

The Impact of Transition of Paper-Based Consent Forms to Digital Format on Dental Healthcare Efficiency

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ABSTRACT

Objective: To evaluate the perceptions and attitudes of patients of different ages and education levels regarding the transition of paper-based consent forms to digital format.

Methods: Ninety-four patients were divided into three groups according to their age range (18–39, 40–59, over 60) as well as education level (primary/secondary school, high school, university). Participants were administered a digital consent form along with an online questionnaire aimed at determining perceptions and attitudes of patients towards paper-based and digital consent. Demographic data was analyzed using descriptive statistics. Pearson's Chi-Square test was used to compare the answer rates between patient groups categorized according to age ranges and educational levels ($p=.05$).

Results: 79.8% and 90.4% of participants reported that converting paper-based consent forms to digital format would be more advantageous for the workflow of healthcare services and in terms of functionality and usability, respectively. The proportion of participants stating they had sufficient knowledge about informed consent was higher in the university graduate group ($p<.05$). While 47.8% of the primary and/or secondary school graduates and 48.2% of high school graduates preferred written consent, 34.1% of the university graduate group was in favor of digital consent ($p<.05$). No other differences were obtained among patient groups regarding answers given to the questionnaire ($p>.05$).

Conclusion: Digital consent may provide advantages for the workflow and efficiency of healthcare services and the quality of consent process. However, using digital forms as a part of in-person dentist-patient communication may be more favorable in obtaining trust-based patient consent.

Keywords: Informed consent; digital conversion; digital consent; healthcare efficiency

1. INTRODUCTION

The physician-patient relationship creates a trust-based communication within the framework of certain ethical principles that impose obligations and responsibilities on both parties. Accordingly, it becomes mandatory to obtain patient consent to ensure the legality of any medical intervention. However, in contemporary practice, "consent" alone does not suffice enough to make medical interventions legal, and therefore the term informed consent begins to acquire increasing significance (1,2). In the medical and dental fields, informed consent refers to the process where, firstly, the physician informs the patient about the diagnosis and treatment options, alternative treatment methods, and the potential outcomes of accepting or rejecting relevant treatments, and secondly, the patient accepts or rejects the proposed treatment with his/her free will. In addition to

its significance regarding the legal liabilities of physicians, informed consent also poses great importance in terms of patient rights and clarifies the medical, ethical, and legal aspects of the dentist-patient relationship (2,3).

Within the scope of daily dentistry practice, informed consent is obtained before numerous dental procedures (1), and paper-based consent forms are used for this purpose in many institutions. However, the implementation of paper-based consent forms poses several challenges such as slowing down the workflow, loss of time spared for diagnosis and treatment and a series of costly manual processes including duplication, supervision, and storage of the forms (4-7). These problems become more prevalent especially in university hospitals where patient circulation is usually more evident than in other health institutions. Therefore, the transition of paper consent forms

to digital format becomes imperative to save time for both the patient and the physician, increase the efficiency of healthcare services, and secure the storage of patient information.

Digitalization of consent forms is also necessary to align with the evolving landscape of digital dentistry practices. Due to global COVID-19 and the disruption of routine healthcare services, digitalization studies in dentistry have begun to focus especially on the field of diagnosis, and accordingly, new terms and concepts such as telemedicine and teledentistry have gained importance (8-10). Teledentistry can be defined as facilitating diagnosis and treatment planning procedures through intraoral photographs and communication technologies, and marks a significant step in the digitalization of diagnostic processes (10). However, despite these digitalization initiatives, it is noteworthy that the impact of digital consent forms on the efficiency of dental healthcare services has not been previously investigated.

Therefore, the aim of this study was to evaluate the perceptions and attitudes of patients of different age groups and education levels regarding paper-based consent forms and their transition to digital format, and to point out the possible disadvantages of paper consent in terms of dental healthcare efficiency.

2. METHODS

2.1. Ethical Approval

The present study was approved by the Scientific Research and Publication Ethics Board of the university (approval date: 31.01.2023, approval number: 1805) and followed the principles of the Declaration of Helsinki.

