

# An Evaluation of the Therapeutic Nutrition Knowledge of Belizean Nurses.

Marcia Magnus, PhD <sup>1\*</sup> and Tabe Besong RN MSc <sup>1</sup>.

<sup>1</sup> Department of Dietetics and Nutrition, Florida International University, Miami, USA.

\*Corresponding Author: Marcia Magnus, Department of Dietetics and Nutrition, Florida International University, Miami, USA.

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## Abstract

In Belize, patients rely on nurses for nutritional guidance on non-communicable diseases in the Caribbean. The objectives of this study were to quantify therapeutic nutritional knowledge of 198 Belizean nurses using the Al-Shwaiyat questionnaire. The mean correct response rate for the therapeutic nutritional knowledge was suboptimal (53.30%±17.20). Nurses in the West region of the country had the highest mean knowledge scores on nutrition and diabetes 75.41±20.10, p=0.003; on nutrition and cardiovascular diseases 57.23±10.90, p=0.000; and in overall knowledge 62.34±9.76 p=0.000. Nurses without a diagnosis of diabetes had higher mean knowledge scores on a) nutrition and diabetes 63.86±26.07, p=0.001; b) nutrition and obesity questions 49.55±20.80, p=0.004; c) nutrition and cardiovascular disease 53.30±15.70, p=0.007 and d), overall mean 55.24±16.67, p=0.000. There is the need to address the low levels of knowledge of Belizean nurses.

**Keywords:** nurses; therapeutic nutritional knowledge; Belize

## Introduction

Belize is the only English-speaking country in Central America. In 2019, Belize had a population of 383,000 [1]. Belize is a developing upper-middle-income country, with a GDP per capita of US\$ 4,829 in 2016. The 2009 Country Poverty Assessment revealed a poverty rate of 68% for the indigenous Maya, a child poverty rate of 50%, and a national average poverty rate of 41.3% [2]. Belize, like other English-speaking Caribbean countries and Central American countries, has been experiencing an increased prevalence of non-communicable chronic diseases, many of which respond to dietary management. In 2015, the crude diabetes prevalence rate was 14.2%, the highest of all countries in North America and the Caribbean region [3]. Between 2000 and 2016, adult male obesity increased from 9.7% to 16 %, in adult females from 23.0% to 31.5% [1]. Although diabetes prevalence increased from 11.3% to 15.2% among females, and from 7.8% to 10.0% among males, high blood pressure in adult males decreased from 27.5% to 24.4%, and among females from 23.4% to 21.0% [1]. Between 2002 and 2014, the prevalence of female adult diabetes increased from 11.3% to 15.2%, with male adult diabetes increasing from 7.8% to 10.0% [1]. The leading cause of death in people aged 50 and over was diabetes and its complications, followed by ischemic heart disease, hypertension, advanced HIV infection, and chronic liver disease and cirrhosis [2]. In 2019, progress against global nutrition targets for adult female and male obesity, adult female and male diabetes were described as “no progress or worsening” in Belize [1].

In 2015, the over 60-year old population accounted for 5.9% of the total population, and this segment of the population had a higher hospital utilization rate than the rest of the population [2]. Research from twelve countries demonstrated that 50.5% of older people in rehabilitation were

malnourished, closely followed by older people in hospital (38.7%) and then those in aged care facilities (13.8%) [4]. Nurses' role in initial nutrition screening has been described as “crucial” in the identification of patients who are already malnourished and those who are at risk of becoming malnourished, with the goal of developing nutritional care strategies which prevent severe malnutrition [5].

Although between 2010 and 2015, the population density of physicians and dentists increased, the population density of nurses decreased from 14.5 in 2010 to 12.3 per 10,000, largely due to migration [2]. In 2020, eight nutritionists/dietitians were employed in seven public and three private hospitals, and 54 health clinics, serving a population of 383,000 persons [1].

US data indicate that nurses are 40 times more than dietitians, and 100 times more than certified diabetes educators to meet hospitalized diabetes patients on a daily basis [6]. Nurses play an important role in patients' nutritional care. Nurses often fill the role of nutrition counsellors by providing nutrition screening and/or nutrition advice to patients [7]. Because they have the most contact with patients, nurses play a key multidisciplinary role and often provide nutrition screening, referral, facilitation of recommendations to adjust a diet plan, and implementation of a special diet modification with patients, and family members [7]. Nurses play equally important roles which complement the role of the dietitian to ensure adequate nutrition for patients [8, 9].

