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RESEARCH ARTICLE

Analysis of Needs for Clinical Dental Hygienist's Performances Using Borich Needs Assessment and the Locus for Focus Model

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Background: This study aimed to identify the present level and needs of clinical dental hygienists and to present the Borich needs assessment and the locus for focus model as integrated priorities.

Methods: The participants of this study were dental hygienists working in dental clinics (hospitals). The final data of the 194 participants were analyzed using frequency analysis and a paired sample t-test. To analyze the need for clinical dental hygienists to perform work, the Borich priority determination formula was used. The x-y plane consisting of four quadrants was used to analyze the need using the locus for focus model, which helps to determine the priority while showing visual effects.

Results: "Scaling" was the highest required level for clinical dental hygienists, and "panorama taking" was the highest present level. The priorities of educational needs were systematically and visually derived from dental hygienists who were currently working through the Borich needs assessment and the locus for focus model for each task performed in the clinical field. Through the priorities of these two models, a total of 13 items appeared in the common high-level area; "oral health care (disability)," "oral health care (systemic disease)," "applying a rubber dam," "professional mechanical tooth cleaning," "root planing," "taking vital signs," "medication counseling," "wire cutting," "removing cement after removing band/bracket," "delivering bracket," "preparing mini-screw implantation," "dental insurance claim," and "patient reception."

Conclusion: Based on the results, the department of dental hygiene should maintain and improve the standardized clinical practice curriculum and clinical dental hygienists' practical skills and contribute to the realization of the legal scope of dental hygienists, reflecting the requirements of clinical fields.

Key Words: Dental hygienist, Dental scaling, Oral health, Orthodontics, Rubber dams

Introduction

1. Background

The dental hygienist is a licensed primary healthcare professional, oral health educator, and clinician who provides preventive, educational, and therapeutic services supporting total health for the control of oral diseases and provides general and specialty dental practices, programs for research, professional education, and community health[1].

Approximately 5,000 dental hygienists graduate through the department of dental hygiene in Korea[2]. In 2021, High Education in Korea showed an employment rate of 82.4%[3], and according to the health and medical personnel survey reported by the National Health Insurance, the number of licensed dental hygienists from 2010 to 2020 was 88,422[4]. However, in 2020, the number of dental hygienists working at dental hospitals (clinics) was 46,303, and the number of dental clinics nationwide was 18,607, which was approximately a 2.5% increase over 5 years[5]. Recently, issues have been raised by dental hygienists regarding difficulties due to manpower shortage, despite them playing an important role in the clinical field[6].

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The causes of difficulties in manpower management for dental hygienists include turnover and career interruptions. In particular, the turnover rate of dental hygienists working at medical institutions was 31.9% as of 2020, which is higher than the 27.1% turnover rate of nurses in similar occupations[7].

The various factors affecting the intention of dental hygienists to change jobs were stress[8,9] caused by the inconsistency between the actual work performed and work prescribed by the law and disappointment and skepticism[10] caused by the difference between occupational expectations and the working field. Dental hygiene education consists of theory-oriented lectures and practical training skills; therefore, after graduation, the confusion regarding the actual role in the dental medical field is due to the need for various dental hygiene performances centered on individual patients[11].

Kim et al.[12] analyzed clinical dental hygienists' performance according to clinical practice contents by dividing them into "observation," "preparation," "performance," and "education." It has been reported that there is a difference in the importance of the practice and that of the work recognized by dental hygienists when analyzing the importance of each treatment in the dental clinic. Kim et al.[13] examined the frequency of duties performed by dental hygienists, the importance of duties as per dental hygienists, and the necessity of education, and presented them as basic data for the development of a curriculum corresponding to changes and demands of the times, expansion of duties of dental hygienists, and improvement of status. Additionally, to investigate the actual work of clinical dental hygienists, Hwang and Han[14] directly observed the frequency and time required for each treatment in the field and derived the improvement items to be included in the legal work by reflecting the actual work of the dental hygienist.

To secure the professionalism of clinical dental hygienist work and improve the qualitative capacity, it is necessary to have the dental hygiene practical ability to meet the rapid change of the medical environment and the demand in the field. Thus, it is necessary to prioritize the educational content to objectively and systematically reflect the needs of clinical dental hygienists rather than simply examining them.

There is a need for education to narrow the gap between dental hygiene education and practice and to cultivate the competencies required in the medical field; however, there is no standardized dental hygiene job ability. Therefore, evaluation criteria based on validity and reliability must be established to understand the performance skills required by dental hygienists in the medical field and evaluate their level of job performance[15].