2.2. Study Group

Patients who applied to the Department of Oral and Maxillofacial Radiology between March and April 2023 were invited to participate in the study. The sample size of the study group was determined based on similar previous studies conducted in the medical field (11,12). Accordingly, the effect size was selected as $w = 0.44$, the degree of freedom as 3 and the confidence interval as 95%. As a result of the power analysis conducted with G*Power 3.1 software, the total sample size required for the present study was calculated to be approximately 89 patients. Participants who were over the age of 18, were able to communicate one-on-one without a companion, and had enough cognitive level to fill out the digital consent form were included. Care was taken to ensure that the number of included patients were homogeneously distributed in the age ranges of 18-39 years, 40-59 years and over 60 years in order to represent individuals from all age groups.

2.3. Preparation of the Questionnaire

The questionnaire was prepared after scanning similar studies in the literature held in the field of medicine (11-13).

The questions used in the study were determined by two oral and maxillofacial radiologists (ES, EA) with different years of experience (20 years, 3 years). The questionnaire consisted of a total of two sections and eighteen questions. The first part included 3 questions regarding the demographic characteristics (gender, age, education level) of the participants. The second part consisted of 15 questions aimed at determining patients' attitudes, perceptions and trust levels towards digital informed consent forms. The questionnaire was first administered to a pilot group of 20 patients in order to verify the reliability and comprehensibility of the questions. The survey was revised and updated in line with the suggestions and responses received regarding the structure and understandability of the questions.

2.4. Application of the Questionnaire

The paper-based informed consent form used in our dental hospital was converted to digital format and transferred to Metasoft patient database. Then, the digital consent form was administered to the patients who agreed to participate in the study and was signed by the participants using Techsign DOC Document Signing Platform (Techsign Information Technologies Inc., Istanbul, Türkiye) installed on an Android tablet. All digital consent forms were stored as electronic records in Metasoft database. Following the informed consent process, a questionnaire aimed at investigating the attitudes and perceptions of the patients towards paper-based and digital consent forms was applied to the participants by three 5th grade dental students (OK, MEK, AK).

2.5. Statistical Analysis

Data analysis was performed using the IBM SPSS Statistics 20.0 (SPSS Inc., Chicago, IL, USA).

Demographic data and the proportional distribution of the responses collected from each question in the second section were analyzed using descriptive statistical methods.

Pearson's Chi-Square test was used to compare the answer rates obtained from the second section of the questionnaire between patient groups aged 18–40 years, 40–60 years, and over 60 years as well as patient groups with different education levels (primary/secondary education, high school, university). For questions revealing a significant difference between patient groups of different age ranges or education levels, pairwise comparisons were performed using adjusting residual analysis (14,15). The statistical significance level was determined as $p < .05$ for all comparisons.

3. RESULTS

3.1. Demographic Characteristics

Among a total of 500 patients invited to participate in the study, 94 patients, 51 female and 43 male (mean age: 45.13 ± 18.37), agreed to be included.

Thirty-eight patients were between the ages of 18-39 (mean age: 25.55 ± 5.75), while 27 were between 40-59 years of age (mean age: 50.9 ± 6.53), and 29 patients were over the age of 60 (mean age: 67.08 ± 5.8).

According to the education levels of the participants, 23 patients were primary and/or secondary school graduates, while 27 patients were high school graduates. The remaining 44 patients were in the group of university graduates (Table 1).

Table 1. Demographic characteristics of the participants.

Demographic characteristic		N (%)	Mean Age ± SD
Gender	Female	51 (54.3)	
	Male	43 (45.7)	
Age	18-39	38 (40.4)	25.55 ± 5.75
	40-59	30 (31.9)	50.90 ± 6.53
	≥60	26 (27.7)	67.08 ± 5.8
Education Level	Primary & Secondary school	23 (24.5)	59.70 ± 9.14
	High school	27 (28.7)	40.52 ± 18.44
	University	44 (46.8)	40.34 ± 18.2

SD: Standard deviation

3.2. Overall Perceptions and Attitudes of Patients Towards Consent Forms

Overall perceptions and attitudes of the participants towards paper-based and digital informed consents are presented in Table 2.

