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Importance and requirements for dental prosthesis order platform services: a survey of dental professionals

Gyu-Ri Kim[1,2†], Keunbada Son[2†], Du-Hyeong Lee[3], So-Yeun Kim[3], Myoung-Uk Jin[4*], Kyu-Bok Lee[2,3*]
[1]*Department of Dental Science, Graduate School, Kyungpook National University, Daegu, Republic of Korea*
[2]*Advanced Dental Device Development Institute, Kyungpook National University, Daegu, Republic of Korea*
[3]*Department of Prosthodontics, School of Dentistry, Kyungpook National University, Daegu, Republic of Korea*
[4]*Department of Conservative Dentistry, School of Dentistry, Kyungpook National University, Daegu, Republic of Korea*

Purpose: This study aimed to gain better understanding of the importance of dental prosthesis order platform services and to identify the essential elements for their enhancement and wider adoption among dental professionals. **Materials and Methods:** A survey was conducted to assess the perspectives of dentists, dental technicians, dental hygienists, and dental industry professionals toward dental prosthesis ordering and associated platform services (a total of 53 respondents). The questionnaire was devised after an expert review and assessed for reliability using Cronbach's alpha coefficient. Factor analysis revealed that 57 factors across five categories accounted for 88.417% of the total variance. The survey was administered through an online questionnaire platform, and data analysis was conducted using a statistical software, employing one-way analysis of variance and Tukey's honestly significant difference test ($\alpha = 0.05$). **Results:** The essential elements identified were accurate information input, effective communication, delivery of distortion-free impressions, convenience in data transmission and storage, development of stable and affordable platform services ($P < 0.05$). Furthermore, significant differences were observed in the importance of these items based on age, dental profession, and career experience ($P < 0.05$). **Conclusion:** The dental prosthesis ordering platform services, the requirements of dental personnel were stability, economic efficiency, and ease of transmitting and storing prosthesis data. The findings can serve as important indicators for the development and improvement of dental prosthesis order platform services. **(J Dent Rehabil Appl Sci 2023;39(3):105-18)**

Key words: dental health services; dentist; dental technicians; dental hygienists; dental prosthesis

Introduction

Collaboration between dental clinics and dental laboratories is essential to successfully fabricate dental prostheses. Traditionally, dental clinics send dental impression obtained from the oral cavity, together with a dental prosthesis work order form, to the dental laboratory. Based on the provided information, the dental technician fabricates the dental prosthesis. Dental clinics and laboratories maintain distinct roles

*Correspondence to: Kyu-Bok Lee
Professor, Department of Prosthodontics, School of Dentistry, Advanced Dental Device Development Institute, Kyungpook National University, 2177 Dalgubuldaero, Jung-gu, Daegu, 41940, Republic of Korea
Tel: +82-53-600-7674, Fax: +82-53-426-7661, E-mail: kblee@knu.ac.kr
*Correspondence to: Myoung-Uk Jin
Associate Professor, Department of Conservative Dentistry, School of Dentistry, Kyungpook National University, 2177 Dalgubuldaero, Jung-gu, Daegu, 41940, Republic of Korea
Tel: +82-53-660-6925, Fax: +82-53-426 7661, E-mail: musljin@knu.ac.kr
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†Contributed equally to this work as first authors.
*Contributed equally to this work as corresponding authors.

in the fabrication process, using the work order form as a communication tool.[1] Sufficient patient and prosthesis fabrication information in the work order form makes it possible to produce high-quality dental prostheses and reduce unnecessary remakes.[2]

Advancements in dental imaging equipment have facilitated the digital transmission of patient data, which was previously unattainable using conventional methods.[3] Dental laboratories can now share cone-beam computed tomography (CBCT) files in digital imaging and communications in medicine format and standard tessellation language (STL) format files obtained from intraoral scanners, which directly capture information on soft and hard tissues within the patient's oral cavity.[3] Typically, such digital data are transmitted to dental laboratories through email or cloud.[4] However, these methods are inefficient, prone to data entry errors, and carry potential risks associated with privacy breaches.[5]

In response to these challenges, platforms for managing dental laboratory work orders have emerged, offering improved security, rapid data transmission, and seamless communication. These platforms have the potential to improve workflow by enabling interoperability and collaborative management between dental clinics and dental laboratories.[6] Despite these benefits, the current number of individuals using these platform services in dental clinics and dental laboratories remains limited, and related studies are scarce.

