internet	532 (72.38%)	16.45 years SD = ±6.54 years
Travel distance to the clinic	646 (87.89%)	47.13 km SD = ± 59.48 km

**Table 3.** Preferences and objections regarding telemedicine.

Questions about telemedicine	Frequency	%
Preferred form of communication		
Phone	116	15.78
App (via a smartphone or tablet)	190	25.85
Via the internet/web browser	245	33.33
E-mail	208	28.3
SMS	30	4.08
Other	24	3.27
No statement	78	10.61
Agreement to such a mode of communication		
Yes, completely	135	18.37
Somewhat yes	321	43.67
Somewhat not	154	20.95
Not at all	44	5.99
No statement	81	11.02
Reasons for a possible rejection of telemedical forms of communication (multiple answers were possible here)		
No indication	483	65.71
Other	87	11.84
I am concerned about unauthorised persons gaining access to my data	86	11.7
I have never used the appropriate technology before	57	7.76
I feel uncomfortable using technology	40	5.44
I do not have internet access	27	3.67
I have basic problems using technical devices	21	2.86
I currently feel too much of a burden due to my illness	12	1.63
I am worried about damaging the device	2	0.27

(continued)

**Table 3.** Continued.

Questions about telemedicine	Frequency	%
My health is too limited to use the devices (e.g., impaired vision, paralysis, etc.)	0	0
Data protection concerns regarding telemedicine applications		
No concerns at all	129	17.55
Few concerns	285	38.78
Somewhat concerned	150	20.41
Very concerned	50	6.8
No statement	121	16.46
Evaluation of the offer of a video-based internet consultation		
Very positive	63	8.57
Positive	280	38.1
Negative	160	21.77
Very negative	57	7.76
No statement	174	23.67

abstained. The next statement was “Telemedicine services could improve the medical care of gynecological patients in Germany.” Among the respondents, 56.19% ( $n = 413$ ) agreed, 23.27% ( $n = 171$ ) disagreed, and 20.54% ( $n = 151$ ) abstained. For the final statement, “Telemedicine services can improve one’s own medical care,” 51.84% ( $n = 381$ ) of participants agreed, 27.21% ( $n = 200$ ) disagreed, and 20.95% ( $n = 154$ ) abstained.

The participants were asked to evaluate the adequacy of a video-based internet consultation compared with an in-person hospital consultation. Of these, 33.06% (243 participants) rated the internet consultation as less suitable, scoring it 1–2 on a scale of 1–5, while 11.35% (87 participants) scored it 5–6, indicating a higher suitability. Additionally, 27.48% (202 participants) made no statement, and 27.62% (203 participants) were neutral, scoring it 3. Concerning effort, 19.59% (144 participants) found the internet consultation more taxing than in-person, rating it 1–2. On the other hand, 30.34% (223 participants) either gave no response or expressed no preference, and 16.87% (124 participants) perceived no difference between both services. Lastly, 33.2% (244 participants) found the internet consultation less demanding, scoring it 4–5.

**Table 4.** Correlations between patient-related factors and the general agreement of the patients to perioperative telemedical offers.

	Coefficient <i>B</i>	Standard error	<i>z</i>	<i>p</i>	Odds ratio	95% confidence interval
Age	0.01	0.01	1.05	0.293	1.01	0.99–1.03
Daily actual health (EQ VAS).	0.01	0.01	0.88	0.381	1.01	0.99–1.02
Years of internet use	−0.02	0.03	0.82	0.412	0.98	0.92–1.03
Years of computer use	−0.01	0.02	0.34	0.732	0.99	0.95–1.04
Distance in km	0	0	0.18	0.855	1	1–1
Not at all stressful	0.25	0.28	0.87	0.382	1.28	0.73–2.24
More burdensome	0.48	0.31	1.56	0.12	1.62	0.88–2.97
Economically inactive	−0.08	0.29	0.29	0.773	0.92	0.52–1.63
Dignity of disease						
Benign	0.07	0.3	0.22	0.826	1.07	0.59–1.92
Other	0.34	0.35	0.98	0.327	1.41	0.71–2.79
Higher computer skills	−0.17	0.27	0.64	0.525	0.84	0.5–1.42
Data protection concerns						
More concerns	1.45	0.32	4.61	<0.001	4.28	2.3–7.93
Few reservations	0.08	0.31	0.27	0.791	1.09	0.59–2.01
Interventional procedure	−0.04	0.27	0.16	0.871	0.96	0.57–1.62
Previous treatment Satisfaction						
Very	0.43	0.43	1.01	0.314	1.54	0.66–3.57
Yes	0.67	0.44	1.51	0.132	1.95	0.82–4.64
Surrounding atmosphere						
Very	0.33	0.33	1.01	0.315	1.39	0.73–2.62
Yes	−0.06	0.36	0.18	0.86	0.94	0.46–1.9
Referral path to the Clinic						
Medical	0.08	0.26	0.31	0.755	1.08	0.66–1.79
Highest general school Qualification						
A-level	0.25	0.61	0.4	0.687	1.28	0.38–4.27
	0.4	0.62	0.64	0.522	1.49	0.44–5.04

