
ORIGINAL

The utilization of the Diabetes Oral Health Assessment Tool[®] for Nurses by Diabetes Nurse Specialists

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Abstract Aim : To evaluate the utilization of the Diabetes Oral Health Assessment Tool (DiOHAT[®]) for Nurses by Diabetes Nurse Specialists (DNSs) in the clinical settings.

Methods : A survey was done using self-administered questionnaire distributed to 138 DNSs who signified continuing collaboration during the authors' previous study. The DNSs answered the questionnaire after utilization of the DiOHAT[®] in the clinical settings.

Results : Forty-seven DNSs responded (34.1%). The data revealed that items on cooperation with dental professionals (e.g., "regular dental visits" (88%), etc.) were frequently utilized, but those about oral function and self-care (e.g., "checking one's mouth with a mirror" (40%) and "use of supplementary tools" (44%), etc.) were rarely utilized. However, over 60% of DNSs evaluated the DiOHAT[®] utilization version on the "nursing-process" and "collecting-information" as "possible" or "possible if revised." Non-utilization of the DiOHAT[®] were due to insufficient time, and insufficient knowledge and skill.

Conclusion : The results of the study revealed the need for DNSs to increase their knowledge and skill about the content and use of the DiOHAT[®] e.g. oral function, and self-care, and to examine the coordination and division of roles between DNSs and dental specialists to support the oral health care of patients with diabetes.

Key words : diabetes nurse specialists, oral health behavior, assess, utilize

INTRODUCTION

The increase of diabetes disease is a worldwide social health problem and economic burden¹⁾, especially in Japan. Macrovascular complications, such as myocardial

infarction and stroke, are life-threatening. Moreover, advanced microvascular complications, such as blindness, end-stage renal failure and limb amputation, have a major impact on patients' quality of life. Another complication is periodontal disease²⁾. It is an inflammatory chronic reaction to biofilm accumulated around the teeth³⁾. Dental caries and periodontal disease are the common cause of tooth loss^{4,5)}. Some researchers have reported the bidirectional relationship between diabetes and periodontal disease. Furthermore, treatment for

Received for publication January 19, 2018 ; accepted March 14, 2018.

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periodontal disease is reported to have beneficial effects on the diabetes status by slightly lowering hemoglobin A1c (HbA1c) levels⁶⁻⁸).

This underlines the importance of patients with diabetes adopting good oral health behavior to prevent the onset and deterioration of the diseases. It was well known that the patient education was important in the diabetes care. The Certified Nurses in Diabetes Nursing (CNs) and Certified Nurse Specialists in Chronic Care Nursing (CNSs), were certified by the Japanese Nursing Association, were diabetes nurse specialists (DNSs) and had important roles to help patients' lives with diabetes. Some researchers reported that most nurses thought oral care was important for the patients, they believe their clinical oral care was inadequate because of shortage of time, awful oral condition, poor skill, and insufficient time⁹). However, knowledge, regarding oral health among patients with diabetes patients' oral health were relatively few based on retrieved research articles.¹⁰ Studies^{11,12} reported that health care professionals have important roles to educate patients about oral health and diabetes. It was pointed out that oral health education should be included in the diabetes education curriculum¹³. Studies have reported the efficacy of the work of interdisciplinary teams to support patients' treatment behavior¹⁴; however, only a few reports^{10,15} have discussed patients' oral health behavior. In order for nurses to support oral health behavior in patients with diabetes (i.e. nurses would be able to evaluate patients' oral status and oral health behaviors easily and simply¹⁰), authors developed the Diabetes Oral Health Assessment Tool (DiOHAT[®]) for nurses¹⁰. The tool was derived from interdisciplinary members. The Cronbach's alpha coefficient for all assessment items was 0.932, indicating high reliability¹⁰, which consists of 21 sub-items in four domains. It was investigated, recognized (necessity) and implemented (in the last 2 weeks) of DiOHAT[®], and found that the implementation scores were significantly lower than the recognition scores for all items ($p < 0.001$)¹⁰. These results showed that DNSs were not inclined to implement all items of DiOHAT[®], despite recognizing its importance¹⁰. Therefore, as for the further investigation,

to be utilized by DNSs (to support the oral health behaviors of patients with diabetes) in the clinical settings, authors created DiOHAT[®] version of "nursing-process" and "collecting-information" DNSs, who were very busy having many things to do for patients, could easily imagine assessing patients' oral conditions in a short time if authors demonstrated to them the DiOHAT[®] version of "nursing-process" and "information-collection."