The criteria for dental practitioners' perception of factors affecting dental laboratory work order environments have not been clearly defined. Thus, this study aimed to identify essential factors in dental laboratory work orders and determine dental practitioners' awareness of the platform features for managing dental laboratory work orders. By deriving critical factors from existing work order forms for prosthesis fabrication and investigating the requirements applicable to the activation of platforms for managing dental laboratory work orders, this study aimed to gain better understanding of the critical aspects of dental prosthesis ordering and explore the potential for enhancing and promoting these platform services. The null hypothesis states that there is no difference in the importance of survey items between categories based on survey results.

Materials and Methods

Selection of survey items

The questionnaire addressing dental laboratory work order status was developed based on previous studies regarding communication between dental clinics and dental laboratories[5-9] and was reviewed by clinical experts. The questionnaire consisted of questions on demographic characteristics, current work order status, important items in work orders, existing work order environment factors, dental laboratory work order platform service environment factors, the impact of work order platform services, and the requirements for work order platform services (Fig. 1). The types of questions used were single-choice, multiple-choice, and ranking questions that assigned weighted scores to each item to determine their importance.

Reliability analysis of survey items

A pilot study was conducted to assess the reliability of the questionnaire, and Cronbach's alpha coefficient was measured using SPSS version 25.0 (IBM, Chicago, USA). The measurement value for the questionnaire used in this study exceeded 0.9, indicating excellent reliability and consistency between the items. The suitability of variables for factor analysis was evaluated using Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) test. The results of the KMO measurement (KMO = 0.782) and Bartlett's test of sphericity (Bartlett's $X^2 = 268.020$, $P < 0.001$) demonstrated excellent appropriateness. The 57 factors in the five selected categories for factor analysis accounted for 88.417% of the total variance. A summary of these factors and their corresponding categories is presented in Table 1.

Survey

The study protocol was approved by Clinical Trial

Questionnaire	Category	Section
Demographic characteristics		
Current work order status		
Dental laboratory work order	Category 1: Important items in work orders (6 items)	
	Category 2: Existing work order environment factors (21 items)	Section 1: Notation (7 items)
		Section 2: Billing (4 items)
		Section 3: Delivery (3 items)
		Section 4: Order management (3 items)
		Section 5: Environmental factors (4 items)
Dental laboratory work order platform service	Category 3: Dental laboratory work order platform service environment factors (22 items)	Section 1: Advantage of platform services (6 items)
		Section 2: Communication (4 items)
		Section 3: Delivery (2 items)
		Section 4: Data clouds (2 items)
		Section 5: Billing (3 items)
		Section 6: Environmental factors (5 items)
	Category 4: Impact of work order platform services (10 items)	Section 1: Positive impact (6 items)
		Section 2: Negative impact (4 items)
	Category 5: Requirements for work order platform services (7 items)	

Fig. 1. Questionnaire questions.

Table 1. Factor and reliability analysis

Items		Factor analysis			Cronbach's alpha
		Factor load	Commonalities	Contribution rate (%)	
Category 1: Important items in work orders					
	Accurate information entry	0.937	0.908	24.944	0.964
	Communication with party	0.91	0.949		
	Payment between ordering parties	0.907	0.993		
	Delivery between ordering parties	0.905	0.778		
	Adjusting schedule	0.905	0.975		
	Dental prosthesis fee	0.905	0.962		
Category 2: Existing work order environment factors					
Section 1: Notation	Patient's nam	0.905	0.639		
	Shade	0.896	0.992		
	Date	0.896	0.959		
	Material to be used	0.876	0.677		
	Tooth notation	0.874	0.949		
	Production method mark	0.837	0.918		
	Others	0.805	0.962		
Section 2: Billing	Prosthesis ledger creation	0.805	0.972	19.558	0.924
	Paying prosthesis fee	0.803	0.993		
	Accounting gold	0.796	0.859		
	Managing accounting	0.562	0.993		
Section 3: Delivery	Undistorted impression delivery	0.555	0.958		
	Rapid dental prosthesis delivery	0.548	0.976		
	Low-cost delivery	0.548	0.962		
Section 4: Order management	Management of order schedules	0.532	0.976		
	Acquiring new parties	0.507	0.934		
	Retention of ordering parties	0.507	0.615		