2. Objectives

This study aimed to identify the present and required level of education for clinical dental hygienists. Additionally, the Borich needs assessment and the locus for focus model are presented as an integrated priority to provide basic data for the development of a standardized curriculum and dental hygienist job performance evaluation tools that reflect the needs of the medical field as closely as possible.

Materials and Methods

1. Ethic statement

This study was approved by the Institutional Review Board of Daejeon Health Institute of Technology (No. 1041490-20220222-HR-006).

2. Study design

The purpose and method of the survey were explained to dental hygienists working in dental hospitals and clinics between March 22 and April 20, 2022. After the explanation, consent to participate in the study was obtained and if they did not agree to participate in the study, they could withdraw at any time. The self-written questionnaire and online survey methods were combined.

3. Participants

The participants in this study were dental hygienists working in local dental clinics (hospitals) such as Daejeon, Chungnam, Sejong, Cheongju, and Gyeonggi. The number of study participants was calculated using the G*Power 3.1.9.2 program with a significance level of 0.05, an effect size of 0.23, and a power of 90%. Similar to previous

studies, the minimum sample size was 164. Considering previous studies and the dropout rates, 200 participants were selected for this study. A total of 194 data points were used for the final analysis, excluding six data points for which the questionnaire was discontinued or the responses were insincere.

4. Study variables

The general characteristics consisted of five items: sex, age, education level, clinical work career, and type of dental institution. Educational level was classified into four categories: bachelor's, master's, and doctoral degrees. Dental institutions were classified into three categories: dental clinics, dental hospitals, and university dental hospitals. To evaluate the needs of clinical dental hygienists, the present and required levels were selected using a Likert 5-point scale for 120 items[16], which are the tasks presented in the second job description of dental hygienists[17] and frequency of tasks performed by actual dental hygienists[18].

5. Statistical methods

1) Analysis of the present and required levels of clinical dental hygienist performance needs

The general characteristics of the participants were analyzed by frequency analysis, and the present and required level of the clinical dental hygienist's performance needs items were calculated using average and standard deviation. Additionally, a paired-sample t-test was conducted to verify the differences between the present and required levels. The data collected in this study were analyzed using the IBM SPSS statistical program (version 20.0; IBM Corp., Armonk, NY, USA).

2) Borich needs assessment

To analyze the need for clinical dental hygienists to perform work, the Borich priority determination formula[19] was used. In Borich's needs, "required level" refers to the desired level of competency, which is "what should be" for a competency that is desired. "Present level" refers to "what is," as determined by learners in their current states, and denotes the level of self-efficacy in translating their competency into practice. By weighing the required level, the difference between the required and present level is multiplied by the average of the required level, and the resulting values are sequentially listed to determine the priority according to the order value (Fig. 1).

$$BPD=\frac{\Sigma_i^n(RCL-PCL)\times avg.(RCL)}{N}$$

Fig. 1. Borich priority determination formula. RCL: required competency level, each individual's importance score, PCL: present competency level, each individual's performance score, avg.: average of importance by each competency.

3) The locus for focus model

The *x*-*y* plane consisting of four quadrants was used to analyze the need using the locus for focus model[20], which helps to determine the priority while showing visual effects (Fig. 2). In this model, the items are listed on the coordinate plane, the graph is created using the difference between the present and required level, and the items to be considered first can be observed[21]. The line parallel to the *y*-axis indicates the value of the discrepancy between the required and present level, and the line parallel to the *x*-axis indicates the average of the required level. The first quadrant, which is higher than the average required level and higher than the average discrepancy, represents the area with the highest priority for educational needs among the four quadrants. The second quadrant (high discrepancy/low importance, HL) represents lower-than-average importance; however, a higher degree of discrepancy than the average. This indicates the second highest priority because

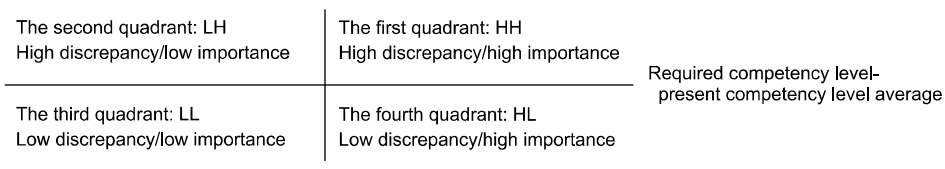

Fig. 2. The locus for focus model. LH: low-high, LL: low-Low, HH: high-high, HL: high-low.