Purpose of the Study

The purpose of this study was to evaluate the utilization of the DiOHAT[®] focused on the version emphasizing the utilization of the "nursing-process" and "information-collection" version by the DNSs.

METHODS

Participants of the Study

In the previous study¹⁰, 700 self-administered questionnaire copies were distributed. One aspect of the study included distribution of post cards mailed to the DNSs to determine if they would like to continue collaborating in future studies of the DiOHAT[®]. One-hundred and thirty-eight DNSs responded and returned the postcards. In this current study, 138 survey packets were sent to the DNSs.

Procedure for Data Collection

The data were collected from March 2015 to March 2016. In the survey packet, the 21-item DiOHAT[®] and two instruction sheets (version of "nursing-process" and version of "information-collection") and questionnaire sheets were mailed to the DNSs. In this DiOHAT[®] version focused on the "nursing-process," nurses could analyze patients' oral care (or oral conditions) by utilizing the 21 item DiOHAT[®]. In the nursing process section, nurses usually collect the patient's information, assess the patient's health problems, and make a nursing diagnosis. Afterwards nurses plan goals to perform interventions, perform interventions (nursing actions constituting nursing care), then evaluate their interventions based on these goals. In this study, the

authors discussed these aspects and showed examples of utilizing these processes.

In the DiOHAT® version of “*information-collection*,” nurses can collect patients’ information by utilizing the 21-item DiOHAT®. It was expressed in writing with larger and bolder texts to help with easy comprehension by patients.

Then, DNSs were requested to utilize these DiOHAT® version of the “*nursing-process*” and “*information-collection*” in their clinical settings. After that, they responded to the questionnaires provided. Because the information collected was not required later, and in order to protect personal information, DNSs were instructed that the information that had been stored for the original DiOHAT® version of the “*nursing-process*” and “*information-collection*” will be destroyed after the study as per agreement with the institutional ethics review. Each DNSs was provided a toothbrush and a pen light as gift for participating in the study.

Survey Questionnaires

Questionnaire 1 was about participants’ demographic data. Questionnaire 2 described the possibility of utilizing the respective DiOHAT® in the clinical settings, and their comments and impressions of the overall study, for example, “Can you utilize DiOHAT® version of “*nursing-process*” or “*collecting-information*” in the clinical settings in the future?” Questionnaire 3 was about the items they did or did not utilize from the 21 items of the DiOHAT® including a section for comments and rationales.

Analysis of Data

For the quantitative data, the utilization rate per item was calculated including the reasons given for non-utilization. Fisher’s exact test (two-tailed) was performed to test for associations between the utilization rate for each item and the environment of the facility or department where they were employed, or their clinical experience in a department of dentistry and oral care. The statistical software used was IBM SPSS Statistics version 23.0. The level of statistical significance was set at 0.05.

As to the qualitative data gathered from free-responses to four open-ended questions, namely, reasons why items were not utilized, comments and impressions of the DiOHAT® version of “*nursing-process*” or “*information-collection*,” and the overall study, all the descriptive answers given in the questionnaires were transcribed as these were written. Next, codes for each theme per sentence were created, extracted by focusing on similarities and differences, and categorized by semantic content. All the qualitative data analysis were conducted by the primary author. Half-way through this process, a supervisor skilled in qualitative research was contacted and provided clarifications to thematic categories. Finally, a summary of the codes was established and categories were confirmed. Clarification of the DNSs assessment of patients’ oral health and oral health behaviors utilizing the DiOHAT® (the version of “*nursing-process*” or “*information-collection*”) was reached. A researcher who was an expert in diabetes nursing research evaluated the sub-categories and categories to validate the qualitative data and check for omissions or other errors.

Ethical Considerations

This research was conducted with the approval of the Clinical Research Ethics Review Board of the Tokushima University Hospital Clinical Trial Center for Developmental Therapeutics (approval number : 2042).