Table 1. (Continued) Factor and reliability analysis

Items		Factor analysis			Cronbach's alpha
		Factor load	Commonalities	Contribution rate (%)	
Category 3: Dental laboratory work order platform service environment factors					
Section 1: Advantages of using the platform	Economic efficiency than the existing methods	0.867	0.931	17.299	0.923
	Securing ordering parties from various regions	0.669	0.991		
	Acquisition of overseas order parties	0.663	0.886		
	Convenience of transmission and storage of dental data	0.599	0.979		
	Improved security than existing process	0.597	0.595		
	Payment for a dental prosthesis fee	0.597	0.99		
Section 2: Communication	Exchanging scan data	0.596	0.743		
	Real-time communication function	0.588	0.931		
	Real-time process monitoring	0.539	0.897		
	Checking of previous data	0.529	0.961		
Section 3: Delivery	Real-time delivery tracking	0.762	0.958		
	Delivery system	0.747	0.979		
Section 4: Data clouds	Data cloud storage	0.747	0.979		
	Data cloud security	0.741	0.979		
Section 5: Billing	Prosthesis ledger linkage	0.706	0.838		
	Automated payments	0.706	0.979		
	Real-time gold management	0.706	0.958		
Category 4: Impact of work order platform services					
Section 1: Positive impact	Convenient communication	0.702	0.822	16.744	0.955
	Reduced prosthesis re-make	0.695	0.993		
	Improved prosthesis quality	0.566	0.998		
	Easy payment with clients	0.527	0.99		
	Useful marketing tool	0.526	0.955		
	Work efficiency	0.504	0.89		
Section 2: Negative impact	Concern of dual workloads	0.706	0.561		
	Dissatisfaction about the replacement of personnel	0.693	0.504		
	Complaints about digital dissemination	0.693	0.572		
	Withering of the digital vulnerable class	0.682	0.548		
Category 5: Requirements for work order platform services					
	Stable and widely available platform service	0.674	0.838	9.872	0.966
	Easy UI/UX	0.567	0.983		
	A/S, client service, *remote assistance*	0.507	0.99		
	Deregulation of the law	0.68	0.904		
	Convenience compared with existing process	0.633	0.879		
	Acquisition of various local clients	0.625	0.993		
	Orders from overseas dental clinics and dental laboratories	0.603	0.877		

UI/UX, user interface and user experience; A/S, after service.

Ethics Committee of Kyungpook National University Dental Hospital (IRB no. KNUDH-2021-04-04-01). The survey targeted domestic dentists, dental technicians, dental hygienists, and dental industry practitioners with extensive experience in dental prosthesis work orders as well as clinical experience. A total of 53 participants were recruited through professional associations and online forums. The survey was conducted from November 30 to December 9, 2022, using a self-administered questionnaire through an online survey platform service (Moaform; Qoom Networks, Seoul, Republic of Korea).

Statistical Analysis

Reliability analysis of the survey data was conducted using Cronbach's alpha coefficient. Normal data distribution was confirmed using the Shapiro-Wilk test. One-way analysis of variance and Tukey's honestly significant difference tests were selected to compare each category because they are appropriate for analyzing differences between multiple groups when the data follows a normal distribution and the sample sizes are relatively equal. All analyses were conducted using SPSS version 25.0 (IBM), with the significance level set at $\alpha = 0.05$.

Results

Cronbach's alpha value for the 53-question survey was 0.9, indicating a high degree of reliability in the survey results. The demographic characteristics of the respondents are presented in Fig. 2. Regarding occupation, the 53 respondents were dentists (30%), dental technicians (53%), dental hygienists (4%), and dental industry workers (13%). Their age distribution was 20s (39%), 30s (34%), 40s (21%), and 50s (6%). Majority of the respondents (56%) had over 5 years of professional experience. Ordering of dental prostheses was done through request forms (30%), phone calls (20%), emails (16%), social media (16%), text messages (11%), or platform services (7%).

Table 2 demonstrates the importance of survey items within the five categories. In Category 1, accurate information entry and communication with the ordering party were important when ordering dental prostheses ($P < 0.05$, Table 2). In Category 2, in billing, prosthesis ledger creation was considered

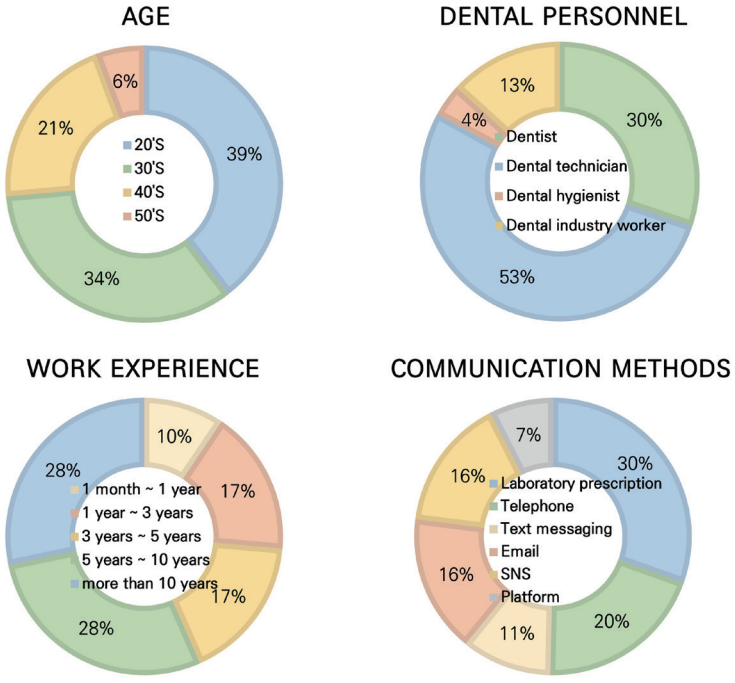

Fig. 2. Demographic characteristics of the survey respondents.