Nurses' roles in nutritional support have been mandated by governmental regulations internationally. The Australia Ministry of Health states that nurses are responsible for monitoring and documenting nutritional intake [10]. The UK Ministry of Health decrees that nurses are expected to a)

promote healthier lifestyle choices from the point of admission through to discharge, to conduct nutritional assessment, and b) offer appropriate lifestyle advice and an effective referral system which supports positive long-term behavioural change [11]. In the USA, nutrition has been described as the second most important area for nursing care. Nutrition topics such as nutritional assessment and monitoring, diet therapy, and enteral and parenteral nutrition have been included in the National Council Licensure Examination for Registered Nurses [12]. In Belize, there is no official Ministry of Health document which specifies the role of nurses in nutrition care. Based on a conversation with a L. Castillo, RN, NP, (August, 2020), nurses are responsible for feeding patients via the oral, enteral and parenteral routes; breastfeeding education, and to provide holistic care.

Despite widespread calls for nurses' role in nutritional care, the Academy of Nutrition and Dietetics, the world's largest association of nutrition professionals, has identified patient risks which derive from "scope creep"—health care professionals who go beyond their scope of practice and engage in activity for which they are not qualified [13]. Although RDNs, nurses and pharmacists all deliver Diabetes Self-Management training to patients, when professionals who provide care for which they were not trained, scope creep can be dangerous and put patients and clients at risk of harm. The Academy believes that the provision of medical nutrition therapy and other complex dietetics and nutrition services should only be provided by individuals who have at minimum the specialized training and competencies of RDNs.

## Objective

Because there are no published studies on the therapeutic nutrition knowledge of nurses in Belize, this study was undertaken. The objective of this study was to determine the extent to which the nurses have the nutrition knowledge needed to educate and improve the lives of persons living with obesity, diabetes and hypertension.

## Research questions

1. What is the level of therapeutic nutrition knowledge among Belizean nurses?
2. How is nurses' knowledge affected by health region, gender, age group, education level, years of service; self-reported weight status, and diagnosed diabetes mellitus and hypertension?

Therapeutic nutrition knowledge was defined as the latest theories and research in nutrition and health sciences to individuals seeking to manage chronic disease or promote optimum health. Nurses' therapeutic nutrition knowledge has been reported as 35%±3.8 in South Africa [14], 60%±8.4 in Australia [15], 56.75%±10.84 in Turkey [16], 58.8% ±13.2 in Jordan [17], 58.4% in Korea [18], 44.9% ± 3.17 in Ghana [19], 65%±11 in the United States of America [20]. Given the low levels of nurses' nutrition knowledge, all authors have recommended better educational preparation in nutrition and specific treatment guidelines for nurses.

## Research design and setting

Of the 635 nurses in Belize, 198 were randomly recruited to respond to the therapeutic nutrition knowledge questionnaire which included items on diabetes (5 items), obesity (9 items) and cardiovascular diseases (17

items). The correct response for each question was scored as [1]. Incorrect and "don't know" answers were scored as (0). Demographic factors (health region, gender, age, level of education, years of work experience), and self-reported weight status, diabetes, and hypertension diagnosis) were conceptualized based on the work of Al-Shwaiyat, 2013 [17].

## Sample Size and sample selection

G-Power version 3.0.10 was used to determine the appropriate sample size of 198. This was considered sufficient to yield 0.80 power using F-test with a significant level of 0.05 and effect size 0.13. A convenience sample was derived. Inclusion criteria were registered nurses, practical nurses, nurses working in both clinics and hospitals. Excluded from the study were nurse specialists, nurse supervisors and nurses working at the private sector.

## Instrumentation

The Al-Shwaiyat et al., 2013 instrument [17] was used. The first section of the instrument included demographic characteristics, and the second section had therapeutic nutrition knowledge questions—five diabetes questions, nine obesity questions, and 17 questions on cardiovascular diseases. It had a Cronbach's Alpha reliability coefficient of 0.709. To assess the face validity of the instrument, a focus group of Belizean nurses was conducted to assess their understanding of questions and perception of the cultural appropriateness of the instrument. A pilot study was undertaken among five nurses to evaluate the time, quality and structure of the questions; and to also determine if there were any problems or misinterpretation of the questionnaire.

## Data collection

Permission to conduct this study was granted by the Institution Review Board of Belize, and by hospital managers. The questionnaires were administered to nurses three hours before the end of their shifts. Nurses were advised of their right to refuse to participate even after giving consent. Privacy of nurses' information was maintained to prevent access by others who are not directly involved in the research. Questionnaires were coded to maximize respondents' confidentiality and anonymity.

## Data analysis

Questionnaires were coded and analyzed with SPSS version 25.0 [21]. Analysis of Variance (ANOVA), t-test and Pearson correlation, and regression analysis were used to test the relationships between variables.

## Results

Among 198 nurses, the majority were female (82.9%), and 67.9% were registered nurses (Table 1). Nurses were almost evenly distributed among the four health regions of Belize. The largest percentage (29.4%) had 6-10 years of work experience. For self-reported weight status, 44.1% described themselves as being at recommended weight, and 48.7% as overweight. Only 10.2% reported a diagnosis of diabetes mellitus status, and 16.8% reported having hypertension.