Table 1. The Needs and Priorities for the Performance of Clinical Dental Hygienist

No.	Specific educational needs	Required level mean	Present level mean	Difference mean	t	p-value	Borich priority	Rank	Quadrant
1	Pit and fissure sealant	4.64	4.08	0.56	7.367	<0.001	2.67	49	IV (HL)
2	Oral health care (Disability)	4.08	2.91	1.17	15.427	<0.001	4.78	7	I (HH)
3	Oral health care (Pregnant)	4.18	3.39	0.79	10.814	<0.001	3.32	34	I (HH)
4	Oral health care (Hypersensitivity)	4.41	3.94	0.46	6.474	<0.001	2.45	60	IV (HL)
5	Oral health care (Dry mouth)	4.03	3.13	0.90	11.112	<0.001	3.62	25	II (LH)
6	Oral health care (Halitosis)	4.00	3.11	0.89	10.189	<0.001	3.55	28	II (LH)
7	Oral health care (Child/adolescent)	4.55	3.96	0.59	8.906	<0.001	2.67	48	IV (HL)
8	Oral health care (Older adult)	4.65	4.31	0.34	5.696	<0.001	1.58	90	IV (HL)
9	Oral health care (Tabacco cessations)	4.34	3.84	0.50	6.265	<0.001	2.17	72	I (HH)
10	Oral health care (Systemic disease)	4.43	3.47	0.95	12.048	<0.001	4.22	13	I (HH)
11	Oral health care (Eating disorder)	3.72	2.46	1.25	14.679	<0.001	4.66	8	II (LH)
12	Neutritional counseling	3.34	2.34	1.00	11.482	<0.001	3.34	33	II (LH)
13	Tooth brushing instruction	4.73	4.41	0.32	5.594	<0.001	1.51	93	IV (HL)
14	Oral care products prescription and education	4.71	4.12	0.58	8.823	<0.001	2.74	45	IV (HL)
15	Measuring halitosis	3.37	2.35	1.02	11.254	<0.001	3.45	32	II (LH)
16	Applying desensitizing agents	4.37	4.05	0.32	4.350	<0.001	1.39	95	IV (HL)
17	Applying fluorides	4.48	4.22	0.26	3.726	<0.001	1.15	103	IV (HL)
18	Oral microorganism test	3.16	2.03	1.13	11.121	<0.001	3.57	27	II (LH)
19	Measuring dental plaque	3.91	3.17	0.74	7.377	<0.001	2.94	39	II (LH)
20	Dental hygiene care charting	4.49	4.04	0.46	6.506	<0.001	2.63	52	IV (HL)
21	Caries activity test	3.53	2.37	1.16	12.786	<0.001	4.80	5	II (LH)
22	Permanent cementation	3.96	3.81	0.16	1.765	0.079	0.61	111	III (LL)
23	Temporary cementation	4.49	4.23	0.26	3.499	<0.001	1.16	101	IV (HL)
24	Gingival retraction: cord packing	4.49	4.02	0.48	6.335	<0.001	2.15	74	IV (HL)
25	Making a temporary crown	4.60	3.85	0.75	8.378	<0.001	3.46	31	I (HH)
26	Setting a temporary crown	4.55	4.12	0.43	5.775	<0.001	1.95	77	IV (HL)
27	Removing improperly prostheses	3.45	3.11	0.34	3.723	<0.001	1.16	102	III (LL)
28	Excess cementation removal	4.72	4.43	0.29	4.503	<0.001	1.36	96	IV (HL)
29	Final polishing of protheses	4.08	3.67	0.41	4.482	<0.001	1.68	86	IV (HL)
30	Dental shade selection	4.29	3.65	0.64	7.749	<0.001	2.74	44	I (HH)
31	Bite registration	4.61	4.18	0.44	5.969	<0.001	2.21	70	IV (HL)
32	Dental impression taking: Alginate	4.79	4.44	0.35	5.770	<0.001	1.68	87	IV (HL)
33	Dental impression taking: Rubber	4.71	4.18	0.53	7.737	<0.001	2.51	56	IV (HL)
34	Dental impression taking: CEREC®	4.02	2.83	1.19	13.004	<0.001	4.79	6	II (LH)
35	Making personal tray for final impression	3.49	2.65	0.84	8.653	<0.001	2.91	40	II (LH)
36	Mixing cement and bonding agent	4.68	4.45	0.22	3.741	<0.001	1.36	97	IV (HL)
37	Making a study cast	3.97	3.46	0.51	6.033	<0.001	2.50	57	III (LL)
38	Making a master cast	3.64	3.04	0.61	7.625	<0.001	2.22	69	II (LH)
39	Making bleaching tray	3.54	2.81	0.73	7.825	<0.001	2.59	53	II (LH)
40	Counseling for dental materials	4.56	3.89	0.67	9.288	<0.001	3.57	26	I (HH)
41	Removing crown button	3.82	3.38	0.44	4.857	<0.001	1.70	85	III (LL)
42	Preparing for dental treatment	4.75	4.53	0.22	3.658	<0.001	1.53	92	IV (HL)
43	FC, CP et al. change	3.61	3.28	0.33	3.782	<0.001	1.19	99	III (LL)
44	Tooth separation	4.53	4.41	0.12	1.790	0.075	0.54	113	IV (HL)
45	Amalgam polishing	2.36	2.43	−0.07	−0.564	0.573	0.16	115	III (LL)
46	Applying a rubber dam	4.34	3.63	0.71	8.673	<0.001	3.65	22	I (HH)
47	Placing a tofflemire matrix system	4.38	3.79	0.59	7.120	<0.001	2.57	54	IV (HL)
48	Temporary sealing	4.50	4.34	0.16	2.799	0.006	0.72	110	IV (HL)
49	Removing temporary filling material	4.51	4.31	0.20	2.581	0.011	0.97	106	IV (HL)