Table 2. Overall perceptions and attitudes of patients towards paper-based and digital consent forms based on the answers obtained from the second section of the questionnaire.

Question	Obtained Answer
➤ Answers	n (%)
1. How do you rate your knowledge about informed consent?	
➤ Sufficient	80 (85.1)
➤ Partially Sufficient	9 (9.6)
➤ Insufficient	5 (5.3)
2. Is obtaining informed consent from patients necessary before a dental examination?	
➤ Yes	83 (88.3)
➤ No	7 (7.4)
➤ Not sure/I don't know	4 (4.3)
3. Is the informed consent requested from you before your dental examination sufficiently understandable?	
➤ Yes	84 (89.4)
➤ No	2 (2.1)
➤ Not sure/I don't know	8 (8.5)
4. How do you think informed consent should be obtained?	
➤ Written (Signed by both patient and dentist)	39 (41.5)
➤ Verbal	5 (5.3)
➤ Written and verbal	26 (27.7)
➤ Digital	24 (25.5)

5. Do you think paper-based consent forms in the healthcare services slow down the workflow?	
➤ Yes	23 (24.5)
➤ No	63 (67)
➤ Not sure/I don't know	8 (8.5)
6. Do you think paper-based consent forms reduce the time spared for diagnosis/treatment?	
➤ Yes	31 (33)
➤ No	53 (56.4)
➤ Not sure/I don't know	10 (10.6)
7. Are you uncomfortable sharing your personal data in the paper-based informed consent form?	
➤ Yes	15 (16)
➤ No	75 (79.8)
➤ Not sure/I don't know	4 (4.3)
8. Do you think transitioning paper-based consent forms to digital format would be advantageous for the workflow of healthcare services?	
➤ Yes	75 (79.8)
➤ No	10 (10.6)
➤ Not sure/I don't know	9 (9.6)
9. Do you consider transitioning paper-based consent forms to digital format would positively contribute to the environment by reducing paper and pen waste?	
➤ Yes	86 (91.5)
➤ No	4 (4.3)
➤ Not sure/I don't know	4 (4.3)
10. Do you think transitioning paper-based consent forms to digital format would be advantageous in terms of environmental sustainability and saving resources?	
➤ Yes	87 (92.6)
➤ No	2 (2.1)
➤ Not sure/I don't know	5 (5.3)
11. Do you think transitioning paper-based consent forms to digital format would provide more advantages in terms of functionality and usability?	
➤ Yes	85 (90.4)
➤ No	7 (7.4)
➤ Not sure/I don't know	2 (2.1)
10. Which one do you find safer for the personal data you declared in the consent form to be stored: paper-based or digital format?	
➤ Paper-based	19 (20.2)
➤ Digital	67 (71.3)
➤ Not sure/I don't know	8 (8.5)
11. Which do you find more valid/reliable for your official transactions, wet-ink or digital signature?	
➤ Wet-ink signature	55 (58.5)
➤ Digital signature	29 (30.9)
➤ Not sure/I don't know	10 (10.6)
14. Would you prefer smart tablets over paper in the informed consent procedure?	
➤ Yes	81 (86.2)
➤ No	8 (8.5)
➤ Not sure/I don't know	5 (5.3)
15. Would you prefer using smart pens and keyboards over normal pens in the informed consent procedure?	
➤ Yes	79 (84)
➤ No	10 (10.6)
➤ Not sure/I don't know	5 (5.3)

88.3% (n=83) of the patients reported that obtaining informed consent was necessary before a dental examination. While 79.8% (n=75) noted that transitioning paper-based consent forms to digital format would be more advantageous for the workflow of healthcare services, 71.3% (n=67) preferred digital consent form as a safer storage format to keep their personal data.

86.2% (n=81) and 84% (n=79) of the participants declared that they preferred smart tablets and smart pens or keyboards in the informed consent procedure, respectively. On the other hand, while 41.5% (n=39) of the participants preferred written consent, 25.5% (n=24) were in favor of obtaining digital consent.

3.3. Comparison of Patient Groups Categorized by Age

Proportions and comparisons of answers regarding the perception, attitude and trust levels of the patient groups

aged 18-39, 40-59 and over 60 towards paper-based and digital informed consent are summarized in Tables 3 and 4.