(continued)

Table 4. Continued.

	Coefficient <i>B</i>	Standard error	<i>z</i>	<i>p</i>	Odds ratio	95% confidence interval
Secondary school Leaving certificate or Similar qualification						
Advanced technical College entrance Qualification	0.08	0.65	0.12	0.902	1.08	0.3-3.88
Lower degree	0.65	0.66	0.98	0.326	1.92	0.52-7.07
Constant	-3.04	1.01	3	0.003		

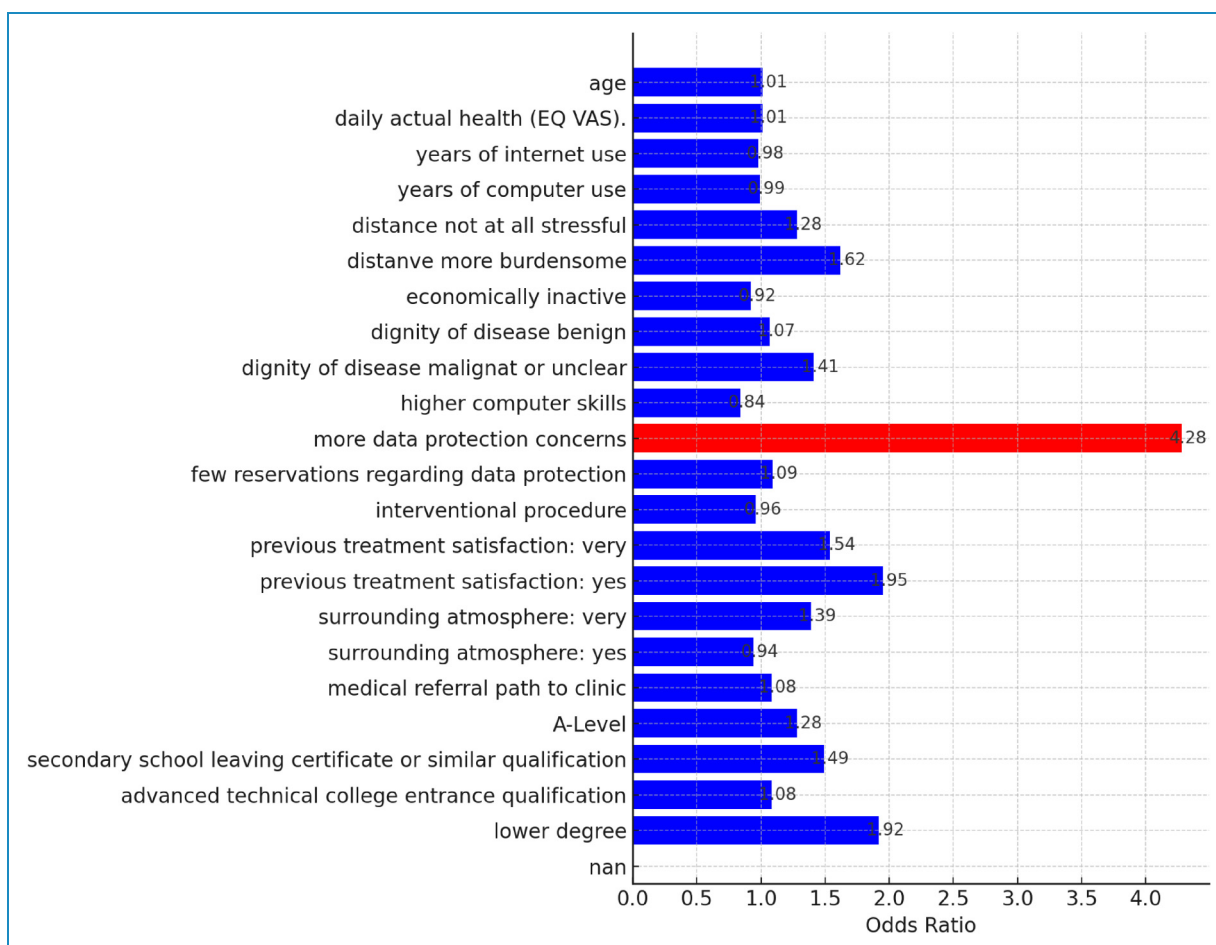


Figure 1. Correlations between patient-related factors and the general agreement of the patients to perioperative telemedical offers.

Out of 180 patients, 24.49% rated their online consultation as more challenging than an in-person hospital visit. Meanwhile, 20.14% (148 respondents) viewed the online consultation as less difficult, selecting a rating of 4 or 5. Similarly, 24.35% (179 respondents) saw no difference between the two, opting for a rating of 3. However, 31.02% (228 respondents) did not provide any feedback.

The patients were asked if their readiness to use telemedicine had risen during the COVID-19 pandemic. Out of those surveyed, 314 (42.72%) leaned toward “yes,” while 78 (10.61%) said a firm “yes.” However, 152 (20.68%) responded with a tendency toward “no” or a definite “no” (75; 10.2%), and 116 (15.78%) made no response.

### Correlations between patient-related factors and the general agreement of the patients to perioperative telemedical offers

A binary logistic regression analysis was executed to discern possible connections between patient-associated factors and their general acceptance of perioperative telemedical offerings in the gynecological preparatory consultation outpatient clinic (Table 4; Figure 1). The fundamental patient acceptance of telemedical communication modes was chosen as the dependent variable. Ratings of “rather yes” and “yes, completely” were considered acceptance ( $n = 456$ ; 62.04%), while “rather not” and “not at all” indicated rejection ( $n = 198$ ; 26.94%). We probed the influence of different independent variables on the dependent variable and calculated the likelihood of rejection. The study included independent metric variables like patient age, internet and computer usage length, daily health assessed by EuroQol-visual analogue scales (EQ VAS), and