Table 1. Continued

No.	Specific educational needs	Required level mean	Present level mean	Difference mean	t	p-value	Borich priority	Rank	Quadrant
50	Testing pulp vitality	3.33	2.64	0.69	7.297	<0.001	2.33	62	II (LH)
51	Tooth whitening	3.81	3.02	0.79	7.780	<0.001	3.24	35	II (LH)
52	Preparing almalgam materials	2.28	2.46	−0.18	−1.564	0.119	0.42	117	III (LL)
53	Dental treatment suction assist	4.78	4.51	0.27	4.733	<0.001	1.29	98	IV (HL)
54	Precautions for dental treatment	4.85	4.53	0.32	6.118	<0.001	1.55	91	IV (HL)
55	Measuring and recording furcations	3.34	2.64	0.70	7.709	<0.001	2.33	63	II (LH)
56	Measuring and recording BOP	3.19	2.53	0.67	7.728	<0.001	2.12	76	II (LH)
57	Measuring and recording CAL	3.00	2.38	0.62	7.702	<0.001	1.87	80	II (LH)
58	Measuring and recording pocket depth	4.04	3.47	0.56	6.798	<0.001	2.27	65	IV (HL)
59	Rubber cup polishing	4.47	4.22	0.25	3.637	<0.001	1.14	104	IV (HL)
60	Professional mechanical tooth cleaning	4.08	3.04	1.04	10.925	<0.001	4.22	12	I (HH)
61	Scaling	4.90	4.59	0.30	6.100	<0.001	1.49	94	IV (HL)
62	Root planing	4.31	3.60	0.71	8.506	<0.001	3.69	20	I (HH)
63	Applying local antimicrobial	3.61	3.12	0.49	2.204	0.029	1.77	83	III (LL)
64	Measuring and recording mobility	3.98	3.44	0.55	6.795	<0.001	2.18	71	III (LL)
65	Placing periodontal pack	3.95	3.23	0.72	8.022	<0.001	2.85	42	II (LH)
66	Precautions for surgical treatment	4.78	4.53	0.25	4.332	<0.001	1.18	100	IV (HL)
67	Surgical dental treatment assist	4.73	4.35	0.38	5.729	<0.001	1.78	82	IV (HL)
68	Drain change	3.21	2.69	0.52	5.179	<0.001	1.67	88	III (LL)
69	Removing implant screw	3.42	2.77	0.66	6.604	<0.001	2.25	68	II (LH)
70	Suture and stich out	4.04	4.05	−0.01	−0.114	0.909	0.42	116	III (LL)
71	Dressing	4.18	4.29	−0.11	−1.373	0.171	0.47	119	IV (HL)
72	Management of dental emergencies	4.44	3.85	0.59	7.900	<0.001	2.64	51	IV (HL)
73	Preparing for surgical dental treatment	4.70	4.33	0.37	6.129	<0.001	1.74	84	IV (HL)
74	Preparing extraction	4.75	4.60	0.16	2.943	0.004	0.73	109	IV (HL)
75	Preparing biopsy	3.75	2.81	0.94	10.494	<0.001	3.52	29	II (LH)
76	Preparing local anesthesia	4.76	4.74	0.02	0.464	0.643	0.98	105	IV (HL)
77	Topical anesthetics	4.59	4.69	−0.10	−1.681	0.094	0.45	118	IV (HL)
78	Infection control	4.78	4.33	0.45	7.416	<0.001	2.17	73	IV (HL)
79	Taking vital signs	4.60	3.47	1.13	4.172	<0.001	5.20	2	I (HH)
80	Intramuscular injection	3.45	2.54	0.91	7.416	<0.001	3.13	37	II (LH)
81	Preparation for window opening	4.10	3.64	0.46	5.752	<0.001	1.88	79	IV (HL)
82	Medication counseling	4.34	3.39	0.95	11.565	<0.001	4.14	15	I (HH)
83	Medical and dental history taking	4.64	4.05	0.60	8.609	<0.001	2.78	43	IV (HL)
84	Wire cutting	4.07	3.31	0.75	6.973	<0.001	3.67	21	I (HH)
85	Bonding bracket	3.09	2.21	0.88	8.701	<0.001	2.73	47	II (LH)
86	Debonding bracket	3.29	2.49	0.80	7.219	<0.001	2.65	50	II (LH)
87	Debonding band	3.24	2.48	0.76	7.143	<0.001	2.47	59	II (LH)
88	Removing ligature wire	4.01	2.93	1.08	8.975	<0.001	4.34	10	II (LH)
89	Orthodontic band shape adjustment	3.13	2.15	0.97	9.103	<0.001	3.48	30	II (LH)
90	Retainer adjustment	3.89	2.81	1.08	10.102	<0.001	4.19	14	II (LH)
91	Removing cement after removing band/bracket	4.22	3.34	0.88	8.746	<0.001	3.72	18	I (HH)
92	Making wire	2.95	1.92	1.04	9.705	<0.001	3.62	24	II (LH)
93	Delivering bracket	4.31	3.27	1.04	9.422	<0.001	4.46	9	I (HH)
94	Applying elastic	4.01	2.95	1.06	9.327	<0.001	4.26	11	II (LH)
95	Making orthodontic models	4.07	3.18	0.89	8.514	<0.001	3.63	23	I (HH)
96	Photo taking for orthodontics	4.36	3.11	1.24	12.055	<0.001	5.42	1	IV (HL)
97	Preparing mini-screw implantation	4.06	3.12	0.93	9.071	<0.001	3.78	17	I (HH)
98	Taking periapical radiography	4.84	4.40	0.44	8.488	<0.001	2.13	75	IV (HL)
99	Taking bitewing radiography	3.94	3.01	0.94	10.097	<0.001	3.70	19	II (LH)