94.7% (n=36) of patients aged 18–39, 88.9% (n=24) of patients aged 40–59 and 79.3% (n=23) of patients aged over 60 noted that informed consent should be obtained before dental examinations. On the other hand, the proportion of patients who declared they had sufficient knowledge about informed consent and found the informed consent adequately understandable was higher in the 18-39 age group (89.5%, n=34) (p>.05).

84.2% (n=32) of the 18–39 group, 81.5% (n=22) of the 40–59 group, and 72.4% (n=21) of the over 60 group declared that transitioning paper-based consent forms to digital format would be more advantageous for the workflow of healthcare services. However, the ratio of patients noting that paper-based consent forms slow down the workflow in the healthcare services and reduce the diagnosis/treatment time was higher in the 40-59 age group (33.3%, n=9) (p>.05).

Table 3. Comparison of perceptions and attitudes of three patient groups aged 18–40 years, 40–60 years, and over 60 years towards paper-based informed consent.

Question	18-39	40-59	Over 60	p value*
➤ Answers	n (%)	n (%)	n (%)	
How do you rate your knowledge about informed consent?				.395
➤ Sufficient	34 (89.5)	22 (81.5)	24 (82.8)	
➤ Partially Sufficient	4 (10.5)	3 (11.1)	2 (6.9)	
➤ Insufficient	0 (-)	2 (7.4)	3 (10.3)	
Is obtaining informed consent from patients necessary before a dental examination?				.416
➤ Yes	36 (94.7)	24 (88.9)	23 (79.3)	
➤ No	1 (2.6)	2 (7.4)	4 (13.8)	
➤ Not sure/I don't know	1 (2.6)	1 (3.7)	2 (6.9)	
Is the informed consent requested from you before your dental examination sufficiently understandable?				.194
➤ Yes	36 (94.7)	22 (81.5)	26 (89.7)	
➤ No	0 (-)	2 (7.4)	0 (-)	
➤ Not sure/I don't know	2 (5.3)	3 (11.1)	3 (10.3)	
How do you think informed consent should be obtained?				.14
➤ Written (Signed by both patient and dentist)	14 (36.8)	11 (40.7)	14 (48.3)	
➤ Verbal	1 (2.6)	4 (14.8)	0 (-)	
➤ Written and verbal	12 (31.6)	8 (29.6)	6 (20.7)	
➤ Digital	11 (28.9)	4 (14.8)	9 (31)	
Do you think paper-based consent forms in the healthcare services slow down the workflow?				.683
➤ Yes	8 (21.1)	9 (33.3)	6 (20.7)	
➤ No	27 (71.1)	15 (55.6)	21 (72.4)	
➤ Not sure/I don't know	3 (7.89)	3 (11.1)	2 (6.9)	
Do you think paper-based consent forms reduce the time spared for diagnosis/treatment?				.766
➤ Yes	11 (28.9)	11 (40.7)	9 (31)	
➤ No	22 (57.9)	13 (48.2)	18 (62.1)	
➤ Not sure/I don't know	5 (13.2)	3 (11.1)	2 (6.9)	
Are you uncomfortable sharing your personal data in the paper-based informed consent form?				.328
➤ Yes	4 (10.5)	4 (14.8)	7 (24.1)	
➤ No	31 (81.6)	23 (85.2)	21 (72.4)	
➤ Not sure/I don't know	3 (7.89)	0 (-)	1 (3.4)	

*Pearson's Chi-Square test

Table 4. Comparison of perceptions, attitudes and trust levels of three patient groups aged 18–40 years, 40–60 years, and over 60 years towards digital informed consent.