RESULTS

Participant Characteristics

Only 47 responses were returned (rate : 34.1%), although three DNSs did not utilize any items ; but gave their reasons, and therefore, were included in the total number of participants. The mean and standard deviation (SD) of the age of the DNSs were 43.4 (SD=7.3) years. Table 1 provides the details of the characteristics of the participants of the study.

The DiOHAT® version of “Nursing-process” and “Information-collection”

The mean utilization rate of each of the items of the

Table 1. Participants' Characteristics

		n
Gender (male / female)		3 / 44
Clinical experience in a department for dentistry and oral care (yes/no)		3 / 44
Department (multiple choices permitted)	Ward	23
	Outpatient section	19
	Outpatient section for diabetes nursing	10
	Other	7
Number of beds at facility of employment	0–19	1
	20–199	5
	200–499	20
	≥500	21
Existence of a specialty outpatient clinic for diabetes at the facility of employment	Yes/no	37 / 10
Existence of a clinical department for dentistry and oral care at the facility of employment	Yes/no	30 / 17
		Mean ± SD
Age (years old)		43.4 ± 7.3
Experience as a nurse (years)		20.2 ± 7.2
Experience working as a nurse for patients with diabetes (years)		11.4 ± 4.3
After acquisition of CN (n=45) (years)		4.6 ± 3.5
After acquisition of CNS (n=2) (years)		3.5 ± 0.7
After acquisition of CDEJ with CN or CNS (n=33) (years)		8.5 ± 4.0
Clinical experience in a department for dentistry and oral care (n=3) (years)		3.0 ± 1.7

Note. CN: Certified Nurses in Diabetes Nursing, CNS: Certified Nurse Specialists in Chronic Care Nursing, CDEJ: Certified Diabetes Educators of Japan

DiOHAT[®] by DNSs was 69.0% (SD =15.4) (see Table 2). Items mean utilization rates of more than 80% included “dentures” (89%), “regular dental visits” (88%), “showing medicine information-sharing notebook to the dentist” (84%), “knowledge of a relationship between periodontal disease and systemic disease including diabetes” (84%), and “bleeding during toothbrushing” (83%). Conversely, the items with a mean utilization rate less than 60% were “checking one’s mouth with a mirror” (40%), “toothbrushing carefully” (43%), “use of supplementary tools” (44%), “counting total number of teeth” (45%), and “toothbrushing around the border” (56%). “Insufficient time” was identified by more than 50% of the DNSs as a reason for not utilizing items. In the comments and suggestions sections, other common reasons declared were “insufficient knowledge” (n=9), “no materials” (n=8), and “performed by dental professionals during dental check-ups” (n=6). For the item “checking one’s mouth with a mirror” the reason provided was that the “patient cannot see due to loss of vision.” For the item “awareness of halitosis,” seven DNSs answered, “difficult to ask” (n=7). Furthermore, for the items such as

“telling the doctor who is treating diabetes about dental treatment” and “telling the nurse working in the diabetes section about dental treatment,” comments included, “there is no coordination with dental professionals” and “I hear this from medical professionals” were declared.

Association of the Items of the DiOHAT[®] and Participants' Characteristics

The DNSs who worked at the outpatient section for diabetes nursing (n=10) were less likely to utilize the items “toothbrushing around the border” (p=0.031), “use of supplementary tools” (p=0.004), and “checking one’s mouth with a mirror” (p=0.009) than the DNSs who did not work there. One of the main reasons for not utilizing the items was “insufficient time”. However, the utilization of the DiOHAT[®] version of “nursing-process” and “collecting-information” was not associated with the other characteristics (e.g., ward, outpatient section, outpatient section for diabetes, existence of specialty outpatient clinic for diabetes, clinical department for dentistry and oral care, number of beds at the facility of employment, and clinical experience in a department for dentistry and oral care). Moreover, thirty (64%) DNSs

Table 2. Utilization of the items of DiOHAT[®]