important for dental prostheses ($P < 0.001$, Table 2). In delivery, the importance of undistorted impression delivery was highlighted, whereas in order management, the management of order schedules and ordering parties was important ($P < 0.001$, Table 2). Among the four environmental factors of dental prosthesis, notation, and order management were the most important orders ($P = 0.01$, Table 2).

In Category 3, economic efficiency than the existing methods, convenience in transferring and storing prosthesis data were the important advantages of the dental prosthesis order platform service ($P < 0.001$, Table 2). In communication, exhibited high importance in exchanging scan data ($P < 0.001$, Table 2), whereas delivery showed high importance in the inter-ordering party prosthesis ledger linkage ($P < 0.001$, Table 2). Among the five environmental factors of dental prosthesis order platform services, the advantages of platform service and communication showed high importance ($P = 0.01$, Table 2).

Table 2. Comparison of the importance of survey items within each category

Item		Mean	SD	95% Confidence interval		*P*	Comparison
				Lower limit	Upper limit		
Category 1: Important items in work orders							
	Accurate information entry	5.00	1.41	4.61	5.39	< 0.001*	A
	Communication with party	4.83	1.20	4.50	5.16		A
	Payment between ordering parties	2.91	1.48	2.50	3.31		B
	Delivery between ordering parties	2.72	1.21	2.38	3.05		B
	Adjusting schedule	2.81	1.18	2.49	3.14		B
	Dental prosthesis fee	2.74	1.78	2.25	3.23		B
Category 2: Existing work order environment factors							
Section 1: Notation	Patient's name	4.49	2.32	3.85	5.13	< 0.001*	A
	Shade	4.19	1.78	3.70	4.68		AB
	Date	4.53	1.88	4.01	5.05		A
	Material to be used	4.53	1.67	4.07	4.99		A
	Tooth notation	4.62	1.66	4.17	5.08		A
	Production method mark	3.23	1.87	2.71	3.74		BC
	Others	2.42	1.75	1.93	2.90		C
Section 2: Billing	Prosthesis ledger creation	3.47	0.87	3.23	3.71	< 0.001*	A
	Paying prosthesis fee	2.75	0.90	2.51	3.00		B
	Accounting gold	1.91	0.81	1.68	2.13		C
	Managing accounting	1.87	1.04	1.58	2.15		C
Section 3: Delivery	Undistorted impression delivery	2.60	0.69	2.41	2.79	< 0.001*	A
	Rapid dental prosthesis delivery	2.00	0.55	1.85	2.15		B
	Low-cost delivery	1.40	0.72	1.20	1.59		C
Section 4: Order management	Management of order schedules	2.17	0.87	1.93	2.41	0.002*	A
	Acquiring new parties	1.68	0.75	1.47	1.89		B
	Retention of ordering parties	2.15	0.74	1.95	2.36		A
Section 5: Environmental factors	Notation	2.77	1.17	2.45	3.10	0.01*	A
	Billing	2.15	1.13	1.84	2.46		B
	Delivery	2.36	0.92	2.10	2.61		B
	Order management	2.72	1.15	2.40	3.03		A

Table 2. (Continued) Comparison of the importance of survey items within each category