Question	18-39	40-59	Over 60	p value*
➤ Answers	n (%)	n (%)	n (%)	
Do you think transitioning paper-based consent forms to digital format would be more advantageous for the workflow of healthcare services?				
➤ Yes	32 (84.2)	22 (81.5)	21 (72.4)	.423
➤ No	3 (7.89)	4 (14.8)	3 (10.3)	
➤ Not sure/I don't know	3 (7.89)	1 (3.7)	5 (17.2)	
Do you consider transitioning paper-based consent forms to digital format would positively contribute to the environment by reducing paper and pen waste?				
➤ Yes	35 (92.1)	25 (92.6)	26 (89.7)	.925
➤ No	1 (2.6)	1 (3.7)	2 (6.9)	
➤ Not sure/I don't know	2 (5.3)	1 (3.7)	1 (3.4)	
Do you think transitioning paper-based consent forms to digital format would be advantageous in terms of environmental sustainability and saving resources?				
➤ Yes	36 (94.7)	24 (88.9)	27 (93.1)	.752
➤ No	1 (2.6)	1 (3.7)	0 (-)	
➤ Not sure/I don't know	1 (2.6)	2 (7.4)	2 (6.9)	
Do you think transitioning paper-based consent forms to digital format would provide more advantages in terms of functionality and usability?				
➤ Yes	36 (94.7)	25 (92.6)	24 (82.8)	.421
➤ No	1 (2.6)	2 (7.4)	4 (13.8)	
➤ Not sure/I don't know	1 (2.6)	0 (-)	1 (3.4)	
Which one do you find safer for the personal data you declared in the consent form to be stored: paper-based or digital format?				
➤ Paper-based	10 (26.3)	3 (11.1)	6 (20.7)	.452
➤ Digital	24 (63.2)	21 (77.8)	22 (75.9)	
➤ Not sure/I don't know	4 (10.5)	3 (11.1)	1 (3.4)	
Which do you find more valid/reliable for your official transactions, wet-ink or digital signature?				
➤ Wet-ink signature	17 (44.7)	18 (66.7)	20 (69)	.255
➤ Digital signature	16 (42.1)	6 (22.2)	7 (24.1)	
➤ Not sure/I don't know	5 (13.2)	3 (11.1)	2 (6.9)	
Would you prefer smart tablets over paper in the informed consent procedure?				
➤ Yes	35 (92.1)	22 (81.5)	24 (82.8)	.496
➤ No	1 (2.6)	3 (11.1)	4 (13.8)	
➤ Not sure/I don't know	2 (5.3)	2 (7.4)	1 (3.4)	
Would you prefer using smart pens and keyboards over normal pens in the informed consent procedure?				
➤ Yes	36 (94.7)	21 (77.8)	22 (75.9)	.482
➤ No	1 (2.6)	2 (7.4)	7 (24.1)	
➤ Not sure/I don't know	1 (2.6)	4 (14.8)	0 (-)	

*Pearson's Chi-Square test

While 69% (n=20) of patients aged over 60 preferred wet-ink signature for their official transactions, the rate of patients who preferred smart tablets and pens over paper and normal pens during the informed consent process was higher in the group of 18–39 (92.1%, n=35; 94.7%, n=36) ($p > .05$).

Comparison of response rates obtained from the second section of the questionnaire revealed no significant difference between patient groups of different ages ($p > .05$) (Tables 3 and 4).

3.4. Comparison of Patient Groups Categorized by Education Level

Proportions and comparisons of responses obtained from the patient groups graduated from primary and/or secondary school, high school and university are given in Tables 5 and 6.

According to Table 5, the ratio of patients with sufficient knowledge about informed consent forms was lower in primary and/or secondary school graduates (65.2%, n=15) and higher in university graduates (93.2%, n=41) ($p < .05$).

While 47.8% of primary and/or secondary school graduates and 48.2% of high school graduates reported that they preferred written consent, the proportion of patients who was in favor of digital consent was higher in the university graduate group. The ratio of patients preferring verbal consent was higher in the primary and/or secondary school graduates (17.4%, n=4)

($p < .05$). The pairwise comparisons of three patient groups disclosed no other significant difference ($p > .05$).

None of the other responses obtained from the second section of the questionnaire revealed any difference between patient groups of different levels of education ($p > .05$).

Table 5. Comparison of perceptions and attitudes towards paper-based informed consent in three patient groups categorized according to their education levels.