Items of DiOHAT [®]	Respondents	Utilized (%) ^{1,2}	Reason for not utilizing ³		
			Insufficient time	No patients	Other reasons
Factor 1 : Oral health status					
Counting the total number of teeth	47	21 (45)	18	3	6
Biting firmly on molar or dentures	47	31 (66)	8	1	7
Checking the inside of the patient's mouth	45	31 (69)	6	3	5
Awareness of halitosis	43	31 (72)	3	2	7
Abscess on gingiva	43	34 (79)	6	2	1
Bleeding during toothbrushing	42	35 (83)	5	2	0
Dentures (partial or full)	44	39 (89)	3	1	1
Factor 2 : Oral health behaviors					
Checking one's mouth with a mirror	40	16 (40)	18	1	5
Toothbrushing carefully	47	20 (43)	20	1	6
Use of supplementary tools	41	18 (44)	17	2	4
Toothbrushing around the border	34	19 (56)	19	1	5
Experience being given dentists' instructions for brushing	42	28 (67)	10	1	3
Regular dental visits more than once a year	43	38 (88)	2	1	2
Factor 3 : Perceptions and knowledge of oral health behaviors					
Perceptions of oral care efficacy regardless of timing of care initiation	41	30 (73)	6	2	3
Experience having problems with one's teeth in one's life	43	33 (77)	5	1	4
Knowledge of a relationship between periodontal disease and systemic disease including diabetes	43	36 (84)	4	1	2
Factor 4 : Information transmission regarding dental visits					
Telling the doctor who is treating diabetes about dental treatment	44	28 (64)	7	3	6
Telling the nurse working in the diabetes section about dental treatment	40	29 (73)	5	3	3
Showing self-monitoring blood glucose notebook to the dentist	42	32 (76)	2	4	4
Showing diabetes information-sharing notebook to the dentist	43	34 (79)	4	2	3
Showing medicine information-sharing notebook to the dentist	44	37 (84)	4	2	1
Mean	42.8	29.5 (69.0)	8.2	1.9	3.7
SD	2.9	6.9 (15.4)	6.2	0.9	2.1

Note. ¹The items descending order of the percentage (%) of utilized. ²The utilization rate of each item of the DiOHAT[®] was calculated by dividing the number of participants who utilized the item ("Utilized") by the total number of answers for each item ("Respondents"): Divide "Utilized" by "Respondents", then multiplied by 100 ("Utilized" ÷ "Respondents" × 100). ³Multiple choices permitted

and thirty-five (75%), respectively, evaluated the DiOHAT[®] utilization of the version focused on the "nursing-process" and "collecting-information" as "possible" or "possible if revised" for utilization in the clinical settings (see Table 3)

Table 3. DNSs' the possibility of utilizing the respective DiOHAT[®] in the clinical settings

Evaluation of the clinical usage	(n=47)	
	DiOHAT [®] version of "nursing-process"	DiOHAT [®] version of "collecting-information"
Possible	16 (34%)	20 (43%)
Possible if revised	14 (30%)	15 (32%)
Possible if partially utilized	16 (34%)	11 (23%)
Impossible	1 (2%)	1 (2%)

Qualitative Responses

The findings suggested three main categories, six subcategories, and thirty-one final codes. The following

descriptions of the results uses "{" }" for categories, "["]" for subcategories, and "< >" for codes.

The content of the comments was broadly divided into {considering for application}, {role of nurses}, and {effects of assessments} (see Table 4). {Considering for application} was divided into three categories: [refining question items], [examining concrete application for clinical use], and [overcoming issues with clinical application]. Regarding [refining question items], DNSs wrote that assessment items should be revised to make them easier for patients and nurses to utilize, with comments such as <use clear expressions and clarify points>.

In relation to [examining concrete application for clinical utilization], it was indicated that detailed examination should be performed into how the assessment items would be specifically utilized, what measures would be taken, and how findings would be recorded. In