Item		Mean	SD	95% Confidence interval		*P*	Comparison
				Lower limit	Upper limit		
Category 3: Dental laboratory work order platform service environment factors							
Section 1: Advantage of platform services	Economic efficiency than the existing methods	4.55	1.74	4.07	5.03	< 0.001*	A
	Securing ordering parties from various regions	3.81	1.52	3.39	4.23		AB
	Acquisition of overseas order parties	2.47	1.54	2.05	2.90		C
	Convenience of transmission and storage of dental data	4.43	1.31	4.07	4.79		A
	Improved security than existing process	3.17	1.17	2.85	3.49		BC
	Payment for a dental prosthesis fee	2.57	1.69	2.10	3.03		C
Section 2: Communication	Exchanging scan data	3.34	1.04	3.05	3.63	< 0.001*	A
	Real-time communication function	2.77	0.97	2.51	3.04		B
	Real-time process monitoring	1.87	0.94	1.61	2.13		C
	Checking of previous data	2.02	0.87	1.78	2.26		C
Section 3: Delivery	Real-time delivery tracking	1.49	0.50	1.35	1.63	0.848	-
	Delivery system	1.51	0.50	1.37	1.65		-
Section 4: Data clouds	Data cloud storage	1.75	0.43	1.64	1.87	< 0.001*	A
	Data cloud security	1.25	0.43	1.13	1.37		B
Section 5: Billing	Prosthesis ledger linkage	2.53	0.75	2.32	2.73	< 0.001*	A
	Automated payments	2.00	0.65	1.82	2.18		B
	Real-time gold management	1.47	0.70	1.28	1.66		C
Section 6: Environmental factors	Advantages of using the platform	3.85	1.43	3.45	4.24	< 0.001*	A
	Communication	3.72	1.26	3.37	4.06		A
	Delivery	2.79	1.10	2.49	3.10		B
	Data cloud	2.87	1.23	2.53	3.21		B
	Payment	1.77	0.99	1.50	2.05		C
Category 4: Impact of work order platform services							
Section 1: Positive impact	Convenient communication	4.77	1.50	4.36	5.19	< 0.001*	A
	Reduced prosthesis re-make	3.77	1.66	3.32	4.23		B
	Improved prosthesis quality	3.64	1.64	3.19	4.09		B
	Easy payment with order parties	3.30	1.32	2.94	3.67		BC
	Useful marketing tool	2.43	1.41	2.05	2.82		C
	Work efficiency	3.08	1.81	2.58	3.57		BC
Section 2: Negative impact	Concern of dual workloads	2.81	1.24	2.47	3.15	0.066	-
	Dissatisfaction about the replacement of personnel	2.55	0.89	2.30	2.79		-
	Complaints about digital dissemination	2.26	0.96	2.00	2.53		-
	Withering of the digital vulnerable class	2.38	1.29	2.02	2.73		-
Category 5: Requirements for work order platform services							
	Stable and widely available platform service	5.43	1.88	4.92	5.95	< 0.001*	A
	Easy UI/UX	4.91	1.52	4.49	5.33		AB
	A/S, service, remote assistance	4.04	1.58	3.60	4.47		BC
	Deregulation of the law	3.51	1.83	3.01	4.01		C
	Convenience compared with existing process	4.62	1.77	4.14	5.11		AB
	Acquisition of various local order parties	3.28	1.73	2.81	3.76		C
	Orders from overseas dental clinics and dental laboratories	2.21	1.84	1.70	2.72		D

* Indicates significant differences within each category or section based on the results of one-way ANOVA testing ($P < 0.05$). Identical capital letters within each category or section indicate no statistically significant differences ($P > 0.05$).
SD, standard deviation; UI/UX, user interface and user experience; A/S, after service.

In Category 4, convenient communication between ordering parties showed the highest importance in the positive effects of using the dental prosthesis order platform service ($P < 0.001$, Table 2). Contrarily, no significant differences were observed in the negative effects ($P = 0.666$, Table 2).

In Category 5, the requirements for using the dental prosthesis order platform service included a stable and widely available platform service ($P < 0.001$, Table 2).

Table 3 demonstrates the importance of survey items by age, dental occupation, and professional experience within the five categories.

In Category 2 related to the environmental factors of dental laboratory orders, order management exhibited a significant difference in the management of order schedules based on dental occupation ($P < 0.001$, Table 3), with dentists and dental hygienists exhibiting higher importance than the other occupations. In addition, there was a significant difference in the retention of ordering parties according to the dental occupation ($P < 0.001$, Table 3), with dentists and dental technicians exhibiting higher importance than the other occupations.

Table 3. Comparison of the importance assigned to each survey item by age, dental personnel, and work experience groups