Question Answers	Primary & Secondary n (%)	High School n (%)	University n (%)	p value*
How do you rate your knowledge about informed consent?				
Sufficient	15 (65.2) ($p = .002$)**	24 (88.9) ($p = .513$)	41 (93.2) ($p = .039$)**	.013
Partially Sufficient	4 (17.4) ($p = .143$)	3 (11.1) ($p = .748$)	2 (4.5) ($p = .120$)	
Insufficient	4 (17.4) ($p = .003$)**	0 (-) ($p = .145$)	1 (2.3) ($p = .217$)	
Is obtaining informed consent from patients necessary before a dental examination?				
Yes	18 (78.3)	26 (96.3)	39 (88.7)	.382
No	3 (13)	1 (3.7)	3 (6.8)	
Not sure/I don't know	2 (8.7)	0 (-)	2 (4.5)	
Is the informed consent requested from you before your dental examination sufficiently understandable?				
Yes	19 (82.6)	23 (85.2)	42 (95.4)	.259
No	1 (4.4)	0 (-)	1 (2.3)	
Not sure/I don't know	3 (13)	4 (14.8)	1 (2.3)	
How do you think informed consent should be obtained?				
Written (Signed by both patient and dentist)	11 (47.8) ($p = .478$)	13 (48.2) ($p = .406$)	15 (34.1) ($p = .172$)	.021
Verbal	4 (17.4) ($p = .003$)**	0 (-) ($p = .145$)	1 (2.3) ($p = .217$)	
Written and verbal	3 (13) ($p = .071$)	10 (37) ($p = .197$)	13 (29.5) ($p = .701$)	
Digital	5 (21.7) ($p = .671$)	4 (14.8) ($p = .130$)	15 (34.1) ($p = .074$)	
Do you think paper-based consent forms in the healthcare services slow down the workflow?				
Yes	6 (26.1)	3 (11.1)	14 (31.8)	.266
No	14 (60.9)	21 (77.8)	28 (63.7)	
Not sure/I don't know	3 (13)	3 (11.1)	2 (4.5)	
Do you think paper-based consent forms reduce the time spared for diagnosis/treatment?				
Yes	9 (39.1)	9 (33.3)	13 (29.5)	.755
No	13 (56.5)	14 (51.9)	26 (59.1)	
Not sure/I don't know	1 (4.4)	4 (14.8)	5 (11.4)	
Are you uncomfortable sharing your personal data in the paper-based informed consent form?				
Yes	5 (21.7)	4 (14.8)	6 (13.7)	.937
No	17 (73.9)	22 (81.5)	36 (81.8)	
Not sure/I don't know	1 (4.4)	1 (3.7)	2 (4.5)	

*Pearson's Chi-Square test

**Adjusted residual analysis

$p < .05$

Table 6. Comparison of perceptions and attitudes and trust levels towards digital informed consent in three patient groups categorized according to their education levels.