Table 4. Comments provided in free responses

Category	Subcategory	Code
Considering for application	Refining question items	Reduce the number of items
		Use clear expressions and clarify points
		Increase the font size so that it is easy to see
		Revise answer options
		Add items that are universally understood
	Examining concrete application for clinical utilization	Examine methods of implementing the assessment (medical interview sheets, clinical pathways, etc.)
		Examine the implementation frequency of the assessment
		Examine places where the assessment will be implemented (wards, outpatient clinics, etc.)
		Examine the assessment who will implement in (groups or individuals, comprehension, necessity)
		Examine the timing of assessment implementation
		Examine advance explanations before implementing the assessment
		Examine treatment after implementing the assessment (such as guidance with the family in perspective)
		Examine methods of setting and evaluating nursing objectives
	Overcoming issues with clinical application	Examine recording methods
		Obtain the cooperation of patients
		Obtain the cooperation of nurses
		Enhance nurses' knowledge and skills related to oral care
		Obtain approval within nursing teams
		Improve educational systems and tools for implementation
		Improve staffing and materials for implementation
Improve cooperation systems with dentists and dental hygienists		
Examine methods of coordinating with dental departments (timing of consultation recommendations, timing of coordination, etc.)		
Sharing information on dental treatment for patients with diabetes		
Role of nurses	Identifying the role of nurse in oral care	Relying on oral specialists for oral care
		Assessing the patient's condition as a nurse
Effects of assessments	Realizing the effects	Realize that patient awareness and interest in oral care has improved
		Realize the changes in nurses' perceptions of supporting patients' oral health behavior
		Realize nurses' support for patients in oral health behavior
		Realize the improvement in nurses' understanding of patients' mouths
	Predicting the effects	Predict the effects on improving patients' knowledge and perceptions
		Predict the effects on nursing support

relation to [overcoming issues with clinical application], comments were presented to overcome issues with coordination methods and improving cooperation systems. In {role of nurse}, DNSs wrote about matters concerning oral care to [identifying the role of nurses in oral care], with comments such as “assessing the specific toothbrushing methods, by relying on dental hygienists,” “dental hygienists are responsible for oral care,” and “inpatients receiving diabetes education consult at the department of oral surgery.” Another comment was that “the system already provides treatment to the patients in need of oral care.” Regarding this, nurses wrote, “we have no detailed questions; however, we closely interview patients with problems.”

Regarding content related to {effects of assessments}, in [realizing the effects], by utilizing the assessment items “patients were able to look back on their daily lives” and to <realize that patient awareness and

interest in oral care has improved>. by noticing that “my interactions had only been brief,” DNSs were able to <realize the changes in nurses' perceptions of supporting patients' oral health behavior>. Providing “guidance on toothbrushing” and performing oral assessments allowed DNSs to be “able to get a variety of information on patients' oral environments, as much as in foot care to prevent diabetic foot amputation.” This led DNSs to realize that they had become capable of supporting the oral health behavior of patients; that is, they could <realize nurses' support for patients in oral health behavior>.

DNSs also wrote comments including “I was surprised that patients let me see inside their mouth.” By realizing that “patients have a good understanding of the state of the inside their mouths” and “that patients do not want to lose teeth,” and by performing oral assessment, DNSs could <realize the improvement in

nurses' understanding of patients' mouths>. Furthermore, in [predicting the effects], DNSs <predicted the effects on improving patients' knowledge and perceptions>, with comments such as "patients will look at the questionnaire and can learn about the relationship between teeth and diabetes" and "patients' awareness of interest in oral self-checks will be enhanced." Utilizing an oral assessment also led DNSs to <predict the effects on nursing support>, with comments such as "I will be able to get the information about patients' knowledge and treatment behavior at home" and "I will be able to use this tool in diabetes team conferences and link this to effective guidance and information-sharing."

DISCUSSION

It was assumed in this study that DNSs were very concerned with oral health and oral care because they participated in two research studies by answering the questionnaire about diabetes and oral health. The comments were evaluated when DNSs utilized the DiOHAT® version of "nursing-process" and "collecting-information" to assess patients' oral health behavior. Regarding the utilization rate of each assessment item, it was found that the mean utilization rate was 69.0% (SD=15.4) and the rates were highest for "dentures" and "regular dental visits."

On the other hand, utilized rates were low for "checking one's mouth with a mirror," "use of supplementary tools", "toothbrushing around the border," "toothbrushing carefully," and "counting total number of teeth." The main reasons for not utilizing items were "insufficient time" and "insufficient knowledge." It was found that 64% and 75% of DNSs evaluated DiOHAT® the version of "nursing-process" and "collecting-information" as "possible" and "possible if revised" to utilize in clinical settings, respectively. The content of free-response comments was broadly divided into {considering for application}, {role of nurses}, and {effects of assessments}.