the distance traveled to the clinic in kilometers. The independent nominal or ordinal variables integrated into the analysis were gainful employment, the dignity of the disease, self-assessed computer skills, data protection concerns, the perceived burden of the journey to the clinic, the nature of the planned intervention, the treatment satisfaction to date, the importance of the surrounding atmosphere as assessed by the patients in the discussion with the doctor, the referral pathway to the clinic, and the highest general school leaving certificate.

The logistic regression analysis indicates that the overall model is significant, with a  $\chi^2$  value of 59.4 and a  $p$ -value less than 0.001, based on a sample of 445 subjects. Positive regression coefficient  $B$  was found for the age variable, indicating a 1% increase in the likelihood of rejection with each advancing year; however, this result was not statistically significant ( $b = 0.01$ , odds ratio [OR] = 1.01,  $p = 0.293$ ). Likewise, patient self-assessments of current health via the EQ VAS also returned the same coefficient  $B$  and OR, but again, these findings were not statistically significant ( $b = 0.01$ , OR = 1.01,  $p = 0.381$ ).

Both the variables, “years of internet use” and “years of computer use,” demonstrated a negative coefficient  $B$  ( $b = -0.02$  and  $b = -0.01$ , respectively), with an OR of 0.98 and 0.99, respectively. This implies that as the duration of internet/computer use increases, the likelihood of the dependent variable, rejection, decreases by 2% and 1%, correspondingly. However, this influence did not prove to be significant ( $p = 0.412$ ;  $p = 0.732$ ). The factor of travel distance in kilometers did not affect the possibility of rejecting telemedical communication (OR = 1;  $p = 0.855$ ).

The categories “full-time employment” and “part-time employment” were merged into “employed” since the exact nature of employment did not impact the study. Results showed a negative coefficient  $B$  ( $b = -0.08$ ) for “unemployed” with an OR = 0.92, indicating a decrease

in rejection probability of the dependent variable by 8% compared with the “employed.” However, this was not significant ( $p = 0.92$ ).