Item		Age *P*	Dental personnel *P*	Work experience *P*
Category 1: Important items in work orders				
	Accurate information entry	0.05	0.845	0.241
	Communication with party	0.186	0.105	0.892
	Payment between ordering parties	0.573	0.138	0.747
	Delivery between ordering parties	0.025	0.381	0.391
	Adjusting schedule	0.893	0.615	0.092
	Dental prosthesis fee	0.127	0.229	0.576
Category 2: Existing work order environment factors				
Section 1: Notation	Patient's name	0.121	0.423	0.572
	Shade	0.103	0.57	0.824
	Date	0.44	0.874	0.102
	Material to be used	0.536	0.057	0.111
	Tooth notation	0.434	0.787	0.113
	Production method mark	0.144	0.982	0.844
	Others	0.065	0.053	0.178
Section 2: Billing	Prosthesis ledger creation	0.408	0.861	0.271
	Paying prosthesis fee	0.456	0.156	0.665
	Accounting gold	0.718	0.986	0.237
	Managing accounting	0.954	0.573	0.786
Section 3: Delivery	Undistorted impression delivery	0.456	0.952	0.283
	Rapid dental prosthesis delivery	0.646	0.346	0.982
	Low-cost delivery	0.202	0.404	0.593
Section 4: Order management	Management of order schedules	0.223	< 0.001*	0.74
	Acquiring new parties	0.319	0.2	0.432
	Retention of ordering parties	0.768	< 0.001*	0.271
Section 5: Environmental factors	Prescription label	0.661	0.055	0.116
	Payment	0.815	0.917	0.968
	Delivery	0.123	0.424	0.256
	Order management	0.519	0.018*	0.711

Table 3. (Continued) Comparison of the importance assigned to each survey item by age, dental personnel, and work experience groups

Item		Age *P*	Dental personnel *P*	Work experience *P*
Category 3: Dental laboratory work order platform service environment factors				
Section 1: Advantage of platform services	Economic efficiency than the existing methods	0.86	0.004*	0.41
	Securing ordering parties from various regions	0.114	0.348	0.591
	Acquisition of overseas order parties	0.313	0.152	0.394
	Convenience of transmission and storage of dental data	0.956	0.426	0.014
	Improved security than existing process	0.924	0.399	0.679
	Payment for a dental prosthesis fee	0.67	0.447	0.355
Section 2: Communication	Exchanging scan data	0.396	0.147	0.17
	Real-time communication function	0.604	0.659	0.482
	Real-time process monitoring	0.113	0.166	0.146
	Checking of previous data	0.784	0.85	0.364
Section 3: Delivery	Real-time delivery tracking	0.17	0.311	0.549
	Delivery system	0.17	0.311	0.549
Section 4: Data clouds	Data cloud storage	0.009*	0.758	0.392
	Data cloud security	0.006*	0.758	0.392
Section 5: Billing	Prosthesis ledger linkage	0.1	0.886	0.492
	Automated payments	0.954	0.134	0.91
	Real-time gold management	0.103	0.065	0.597
Section 6: Environmental factors	Advantages of using the platform	0.496	0.525	0.214
	Communication	0.092	0.092	0.41
	Delivery	0.127	0.81	0.125
	Data cloud	0.327	0.073	0.787
	Payment	0.459	0.147	0.391
Category 4: Impact of work order platform services				
Section 1: Positive impact	Convenient communication	0.586	0.892	0.129
	Reduced prosthesis re-make	0.235	0.842	0.127
	Improved prosthesis quality	0.075	0.403	0.832
	Easy payment with order parties	0.513	0.378	0.603
	Useful marketing tool	0.664	0.697	0.987
	Work efficiency	0.091	0.754	0.067
Section 2: Negative impact	Concern of dual workloads	0.011*	0.553	0.002*
	Dissatisfaction about the replacement of personnel	0.106	0.1	0.903
	Complaints about digital dissemination	0.192	0.845	0.229
	Withering of the digital vulnerable class	0.145	0.283	0.134
Category 5: Requirements for work order platform services				
	Stable and widely available platform service	0.499	0.83	0.936
	Easy UI/UX	0.576	0.081	0.628
	A/S, service, remote assistance	0.7	0.138	0.416
	Deregulation of the law	0.076	0.466	0.224
	Convenience compared with existing process	0.38	0.491	0.155
	Acquisition of various local order parties	0.43	0.273	0.819
	Orders from overseas dental clinics and dental laboratories	0.029*	0.044*	0.578

* Indicates significant differences within each category or section based on the results of one-way ANOVA testing ($P < 0.05$).
SD, standard deviation; UI/UX, user interface and user experience; A/S, after service.

In Category 3, focusing on the platform service environment of dental laboratory orders, the advantage of platform services showed a significant difference in economic efficiency than the existing methods based on dental occupation ($P = 0.004$, Table 3), with dentists and dental technicians exhibiting significantly higher importance than the other occupations. In the data cloud storage item, a difference was observed based on age ($P = 0.009$, Table 3), with the 20 - 30 age group exhibiting significantly higher importance than the 40 - 50 age group. Furthermore, in data cloud security, the 40 - 50 age group exhibited significantly higher importance than the 20 - 30 age group ($P = 0.006$, Table 3).