Question Answers	Primary& Secondary n (%)	High School n (%)	University n (%)	p value*
Do you think transitioning paper-based consent forms to digital format would be more advantageous for the workflow of healthcare services?				
Yes	18 (78.3)	19 (70.4)	38 (86.4)	.494
No	2 (8.7)	4 (14.8)	4 (9.1)	
Not sure/I don't know	3 (13)	4 (14.8)	2 (4.5)	
Do you consider transitioning paper-based consent forms to digital format would positively contribute to the environment by reducing paper and pen waste?				
Yes	21 (91.3)	25 (92.6)	40 (90.9)	.529
No	2 (8.7)	1 (3.7)	1 (2.3)	
Not sure/I don't know	0 (-)	1 (3.7)	3 (6.8)	
Do you think transitioning paper-based consent forms to digital format would be advantageous in terms of environmental sustainability and saving resources?				
Yes	22 (95.7)	25 (92.6)	40 (90.9)	.877
No	0 (-)	1 (3.7)	1 (2.3)	
Not sure/I don't know	1 (4.3)	1 (3.7)	3 (6.8)	
Do you think transitioning paper-based consent forms to digital format would provide more advantages in terms of functionality and usability?				
Yes	20 (87)	25 (92.6)	40 (90.9)	.671
No	3 (13)	1 (3.7)	1 (2.3)	
Not sure/I don't know	0 (-)	1 (3.7)	3 (6.8)	
Which one do you find safer for the personal data you declared in the consent form to be stored: paper-based or digital format?				
Paper-based	4 (17.4)	5 (18.5)	10 (22.7)	.816
Digital	18 (78.3)	20 (74.1)	29 (65.9)	
Not sure/I don't know	1 (4.3)	2 (7.4)	5 (11.4)	
Which do you find more valid/reliable for your official transactions, wet-ink or digital signature?				
Wet-ink signature	18 (78.3)	12 (44.5)	25 (56.8)	.097
Digital signature	3 (13)	10 (37)	16 (36.4)	
Not sure/I don't know	2 (8.7)	5 (18.5)	3 (6.8)	
Would you prefer smart tablets over paper in the informed consent procedure?				
Yes	19 (82.6)	24 (88.9)	38 (86.4)	.795
No	3 (13)	1 (3.7)	4 (9.1)	
Not sure/I don't know	1 (4.4)	2 (7.4)	2 (4.5)	
Would you prefer using smart pens and keyboards over normal pens in the informed consent procedure?				
Yes	17 (73.9)	25 (92.6)	37 (84.1)	.152
No	5 (21.7)	2 (7.4)	3 (6.8)	
Not sure/I don't know	1 (4.4)	0 (-)	4 (9.1)	

*Pearson's Chi-Square test

4. DISCUSSION

Informed consent is an indispensable part of the physician-patient relationship since it establishes a trust-based communication between the physician and the patient and upholds essential values of medical ethics, including beneficence, non-maleficence, and the respect for individual autonomy. Nonetheless, the routine implementation style of the consent form poses some difficulties in daily clinical practice due to its paper-based format. Despite

numerous studies evaluating the advantages and outcomes of digital consent forms in medical surgical procedures (4,5,11,12), radiation therapy (6), pharmacy (13) and in the field of biomedical research (7,16), the influence of digital consent forms in dental practice has not been investigated. Accordingly, this is the first study aimed at determining the effect of the transition of paper-based consent forms to digital format on dental healthcare efficiency.

Implementation of paper-based consent forms leads to a number of problems that may affect the quality of the consent process, including lost consent forms, illegible handwriting, missing patient data, incorrectly completed forms, difficulties with form transfer, and the financial burden of documentation (4-6,17). Several studies comparing informed consent-related errors between paper-based and digital formats have reported a significant improvement in the error rate with the use of digital consent forms (4,5,17-19). Furthermore, digital consent appears to have a large impact on patient satisfaction, especially in younger age groups, since patients find digital consent more interesting, easier to use and better for understanding (7,16). Consistent with these statements, 90.4% of total participants in our study reported that they think digital consent forms would provide more advantages in terms of functionality and usability, and the rate of patients noting this statement was higher in the 18-39 age group (94.7%). Moreover, 71.3% of our total participants declared that they found the digital consent format safer than paper-based in terms of storing their personal data. Although older patients have been reported to be more skeptical about sharing their personal data electronically (17), 75.9% of older patients in our study supported the safety of storage conditions of the digital consent forms.

Interestingly, despite the common agreement regarding the functionality, usability and storage safety of digital consent forms, the ratio of participants who preferred written consent (41.5%) was still higher than that of those who preferred digital consent (25.5%). This discrepancy observed in our results may be caused by concerns about the possible loss of face-to-face communication between patient and dentist during the digital consent process. Additionally, another potential explanation for this inconsistency may be patients' greater dependence on wet-ink signature and the fact that more than half of our participants (58.5%) found wet-ink signature more reliable for their official transactions supports this interpretation. However, further multi-center studies investigating perceptions of larger patient groups about digital consent forms are required to validate our findings.