The study also examined how the severity of the patient’s disease impacted their acceptance of telemedicine tools. To account for a broad range of responses, we combined the categories into “benign” (including “probably benign” and “definitely benign”) and “malignant” (including “probably malignant” and “definitely malignant”). The “other” category was not included as it could not be assigned categorically and represented over 10% of the patients.

In the “benign” category, there was a positive coefficient  $B$  of  $b = 0.07$  (OR = 1.07). This suggests that patients with a “benign” status were 7% more likely to reject telemedicine compared with those with a “malignant” status, although this finding was not significant ( $p = 0.826$ ). The “other” category did not significantly impact rejection rates in the analysis ( $p = 0.327$ ;  $b = 0.34$ ; OR = 1.41).

The variable “computer skills” was categorized into two groups: “higher skills” (encompassing “professional skills” and “advanced skills”) and “lower skills” (including “beginner” and “layman skills”). Negative coefficient  $B$  ( $b = -0.17$ ; OR = 0.84) indicated that the likelihood of rejection, the dependent variable, is 16% less in comparison with the baseline “lower skills.” The significance level  $\alpha = 0.05$  was surpassed ( $p = 0.525$ ).

Next, we evaluated data protection concerns as potential influences on the acceptance of telemedicine offers. The categories “rather concerned” and “very strong concerns” were grouped as “more concerns.” The variable “few concerns” ( $b = 0.08$ ; OR = 1.09) proved insignificant ( $p = 0.791$ ). However, “more concerns” was significant ( $p < 0.001$ ) with a regression coefficient  $B$  of  $b = 1.45$  and an OR = 4.28. This implies that “more concerns” is 4.28 times more likely to be rejected compared to “no concerns at all.”

A logistic regression subanalysis was undertaken to explore the preferred contact type’s impact on patients with extreme concerns over their personal data protection via telemedicine. The logistic regression analysis indicated that the model as a whole is not significant ( $\chi^2(7) = 13.17$ ,  $p = 0.068$ ,  $n = 735$ ). Various preferred contact methods such as phone ( $p = 0.198$ , OR = 0.6), app (via a smartphone or tablet) ( $p = 0.456$ , OR = 1.37), e-mail ( $p = 0.105$ ; OR = 0.53), SMS ( $p = 0.521$ , OR = 0.51), and other ( $p = 0.777$ , OR = 1.22), each showed no statistical significance. However, a significance was observed for patients who chose the internet/web browser as their preferred contact for telemedicine ( $p = 0.005$ , OR = 3.49).

The planned intervention’s wide-ranging frequency distribution led to the categories “uterus endoscopy” and “laparoscopy” being grouped into a single “diagnostic” variable. Due to the large number of instances ( $n = 111$ ), the “other” category was maintained. All remaining options were included under the “interventional” variable. For the “interventional” variable, a negative coefficient  $B$

( $b = -0.04$ ; OR = 0.96) meant that the refusal possibility was reduced by 4%. This effect was not significant ( $p = 0.871$ ), similar to the “other” category ( $b = -0.14$ ; OR = 0.87;  $p = 0.692$ ).

We examined the impact of previous treatment satisfaction on the approval of telemedical services. We consolidated the categories “rather not” ( $n = 15$ ) and “not at all” ( $n = 5$ ) into a “less” category due to low case numbers. A positive regression coefficient  $B$  was found for the “very” satisfied category ( $b = 0.43$ ; OR = 1.54) and for the “rather yes” category ( $b = 0.67$ ; OR = 1.95). This implies that the likelihood of disapproval for the dependent variable enhanced by 54% and 95%, respectively, compared with the “less” category. However, these findings were not statistically significant ( $p = 0.314$ ;  $p = 0.132$ ).

The categories “rather not” and “not at all” for the variable representing the perceived significance of a doctor’s office environment were merged to form a “less” category. The variable “very” yielded a positive regression coefficient  $B$  of  $b = 0.33$  (OR = 1.39), while “rather yes” resulted in a negative coefficient  $B$  ( $b = -0.06$ ; OR = 0.94). This implies a 39% increase in the likelihood of the dependent variable being rejection for “very” and a 6% decrease for “rather yes,” relative to “less.” However, these findings lacked statistical significance ( $p = 0.315$ ;  $p = 0.86$ ).