Table 1. Continued

No.	Specific educational needs	Required level mean	Present level mean	Difference mean	t	p-value	Borich priority	Rank	Quadrant
100	Taking occlusal projection	3.61	2.81	0.80	8.709	<0.001	2.88	41	II (LH)
101	Taking panorama	4.86	4.74	0.12	2.955	0.004	0.58	112	IV (HL)
102	Taking cephalometric radiography	4.59	3.89	0.70	8.040	<0.001	3.22	36	I (HH)
103	Taking computed tomography	4.59	4.24	0.35	5.221	<0.001	1.58	89	IV (HL)
104	Radiographic interpretation	4.30	3.67	0.63	8.107	<0.001	2.73	46	I (HH)
105	X-ray film developing	2.11	2.41	−0.30	−2.934	0.004	0.63	120	III (LL)
106	Preparing radiography	4.62	4.56	0.06	1.008	0.315	0.26	114	IV (HL)
107	Managing radiographs	4.24	4.06	0.18	2.923	0.004	0.76	107	IV (HL)
108	Physical therapy in head and neck	2.70	1.96	0.74	8.628	<0.001	2.49	58	II (LH)
109	Heat pack therapy in head and neck	2.59	1.89	0.70	8.893	<0.001	1.81	81	II (LH)
110	Exercise therapy	2.75	1.93	0.82	9.675	<0.001	2.25	67	II (LH)
111	Head and neck ultrasonography	2.59	1.72	0.87	10.54	<0.001	2.26	66	II (LH)
112	Oral muscle massage	3.31	2.07	1.24	12.528	<0.001	4.94	3	II (LH)
113	Laser equipment management	3.45	2.59	0.86	9.017	<0.001	2.97	38	II (LH)
114	Managing prostheses	4.38	3.92	0.46	6.762	<0.001	2.33	64	IV (HL)
115	Dental insurance claim	4.58	3.52	1.07	12.206	<0.001	4.89	4	I (HH)
116	Maintenance and repair of facilities	3.34	3.11	0.23	2.651	0.009	0.76	108	III (LL)
117	Maintenance and repair of dental equipment	3.73	3.22	0.51	6.806	<0.001	1.92	78	III (LL)
118	Dental goods management	4.52	3.99	0.52	7.188	<0.001	2.36	61	IV (HL)
119	Document management	4.13	3.52	0.62	7.455	<0.001	2.56	55	I (HH)
120	Patient reception	4.40	3.52	0.89	9.568	<0.001	3.93	16	I (HH)

BOP: bleeding on probing, CAL: clinical attachment loss, LH: low-high, LL: low-low, HH: high-high, HL: high-low.

it is necessary to understand the low importance and increase performance. In the third quadrant, the degree of discrepancy between the two levels and the required level are both low (LL). In the fourth quadrant, the degree of discrepancy between the two levels is low; however, the required level is high (HL). Therefore, the items in the first quadrant are the most demanding and have the highest priority.