In Category 4, regarding the negative impact of using dental laboratory order platform services, a significant difference was observed in the concern of dual workloads based on age ($P = 0.011$, Table 3) and clinical experience ($P = 0.002$, Table 3), with the 20 - 30 age group and those with less than 3 years of experience exhibiting significantly higher importance.

In Category 5, regarding the requirements for using dental laboratory order platform services, the item related to orders from overseas dental clinics and dental laboratories showed a significant difference based on age ($P = 0.029$, Table 3) and occupation ($P = 0.044$, Table 3), with the 40 - 50 age group as well as dentists and dental technicians exhibiting significantly higher importance.

Discussion

The present study aimed to gain better understanding of the importance and requirements of dental prosthesis order platform services among dentists, dental technicians, dental hygienists, and dental industry workers. There were significant differences in the importance aspect of the 57 survey items included in the 5 categories (Table 2, $P < 0.05$), which led to the rejection of the null hypothesis.

According to a previous study, the necessary information was perfectly completed on the prosthesis order forms in only 26% of respondents.[7] Clear and specific order forms can improve the quality and cost-efficiency of prosthetic work; thus, dentists should ensure that all necessary information is provided on the forms so dental technicians can accurately fabricate the prosthetics.[8] In this study, the importance of accurately providing information on the prosthesis order form was also emphasized (Table 2, $P < 0.05$). In addition, the importance of communication between the orderer and the dental clinic was highlighted (Table 2, $P < 0.05$) as dental clinics and dental laboratories perform specialized tasks in their respective fields, and smooth communication between them is crucial for a successful prosthesis fabrication.[2,9]

The importance of maintaining accurate records for accounting and management was also highlighted (Table 2, $P < 0.05$) as record-keeping is essential for profit calculations and optimal business operations.[10] Regarding delivery, the importance of delivering impression without distortion was emphasized (Table 2, $P < 0.05$). This finding is consistent with that of a previous study that investigated the current state of dental prosthesis fabrication, where the main causes of remanufacturing were distortions in the impressions or materials.[11,12] Furthermore, this study demonstrated that order schedule management was highly important in client management (Table 2, $P < 0.05$). Because prosthetics are customized for each patient, order management can be challenging, and most dental laboratories need to consider a specific timeframe when delivering orders to clients.[13]

According to previous studies, electronic transmission of acquired data between dental clinics and dental laboratories has proven to be more cost-effective than the traditional process.[14] In addition, automated management systems have been reported to provide benefits in terms of reduced work time and cost savings.[15] In the present study, the higher economic efficiency of platform services than the conventional methods was also found to be significant (Table 2, $P < 0.05$). Furthermore, a unified digital workflow is required for the seamless transmission of oral photographs, CBCT, and STL files; the lack of integration in data transmission and storage can impede the digital dental workflow.[5] Therefore, the present study emphasized easy data transmission and storage as an advantage of platform services (Table 2, $P < 0.05$).

In the communication aspect of platform services, scan data exchange was highly important (Table 2, $P < 0.05$), as it provides opportunities for immediate communication.[16] Small dental laboratories with insufficient digital case submissions may face difficulties in integrating digital workflows.[17] Consequently, a high demand for the development of stable, affordable platform services that can be widely disseminated among dental professionals was found in this study (Table 2, $P < 0.05$).

In this study, the importance of specific survey items significantly varied depending on age, occupation, and career experience. Occupation-related differences were found in the dental prosthetic environment, with dentists and dental hygienists prioritizing order schedules (Table 3, $P < 0.05$). This is likely because as professionals closely involved with patients, they value schedule management connected to patient appointments to maintain service quality in dental clinics.[18] Dental technicians place importance on client management (Table 3, $P < 0.05$) as the primary clients for dental laboratories are dental clinics, and their relationship with clinics is a crucial factor in laboratory operations.[18]

Furthermore, secure digital transmission of patient information is essential in compliance with privacy and protection regulations.[5] In line with a previous study showing that older workers are more aware and compliant with data protection policies,[19] respondents aged 40 years and above in this study considered data cloud security of prosthetic order platform services to be important (Table 3, $P < 0.05$). Therefore, cloud providers need to pay significant attention to security and privacy and ensure that all data is encrypted and backed up.[20] Currently, blockchain technology is being implemented in the storage and sharing of patient medical information.[21] However, there are challenges associated with the adoption of blockchain technology in dental healthcare, such as regulatory barriers, technical limitations, and the need for specialized knowledge.[21]

Individual characteristics, such as age and professional experience, may inhibit investment in digitalization.[22] In the present study, the respondents in their 20s and 30s with less than 3 years of professional experience expressed concern regarding dual workloads due to the negative impact of dental prosthesis order platform services (Table 3, $P < 0.05$). This finding is consistent with that of previous study, which found that although younger individuals are more exposed to digital technology, their digital proficiency is not necessarily equivalent.[23] As current digital dentistry has not yet been fully integrated into a universally accepted workflow, concerns regarding transition to digital practices are expected.[17]

To date, no studies on dental prosthesis order platform services have been conducted. This study is significant as it verified the requirements of dental prosthesis order platform services and the importance of paper order forms while considering differences in age, profession, and professional experience to derive the direction of platform services. However, this study targeted only Korean dental professionals, and the sample may not be representative of the entire population. The generalization of the findings is limited by the small sample size; therefore, further study involving dental professionals from diverse ethnic backgrounds is warranted.