Regarding factor 1, "oral health status," two items were utilized at a high rate, "dentures" and "bleeding during toothbrushing." The latter is one of the signs of

gingival inflammation¹⁶⁾, which needs to be observed until the bleeding stops. Both were relatively easy to ask orally in a short period of time. However, "counting total number of teeth" was utilized at a low rate. As previously discussed¹⁰⁾, the number of teeth provides critical information about patients' trajectory of tooth loss due to periodontal disease or dental caries¹⁰⁾. It also allows one to observe the oral status and infer patients' implementation of oral care and masticatory function (or performance). Therefore, it is a valuable source of information for assessing intraoral health. Thus, initiatives are required to raise awareness of the importance of such assessment. The number of teeth and dentures do not change often, so it may be enough to check several times in a year. It also need the evidence to consider how often nurses may check the total number of teeth.

Regarding factor 2, "patients' oral health behaviors," items were utilized at a low rate, except for "regular dental visits," especially by the DNSs who worked at the outpatient section for diabetes nursing. These items concern obtaining information about patients' oral self-care status. The treatment for periodontal disease and dental caries are based on two-pronged care: professional care by specialists and self-care by the individual. Prevention, examination, and treatment services from oral healthcare professionals are critical for patients with diabetes^{5,17)}. DNSs assessed the patients' behaviors from this point of view (professional care) by checking the status of the item "regular dental visits." Raising awareness of the assessment items for oral self-care is therefore necessary to improve it. In self-care, it is essential to clean the intraoral biofilm using tools including toothbrushes¹⁸⁻²⁰⁾, interdental brushes^{18,19)}, and dental floss¹⁸⁻²⁰⁾. For oral self-care, it is also vital that DNSs share common knowledge about oral self-care and "regular training in assessment techniques"²¹⁾.

The main reason for not utilizing the assessment items was "insufficient time." It was assumed that there was more important care than oral, especially in the outpatient section for diabetes nursing. It is needed to create more effective items for assessment in a shorter time.

Another reason was “insufficient knowledge and skills.” Even in the free responses, many provided comments including “enhance nurses’ knowledge and skills related to oral care” and “improve educational systems and tools for implementation.” Johansson et al.¹⁹⁾ also noted the need for knowledge to assess intraoral status. A Thought Leader Summit hosted by the American Association of Diabetes Educators (AADE) in April 2016 focused on the relationship between diabetes and oral health and indicated the importance of screening for intraoral problems by people involved in diabetes education, educating patients about oral health, and building bridges with specialists in oral care¹⁷⁾. This suggests the need for activities to raise awareness of key items when assessing the intra-oral environment. It was suggested that even the DNSs who have special opportunities to acquire knowledge and studied well about diabetes nursing, may not have sufficient awareness of oral health care, then perhaps registered nurses in practice may not have the awareness to facilitate oral health care to their patients.

Regarding factor 3, “perceptions and knowledge of oral health behaviors,” items were utilized at a high rate. It seemed that DNSs attached greater importance to these items. The authors recommend that patients’ perceptions^{15,22)} are the most crucial information in diabetes care awareness and practice.

Regarding factor 4, “patients’ information transmission regarding dental visits,” and the utilization rate of the item “telling the doctor who is treating diabetes about dental treatment” was a lower than expected. It seemed that it would be beneficial for patients to tell the doctor about dental treatment because they can provide them with key information about taking care of their teeth. Therefore, nurses should give this information not only to the patients, but also to dentists and other dental care personnel.

Regarding evaluation of the clinical utilization of the DiOHAT[®], “insufficient time” was provided as the reason for not utilizing items in most cases, and many wished for reduction of the number of items. In extremely busy clinical settings, such comments by

clinical nurses are critical to assess oral self-care. Through this questionnaire survey, authors obtained many concrete information from comments about how to improve the clinical utilization of the DiOHAT[®]. These ideas suggest the need to continue examination together with clinical nurses who will utilize the assessment items in clinical settings. In addition, it was crucial that DNSs demonstrate the usefulness of the assessment items. This assessment method, which can recognize periodontal disease through a questionnaire without a specialized examination by a dentist, is beneficial and cost-effective²³⁾. Authors are currently refining the items based on this evaluation and relating assessment items and intraoral examinations by dentists.