Results

1. General characteristics of participants

In this study, 187 women (96.4%) and seven men (3.6%) were clinical dental hygienists, with ages ranging from 22 to 55 years. Their average age was 30.18 years, and the average clinical work career time was 7 years and 5 months. In addition, the education level of the participants consisted of college (54.1%), bachelor's (34.0%), master's (7.2%), or doctoral degrees (4.6%). Regarding the type of dental institution, 113 (58.2%) were working in dental clinics, 31.4% in dental hospitals, and 10.3% in university dental hospitals.

2. Borich needs assessment analysis of needs for clinical dental hygienist performances

Among the 120 items performed by clinical dental hygienists, the average score of the required level and the present level was 4.04 and 3.44, respectively. "Scaling" and "taking panorama" showed high levels of need in the order of 4.90 and 4.86, respectively. A paired t-test was used to analyze the discrepancy between the present and required levels; significant differences were found in 111 items ($p<0.05$). Additionally, by applying the Borich need assessment formula, the priority of items for clinical dental hygienists was derived, and "photograph taking for orthodontics" showed the highest need at 5.42. Items in the top 10 of Borich priority included: "taking vital signs," "oral muscle massage," "dental insurance claim," "caries activity test," "dental impression taking: CEREC®," "oral health care (disability)," "oral health care (eating disorder)," "delivering bracket," and "removing ligature wire," in that order (Table 1).

3. The locus for focus model of needs for clinical dental hygienist performance

The results of visualizing the priority using the locus for focus model are shown in Fig. 3. As a result of the analysis, the average of the required level (*x*-axis) for the clinical dental hygienists' performance was 0.61. The mean discrepancy between the required and present level (*y*-axis) was 4.04. Higher than average on both the *x* and *y* axes, 22 items corresponded to the first quadrant (HH): "oral health care (disability)," "oral health care (pregnant)," "oral health care (tobacco cessations)," "oral health care (systemic disease)," "making a temporary crown," "dental shade selection," "counseling for dental materials," "applying a rubber dam," "professional mechanical tooth cleaning," "root planing," "taking vital signs," "medication counseling," "wire cutting," "removing cement after removing band/bracket," "delivering bracket," "making orthodontic models," "preparing mini-screw implantation," "taking cephalometric radiography," "radiographic interpretation," "dental insurance claim," "document management," and "patient reception."

4. The common priorities for the performance of clinical dental hygienists

This section involves checking for redundancy of items proposed as a high priority according to the Borich needs assessment model and locus for focus model. In the results using the locus for focus model, 22 items were included in the first quadrant (HH), and Borich needs and priorities were also selected for up to 22 items (Table 2). Through the priorities of these two models, a total of 13 items appeared in the common high-level area: "oral health care (disability)," "oral health care (systemic disease)," "applying a rubber dam," "professional mechanical tooth cleaning," "root planing," "taking vital signs," "medication counseling," "wire cutting," "removing cement after removing band/bracket," "delivering bracket," "preparing mini-screw implantation," "dental insurance claim," and "patient reception." The above items are the needs to be considered first among the 120 items of performance for clinical dental hygienists. In the locus for focus model, there were items that corresponded to the second quadrant (LH); however, in the Borich need assessment, they were ranked third, fifth, sixth, and eighth: "oral muscle massage," "caries activity test," "dental impression taking: CEREC®," and "oral health care (eating disorder)." These items can be sub-prioritized.

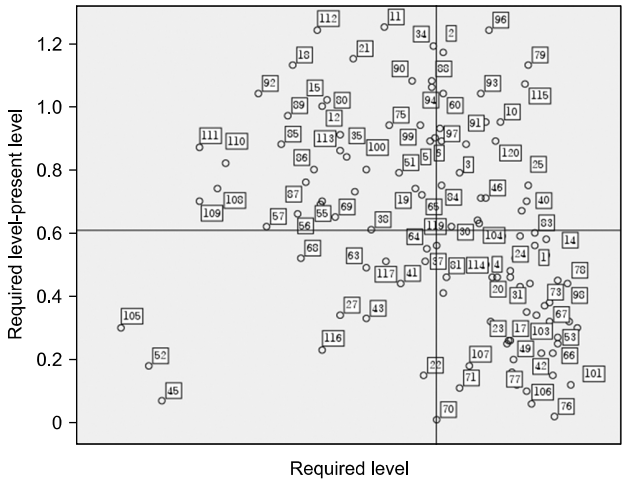

Fig. 3. The locus for focus model of needs for clinical dental hygienist performance.