Conclusion

This study investigated the importance and requirements of dental prosthesis order platform services. The results indicate that convenience in data transmission and storage, the development of stable and affordable platform services are essential requirements for dental prosthesis orders. In addition, the importance of these requirements varied depending on age, occupation, and professional experience, with respondents aged 40 years and above showing greater awareness of cloud security in digital data transmission. The findings can serve as important indicators for the development and improvement of dental prosthesis order platform services.

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ORCID

Gyu-Ri Kim https://orcid.org/0009-0009-1679-0469
Keunbada Son https://orcid.org/0000-0002-3177-8005
Du-Hyeong Lee https://orcid.org/0000-0003-2803-7457
So-Yeun Kim https://orcid.org/0000-0001-8936-6110
Myoung-Uk Jin https://orcid.org/0000-0001-9263-047X
Kyu-Bok Lee https://orcid.org/0000-0002-1838-7229

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치과 보철물 거래 플랫폼 서비스의 중요성과 요구사항: 치과 전문가 설문조사

김규리[1,2†] 대학원생, **손큰바다**[2†] 연구교수, **이두형**[3] 부교수, **김소연**[3] 조교수, **진명욱**[4*] 부교수, **이규복**[2,3*] 교수

[1]경북대학교 일반대학원 치의과학과

[2]경북대학교 첨단치과의료기기개발연구소

[3]경북대학교 치과병원 치과보철학교실

[4]경북대학교 치과병원 치과보존학교실

목적: 본 연구는 치과 보철물 거래 플랫폼 서비스의 중요성을 이해하고, 보다 넓은 적용을 위해 필수 요소를 파악하는 것을 목표로 하였다.

연구 재료 및 방법: 치과 의사, 치과 기공사, 치과 위생사, 그리고 치과 산업 종사자들을 대상으로 치과 보철물 주문 및 관련 플랫폼 서비스에 대한 견해를 평가하기 위해 설문 조사를 실시하였다(총 53명). 이를 위해 설문지는 치과 전문가의 검토를 거쳐 작성되었고, Cronbach's alpha coefficient를 사용하여 설문지의 신뢰도를 평가하였다. 요인 분석을 통해 총 변동의 88.417%를 설명하는 5개 범주의 57개 요인을 도출했다. 설문 조사는 온라인 설문지 플랫폼을 통해 실시되었으며, 데이터 분석은 통계 소프트웨어를 사용하여 one-way analysis of variance과 Tukey's honestly significant difference test을 사용하여 수행되었다($\alpha = 0.05$).

결과: 주문 시에 정확한 정보 입력, 효과적인 의사소통, 변형 없는 치과 인상체 전달, 데이터 전송 및 저장의 편리성, 안정적이고 합리적인 가격의 플랫폼 서비스 제공이 필수 요소로 확인되었다($P < 0.05$). 또한, 이러한 항목의 중요성에는 연령, 치과 직업, 경력 경험에 따른 유의한 차이가 관찰되었다($P < 0.05$).

결론: 치과 보철물 주문 플랫폼 서비스에 대한 치과 종사자들의 요구사항은 안정성과 경제성, 그리고 치과 보철물 데이터 전송 및 저장의 용이성이었다. 이러한 결과는 앞으로 치과 보철물 주문 및 관련 플랫폼 서비스의 개발 및 개선을 위한 중요한 지표가 될 수 있다.

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주요어: 치과 건강 서비스; 치과의사; 치과기공사; 치과위생사; 치과 보철물

*교신저자: 이규복
(419470)대구광역시 중구 달구벌대로 2177 경북대학교 치과대학 치과보철학교실, 첨단치과의료기기개발연구소
Tel: 053-600-7674 | Fax: 053-426-7661 | E-mail: kblee@knu.ac.kr
*교신저자: 진명욱
(419470)대구광역시 중구 달구벌대로 2177 경북대학교 치과대학 치과보존학교실
Tel: 053-660-6925 | Fax: 053-426-7661 | E-mail: musljin@knu.ac.kr
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