Furthermore, the responses to “effects of assessments” showed that the usage of the DiOHAT[®] by DNSs improves patients’ oral health behavior. However, other comments including “oral assessments should be done by specialists in oral care” and “the system already provides treatment to patients in need of oral care.” were recognized. The AADE¹⁷⁾ has noted the need to examine the nature of coordination between dental specialists and diabetes educators to improve health problems in patients and produce better health outcomes.

Regarding cooperation between medical and dental professionals, it is reported that “the clinical pathway program to patients with periodontitis and diabetes”²⁴⁾, and that “routine collaboration between dentists and physicians” are necessary for patients undergoing dialysis treatment²⁵⁾. Consequently, further study is needed to clarify the role of nurses and methods of interdisciplinary coordination between nurses and other specialists.

STUDY LIMITATIONS

This study limitations focus on the number of the subjects which was small (n=47) and ex post facto responses by DNSs’ to qualitative data questions. Additionally, the study did not require respondents to indicate the rate of utilization of the DiOHAT[®] in the

clinical setting prior to responding to the questionnaire.

FUTURE CHALLENGES

To implement the oral health behavior assessment tool, a detailed examination of its practical utilization needs to be performed along with thorough discussions with clinical nurses about matters of care, including disseminating information on key items, its systematic utilization, and a reduction of items. Another future challenge will be to clarify the outcomes of nursing interventions utilizing these items for intraoral assessment in an interventional study.

CONCLUSIONS

Over 60% of DNSs evaluated utilizing the DiOHAT® version focused on the “*nursing-process*” and “*collecting-information*” as “possible” or “possible if revised.” It was found that utilization rates were low for items that assess patients’ oral self-care and basic matters related to oral function. These three categories are: “considering for application,” “role of nurses,” and “effects of assessments.” Findings further revealed that the need for DNSs to raise their awareness about key items of DiOHAT®, such as oral function and self-care, and to examine the coordination and division of roles between DNSs and dental specialists to support the oral health behaviors of patients with diabetes are critical for preserving intra-oral health particularly for patients with diabetes. The findings further suggest the need to continue studies focused on utilization and outcomes of care.

ACKNOWLEDGEMENTS

This study was supported by the Japan Society for the Promotion of Science (JSPS), JSPS KAKENHI grant (number 26463305), and a Grant-in-Aid for Scientific Research (C).

The authors would like to express their deepest gratitude to all the CNs and CNSs nationwide who kindly took their time out of their busy clinical work to

participate in this study.

Furthermore, the authors would also like to offer thanks to Toshihiko Nagata, Emeritus Professor in the Department of Periodontology and Endodontology, Graduate School of Biomedical Sciences and Munehide Matsuhisa, Professor in the Diabetes Therapeutics and Research Center, Institute of Advanced Medical Center, Tokushima University.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest to this study.

REFERENCE LISTS

- 1) World Health Organization 2016: Global report on diabetes executive summary. http://apps.who.int/iris/bitstream/10665/204874/1/WHO_NMH_NVI_16.3_eng.pdf (Accessed March 13, 2018)
- 2) Loe H: Periodontal disease: The sixth complication of diabetes mellitus. *Diabetes Care* 16: 329-334, 1993
- 3) Botero JE, Rodríguez C, Agudelo-Suarez AA: Periodontal treatment and glycaemic control in patients with diabetes and periodontitis: An umbrella review. *Aust Dent J* 61: 134-148, 2016
- 4) Chapple ILC, Bouchard P, Cagetti MG, et al: Interaction of lifestyle, behaviour or systemic diseases with dental caries and periodontal diseases: consensus report of group 2 of the joint EFP/ORCA workshop on the boundaries between caries and periodontal diseases. *J Clin Periodontol* 44: S39-S51, 2017
- 5) Morita M, Kimura T, Kanegae M, et al: Reasons for extraction of permanent teeth in Japan. *Community Dent Oral Epidemiol* 22: 303-6, 1994
- 6) Engebretson S, Kocher T: Evidence that periodontal treatment improves diabetes outcomes: a systematic review and meta-analysis. *J Periodontol* 84: S153-69, 2013
- 7) Koromantzou PA, Makrilakis K, Dereka X, et al: Effect of non-surgical periodontal therapy on C-