Discussion

1. Interpretation

The Department of Dental Hygiene Education graduates licensed dental hygienists after completing 3 or 4 years of education in harmony with the depth of the major theory and practice-oriented curriculum. Additionally, it is possible to perform the tasks and various roles of dental hygienists required in the clinical field. In this process, the quality of practice can be further improved if practical dental hygiene performance can be performed together with clinical practice education, after identifying the importance of the dental hygienists' work[12]. This study aimed to identify the educational needs of clinical dental hygienists and to suggest priorities using the paired sample t-test, Borich needs, and the locus for focus model.

2. Comparison with previous studies

Among the 120 educational contents required for clinical dental hygienists' work, the performances with the highest required level were "scaling" and "taking panorama." Kim et al.[12] found that "scaling" was the most important aspect of dental hygienists' performance, indi-

Table 2. The Needs and Priorities for Performance of Clinical Dental Hygienists according to the Borich Needs Assessment and Locus for Focus Models

No.	Specific educational needs	Borich priority	The locus for focus model
2	Oral health care (Disability)	○	○
3	Oral health care (Pregnant)		○
9	Oral health care (Tabacco cessations)		○
10	Oral health care (Systemic disease)	○	○
11	Oral health care (Eating disorder)	○	
21	Caries activity test	○	
25	Making a temporary crown		○
30	Dental shade selection		○
34	Dental impression taking: CEREC®	○	
40	Counseling for dental materials		○
46	Applying a rubber dam	○	○
60	Professional mechanical tooth cleaning	○	○
62	Root planing	○	○
79	Taking vital signs	○	○
82	Medication counseling	○	○
84	Wire cutting	○	○
88	Removing ligature wire	○	
90	Retainer adjustment	○	
91	Removing cement after removing band/bracket	○	○
93	Delivering bracket	○	○
94	Applying elastic	○	
95	Making orthodontic models		○
96	Photo taking for orthodontics	○	
97	Preparing mini-screw implantation	○	○
99	Taking bitewing radiography	○	
102	Taking cephalometric radiography		○
104	Radiographic interpretation		○
112	Oral muscle massage	○	
115	Dental insurance claim	○	○
119	Document management		○
120	Patient reception	○	○

cating that it is an item that requires more thorough education on scaling than other performances. Scaling is the most skilled performance among the core basic dental hygiene competencies presented by the Dental Hygiene Education Evaluation Institute and requires the highest proficiency in dental hygiene practice[22]. Mostly, dental hygienists perform scaling using an ultrasonic scaler rather than that for a hand- held instrument. Scaling is the main performance of dental hygienists[23]. Scaling has been extended to insurance items since July 2013, patients who are over 19 years old have been provided benefits once a year[24], and the number of scaling patients has also increased[25]. The Department of Dental Hygiene devotes considerable educational time to practicing periodontal instrumentation classes and simulation evaluation classes in preparation for practical testing in the National Dental Hygienist Examination[23]. It is necessary to present a dental hygiene curriculum that reflects the reality of the clinical field, which is highly dependent on ultrasonic scaling. As a result of a study on the awareness of dental hygienists regarding the content of clinical practice education and the importance of duty, the score for “extraoral radiography” was the highest in oral and maxillofacial radiology. Due to the nuclear safety act, the department of dental hygiene students cannot practice on each other during oral and maxillofacial radiology practice classes;

therefore, they practice with a mannequin model. For this reason, there are cases in which students cannot be put into practice immediately after graduation and need to receive retraining in the dental clinic[12].

Using the priorities of the locus for focus model and the Borich needs assessment model, a total of 13 items appeared in the common high-level area. The first group included "oral health care (disability)," "oral health care (systematic disorder)," "taking vital signs," and "medication counseling" items. A dental hygiene process is a systematic approach to dental hygiene care used by dental hygienists and involves five key behaviors. The key behaviors, also known as steps, are assessment, diagnosis, planning, implementation, and evaluation[1]. During dental hygiene assessment, the use of critical decision-making skills to reach conclusions regarding the patient's dental hygiene needs is based on all available data and evidence in the literature. Competencies for this include medical history taking, health status, drug medication status, and risk factors. The dental hygiene process has been introduced into the domestic department of the dental hygiene curriculum, and education is currently being conducted at many universities[26], and various studies such as clinical practice[27] and cases[28] are being conducted. As a result of the survey of clinical dental hygienists, the performance rate of dental and medical history, and vital sign-taking was higher than that in previous studies[29]. In another study[30], the need for clinical dental hygienists for the advanced dental hygienist system was high, and that for the older adults and individuals with disability for dental hygiene processes was the highest in each field. Moreover, by field, the need for dental hygiene processes for older adults and individuals with disability was the highest. In the clinical field, a dental hygienist is required to perform patient-centered comprehensive management as an expert by evaluating the patient overall. In the setting where significant effort is devoted to preparation and assistance for treatment[31], legal and institutional arrangements are required to develop and establish the autonomous performance of dental hygienists to provide useful dental services not only for patients but also for dental hygienists and dentists.