World Health Organization (WHO) encourages the development of person-centric digital health technologies in their report of global strategy on digital health 2020–2025 (20). In accordance with this strategy, the use of digital consent forms personalized to the patient and/or specific to the procedure has been proposed by different authors to establish a more effective patient information process (5,7,21). In the field of dentistry, personalized consent forms may provide benefits in many dental procedures, particularly in surgical treatments, where a more detailed and procedure-specific consent is required to ensure that the patient is properly informed about the benefits, risks, and alternatives of the planned treatment. Accordingly, the results of our study showing that 86.2% and 84% of the participants preferring smart tablets and pens over paper and regular pens may be considered promising regarding

the future development and improvement of personalized digital consent. However, as already mentioned, the digital consent process still upholds some obstacles since electronic signatures or signing platforms may not reach a wide usage area among some societies with variable socioeconomic levels and older age groups (19). Accordingly, the results of our study revealed that approximately half of primary and/or secondary graduates as well high school graduates tend to prefer written consent forms over digital format. Therefore, further studies should focus on the development and validation of personalized digital consent forms by taking into account the personal preferences of different societies with variable socioeconomic levels and patients of different age groups.

Previous studies focusing on the effect of digital consent forms in the field of biomedical research emphasize the importance of face-to-face communication in the consent process in terms of ensuring the understanding of participants, regardless of the format of the consent form (16,21,22). It can be anticipated that the same concern would also apply to dental and medical fields, especially in invasive and/or surgical treatments since patients tend to be more stressed and hesitant about these procedures and thereby may be in greater need of face-to-face communication with their dentists. Accordingly, the use of digital consent creates an advantage in this regard by reducing the time loss caused by the administration process of paper-based consents and providing more time for a face-to-face patient and physician conversation to discuss the diagnosis and treatment processes comprehensively (4). Nevertheless, instead of converting the paper-based consent process to a fully digital format, adding various digital features to consent forms and preserving face-to-face communication may offer a better option in terms of the digitalization of the informed consent (23-26). Although only 33% of participants in the present study stated that paper-based consent forms may reduce the time spared for diagnosis/treatment, the perspectives of different groups of patients applying various dental departments should be investigated to accurately interpret the impact of paper-based consent forms on the diagnosis/treatment time.

In addition to the patient-related benefits of digital consent, the transition of paper-based consent forms to digital format may also contribute to the environment by preventing unnecessary paper use in healthcare services and thus saving resources. In accordance with this, over 90% of our participants agreed with the perception of digital consent format would be advantageous in terms of reducing paper and pen waste and environmental sustainability. Aside from the environmental contribution, digital consent may also provide financial benefits by the development of cost-effective electronic consent systems to reduce unintended costs caused by the errors associated with paper-based format (17). However, it also should be remembered that the technical requirements of digital consent systems such as smart tablets, phones or multimedia features may also impose another financial burden on healthcare institutions (19). Therefore, further investigations should aim to develop

reliable cost-effective consent formats with minimal technical requirements.

One of the limitations of this study was the failure to include different health institutions and compare the attitudes of larger patient groups. Therefore, multicenter studies including larger patient groups from different socioeconomic levels, various societies and age ranges should be conducted to confirm the global impact of the digital consent forms on dental healthcare efficiency and to generalize our results. Nevertheless, despite the possible advantages of digital consent forms in terms of workflow and efficiency of healthcare services and the quality of the consent process, the in-person physician-patient relationship continues to be a crucial intermediary step in obtaining patient consent in a trust-based clinical environment. Therefore, it can be anticipated that the digital consent format would provide more benefits and may be more preferable if it is used as a part of face-to-face physician-patient communication.

This was the first study in the dental field evaluating patients' perceptions towards the transition of paper-based consent forms to digital format by implementing a digital consent form combined with an electronic document signing platform. Further studies with larger groups of participants may enable more concrete data on the efficiency and reliability of the digital consent format and may provide guidance on its routine use as a part of face-to-face communication.

5. CONCLUSION

The transition of paper-based consent forms to digital format may provide several advantages in terms of workflow and efficiency of healthcare services, time spared for diagnosis and treatment processes, better patient understanding, security of storing patient information and, accordingly, the quality of the consent process. However, face-to-face physician-patient communication still upholds an important part in trust-based patient consent. Therefore, rather than converting the paper-based consent process to a fully digital format, the use of digital consent forms as complementary to in-person physician-patient communication may provide a more qualified consent process in dental clinical practice.

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