- reactive protein, oxidative stress, and matrix metalloproteinase (MMP)-9 and MMP-2 levels in patients with type 2 diabetes: a randomized controlled study. *J Periodontol* 83 : 3-10, 2012
- 8) Chen L, Luo G, Xuan D, et al : Effects of non-surgical periodontal treatment on clinical response, serum inflammatory parameters, and metabolic control in patients with type 2 diabetes : a randomized study. *J Periodontol* 83 : 435-443, 2012
 - 9) Kubota K, Nakashima F, Machishima K : Relationship between Recognition of Oral Care and Self-assessment of Problem-solving Behavior by Floor Nurses. *J. Jpn. Acad. Nurs. Ed* 27(1) : 25-37, 2017 (Japanese, abstract in English)
 - 10) Kuwamura Y, Sumikawa M, Tanioka T, et al : Development of the Diabetes Oral Health Assessment Tool © for Nurses. *Health (Irvine Calif)* 7 : 1710-1720, 2015
 - 11) Bowyer V, Sutcliffe P, Ireland R, et al : Oral health awareness in adult patients with diabetes : a questionnaire study. *British Dental Journal Online* article number E12 : 2011
 - 12) Lindenmeyer A, Bowyer V, Roscoe J, et al : Oral health awareness and care preferences in patients with diabetes : a qualitative study. *Fam Pract.* 30 : 113-118, 2012
 - 13) Yuen HK, Onicescu G, Hill EG, et al : A survey of oral health education provided by certified diabetes educator, *Diabetes Research and Clinical Practice* 88 : 48-55, 2010
 - 14) Katon W, Lin EHB, Von Korff M, et al : Integrating depression and chronic disease care among patients with diabetes and/or coronary heart disease : The design of the TEAMcare study. *Contemp Clin Trials* 31 : 312-322, 2010
 - 15) Kuwamura Y, Matsuda N : Oral Health Behaviors and Associated Factors in Patients with Diabetes. *Bull Heal Sci Kobe, Kobe Univ Repos Kernel* 29 : 1-16, 2013
 - 16) Löe H, Theilade E, Jensen SB : Experimental Gingivitis in Man. *J Periodontol* 36 : 177-187, 1965
 - 17) American Association of Diabetes Educators : AADE Thought Leader Summit : Diabetes and Oral Health., 2016. <https://www.diabeteseducator.org/docs/default-source/default-document-library/aaade-diabetes-oral-health-white-paper.pdf?sfvrsn=2> (Accessed March 13, 2018)
 - 18) Claydon NC : Current concepts in teethbrushing and interdental cleaning. *Periodontol* 2000 48 : 10-22, 2008
 - 19) Drisko CL : Periodontal self-care : evidence-based support. *Periodontol* 2000 62 : 243-255, 2013
 - 20) Ilc C, F VDW, Doerfer C, et al : Primary prevention of periodontitis : managing gingivitis. *J Clin Periodontol* 42 : S71-S76, 2015
 - 21) Johansson I, Jansson H LU : Oral Health Status of Older Adults in Sweden Receiving Elder Care : Findings From Nursing Assessments. *Nurs Res (New York)* 65 : 215-223, 2016
 - 22) Broadbent E, Donkin L, Stroh JC : Illness and treatment perceptions are associated with adherence to medications, diet, and exercise in diabetic patients. *Diabetes Care* 34 : 338-340, 2011
 - 23) Eke PI, Dye BA, Wei L, et al : Self-reported Measures for Surveillance of Periodontitis. *J Dent Res* 92 : 1041-1047, 2013
 - 24) Ota M, Seshima F, Okubo N, et al : A collaborative approach to care for patients with periodontitis and diabetes. *Bull Tokyo Dent Coll* 54 : 51-7, 2013
 - 25) Yoshioka M, Shirayama Y, Imoto I, et al : Current status of collaborative relationships between dialysis facilities and dental facilities in Japan : results of a nationwide survey. *BMC Nephrol* 16 : 17 : 1-8, 2015