The performance of dental insurance claims and "patient reception" was also included in the high priorities of the two models. In Kim et al.'s study[13], the frequency of business management support was the highest. In addition, the study by Hwang and Han[14] showed that the performance of patient reception and hospital management took up a considerably high frequency and required time. Dental hygienists are the most suitable persons for dental health insurance claims, and the need for dental hygienists for dental fee claims is very high. Additionally, dental health insurance claims are necessary not only for the person in charge, but also for patient counseling and treatment[32]. Health insurance claims had the highest need for desired continuing education content for clinical dental hygienists[33]. New insurance policies, expanded health insurance coverage, and a shift in perspective on public health have increased medical needs, and the number of medical treatments and expenses of medical institutions has increased. Thus, the importance and expertise of dental health insurance claims in dental institutions are required.

Orthodontic treatment performances such as "wire cutting," "removing cement after removing the bracket," "delivering bracket," and "preparing mini-screw implantation" were commonly included in high priority. In a study on the frequency and duration of actual duties of dental hygienists, the frequency of performances such as "assistance of fixed orthodontic treatment" and "ligating and removing wires" were high in the orthodontic treatment performance part[14]. As the need for orthodontic treatment increases, orthodontists are also making efforts to increase patient satisfaction. The professionalism of medical staff had the greatest effect on orthodontic treatment satisfaction[34]. In orthodontic treatment, it is necessary to improve the knowledge, behaviors, and attitudes of dentists as well as dental hygienists regarding various tasks performed.

"Professional mechanical tooth cleaning" and "root planning" tasks were also commonly included in high priority. In a study on the frequency of dental hygienist performance, among the part of periodontics, "root planing" showed the highest frequency after "scaling"[35]. Additionally, a high rate was shown in the future-oriented work of dental hygienists[35]. In the evaluation of dental

hygienists' job validity according to the judgment standard of medical practice in medical law, "professional tooth cleaning" and root planing were classified into level 4 groups, requiring performance difficulty and expertise[16]. It is necessary to expand the scope of dental hygienists' work in consideration of the negative impact on the health and safety of patients if proper education and verification of performance are not provided.

Finally, "applying rubber dam" was included as a high priority. Rubber dams are used in dental treatment for patient protection, infection control, and treatment efficiency. Despite these strengths, there have been reports that they are not used well due to time consumption, insufficient practice, difficulty in use, lack of experience, laziness, and low cost[36].

Patients who visited the dentist were highly satisfied with the use of rubber dams and responded that they were needed in all dental fields[37]. To reflect the patient's needs and reduce aerosol emission and cross-infection that occurs during the treatment process, sufficient education on rubber dam application should be provided at universities.

3. Limitations

This study has limitations owing to its cross-sectional design, and care should be taken when generalizing results from a study targeting dental hygienists in specific regions. Additionally, since the contents of the dental hygienist job used as a tool did not fully reflect the contents of the recently changed clinical field, new developments are needed in the future.

4. Generalizability

This study is meaningful in that it systematically and visually derived the priority of educational needs through various educational needs analysis methods for dental hygienists currently working in clinical practice and provides basic data for the standardized curriculum with the department of dental hygiene and the development of assessment tools for dental hygienists' job performance.

5. Suggestions

Based on the results of this study, the performance tasks of dental hygienists are a priority in the clinical field. In the department of dental hygiene, efforts should be made to standardize the curriculum of standardized clinical practice and capacity to maintain and improve clinical dental hygienists' practical skills. Furthermore, it will contribute to the realization of the legal scope of dental hygienists, reflecting the needs of the clinical field.

Notes

Conflict of interest

No potential conflict of interest relevant to this article was reported.

Ethical approval

This study was approved by the Institutional Review Board of Daejeon Health of Technology (IRB No. 1041490-20220222-HR-006).

Author contributions

Conceptualization: Yang-Keum Han and An-Na Yeo. Data acquisition: Yang-Keum Han and An-Na Yeo. Formal analysis: An-Na Yeo. Funding: Yang-Keum Han and An-Na Yeo. Supervision: Yang-Keum Han. Writing-original draft: Yang-Keum Han and An-Na Yeo. Writing-review & editing: Yang-Keum Han and An-Na Yeo.

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Data availability

Please contact the corresponding author for data availability.

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