Furthermore, the means by which patients were referred to the clinic were categorized as “medical” (referrals by a general practitioner or gynecologist) and “self” (deciding to seek treatment at this particular university clinic). The data demonstrated an 8% increased likelihood of rejection for medical referrals ( $b = 0.08$ ; OR = 1.08), but this correlation was not statistically significant ( $p = 0.755$ ).

In the final step, we determined the likelihood of telemedical communication tools’ rejection in relation to the respondents’ highest level of education.

We found a positive regression coefficient  $B$  for both A levels ( $b = 0.25$ ; OR = 1.28;  $p = 0.687$ ) and general certificate of secondary education (GCSEs) or similar qualifications ( $b = 0.4$ ; OR = 1.49;  $p = 0.522$ ), additional education qualifications ( $b = 0.08$ ; OR = 1.08;  $p = 0.902$ ), and basic school graduation ( $b = 0.65$ ; OR = 1.92;  $p = 0.326$ ). The basic school graduation category included the values “elementary or secondary school leaving certificate” and “school completed without academic qualification.” The “other” variable remained as a constant. However, as noted, none of these correlations reached statistical significance.

## Discussion

The acceptance of telemedical services hinges significantly on trust in the provider, as demonstrated by this study. The analysis was based on a patient’s initial interaction with the surgeon, which included the examination, consultation, confirmation of the indication by the referring physician, and the patient’s consent to the procedure.

A meta-analysis of 44 related articles revealed that effectiveness and efficiency were prime factors contributing to patient satisfaction with telehealth. These factors made up 61% of all mentions and included improved outcome (20%), preferred delivery method (10%), ease of use (9%), lower cost (8%), enhanced communication (8%), and decreased travel time (7%).<sup>9</sup> However, given a choice, patients generally favor an in-person over a virtual appointment.<sup>10</sup>

In our study, 29.53% (or 217 patients) were mostly negative about the video-based online consultation offer. These reservations toward telemedicine stem from technical concerns (e.g., unfamiliarity with technology and lack of internet access) and data security worries. Other studies corroborate these findings.<sup>11–15</sup>

Age, computer literacy, travel distance, employment and education status, disease severity, previous treatment satisfaction, environment, and referral path were also factored into the analysis. Nonetheless, high data security concerns were the only statistically significant variable linked to telemedicine approval rates.

Positive aspects of telemedicine, such as time-saved traveling, leading to enhanced cost-effectiveness and ecological sustainability, are underlined in numerous studies.<sup>16,17</sup> However, from a patient’s viewpoint, such benefits are less critical than data security concerns. Addressing these concerns requires transparency and informed consent.<sup>18</sup>

This study emphasizes the need to create protective guidelines around mHealth apps, in spite of their complexity.<sup>19–21</sup> While previous studies have addressed data security from a provider’s perspective, our study spotlights patient concerns.<sup>18–20</sup> The data intimate that not only do patients worry about data security, but they also trust telephone service over video consultation.

On reflecting on these findings, data security concerns seem more prevalent in certain regions and demographics rather than being dependent universally on factors such as education, computer experience, and age. This study also shows that patient concerns over data security significantly affect telemedicine compliance. Future studies, therefore, should further investigate what data security signifies to patients and how to appease their concerns.

## Limitations of this study

The questionnaire used here was created specifically for this study, as no validated questionnaires were available to explore the questions.

The study results only pertain to patients who were both linguistically and cognitively capable and willing to participate due to the inability to record blank or nonreturned questionnaires while maintaining anonymity. When applying these findings to other disciplines, consider that the study population is gender specific.



## Conclusion

Gynecological patients are generally open to telemedicine approaches, especially after the COVID-19 pandemic. However, various factors influence this openness in patients undergoing gynecological surgery. These include patient age, computer skills, travel length, occupation, education level, the severity of illness, past treatment satisfaction, environmental ambiance, and referral process. Of these, only concerns over data security showed statistical significance. Thus, considering data security is crucial when designing telehealth services as it can impact service compliance and effectiveness. Future studies should further explore patients' data protection concerns and how they might be addressed.

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**Data availability:** Researchers interested in accessing the data used for this study can submit a Data Use Agreement (DUA) to the corresponding author.

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