Demographic characteristic	N	%
Health region:		
North	47	23.7
South	48	24.2
West	48	24.2
Central	55	27.8
Gender:		
Male	33	17.1
Female	160	82.9
Age group (years):		
≤25	36	18.3
31-35	92	46.7
≥36	69	35.0
Educational level:		
LPN	63	32.1
RN	133	67.9
Years of work experience:		
≤5	55	27.9
6-10	58	29.4
11-15	33	16.8
≥16	51	25.9
Nurses' self-reported weight status:		
At Recommended Weight	86	44.1
Overweight	95	48.7
Underweight	14	7.2
Self-reported diabetes diagnosis:		
No DM diagnosis	176	89.8
DM diagnosis	20	10.2
Self-reported hypertension diagnosis:		
No HBP diagnosis	164	83.2
HBP diagnosis	33	16.8

**Table 1:** Demographic characteristics of Belizean nurses (N=198)

The mean therapeutic nutrition knowledge score of 198 Belizean nurses was 53.31%±17.20 (Table 2). The mean knowledge score for diabetes mellitus questions was 62.90%±26.70, 51.0%±16.50 for questions on cardiovascular diseases, and 47.00%±20.90 for obesity questions. Nurses in Belize's West region had a significantly higher overall mean knowledge score 62.34±9.76 p=0.000; and higher mean knowledge scores for nutrition and diabetes 75.41±20.10, p=0.003; nutrition and cardiovascular diseases 57.23±10.90, p=0.000; compared to nurses in other regions. Female nurses had a mean score of 54.58%±16.76, while males had a mean score of 53.50%±16.59. Nurses who were >36 years of age had the highest mean score of 57.80%±14.45, followed by those ≤25 years (54.28%±17.84) and lastly, those >31-35 years (50.57%±18.11). Registered nurses had a higher score of 55.40%±17.61, while practical nurses had a score of 49.50%±15.44. Nurses with less than 5 years of work experience had the highest score 61.25%±14.24, followed by those with ≥ 16 years (56.05%±15.50), those with 6-10 years (49.92%±17.63) and lastly, those with 11-15 years of work experience (44.57%±17.36).

Variables	Nurses N (%)	Nutrition and diabetes knowledge Mean±SD	Nutrition and obesity knowledge Mean±SD	Nutrition and cardiovascular diseases Mean±SD	Overall Mean ±SD
All nurses	198(100%)	62.90±26.70	47.0±20.90	51.0±16.50	53.31±7.20
Health region:					
North	47(23.7%)	56.52±7.44	48.92±0.15	45.18±15.99	50.23±17.31
South	48(24.2%)	49.16±27.40	38.19±25.10	44.61±20.19	43.98±20.48
West	48(24.2%)	75.41±20.10	54.39±16.80	57.23±10.90	62.34±9.76
Central	55(27.8%)	65.09±25.00	50.10±18.70	56.57±13.88	57.25±14.29
<i>p-value</i>		0.003*	0.136	0.000*	0.000*
Gender					
Men	33(17.1%)	63.63±19.50	46.80±22.50	50.08±18.19	53.50±16.59
Women	160(82.9)	62.75±27.50	49.16±20.90	51.83±16.13	54.58±16.76
<i>p value</i>		0.857	0.547	0.580	0.737
Age Group:					
≤25 years	36(18.3%)	62.27±25.10	48.45±21.40	51.47±15.99	54.28±17.84

>31-35	92(46.7%)	57.82±28.40	44.93±21.40	48.97±17.20	50.57±18.11
>36 years	69(35.2%)	66.95±24.40	52.33±18.40	54.13±15.65	57.80±14.45
<i>p value</i>		0.463	0.381	0.449	0.327
Education:					
Practical nurse	63(32.1%)	58.09±25.33	45.50±17.48	48.64±15.17	49.50±15.44
Registered nurse	133(67.9)	63.90±27.13	49.71±21.99	52.59± 17.65	55.40±17.61
<i>p value</i>		0.154	0.185	0.119	0.074
Years of experience:					
≤5	55(27.9%)	73.81±18.8	54.74±21.15	55.18±16.65	61.25±14.24
6-10	58(29.4%)	55.86±27.47	45.02±20.33	48.88±16.46	49.92±17.63
11-15	33(16.8%)	49.09±30.45	37.37±17.96	47.24±14.21	44.57±17.36
≥16	51(25.9%)	64.70±24.19	51.42±20.12	52.02±17.50	56.05±15.50
<i>p-value</i>		0.059	0.257	0.323	0.080

**Table 2:** Nurses’ therapeutic nutrition knowledge and demographic characteristics (N=198).

\*Means are significantly different at *p value* < 0.05 by students’-test.

Overweight nurses had the highest knowledge score 57.87%±15.94, followed by those at recommended weight (52.08%±17.19) and lastly, by those who are underweight (33.0%±10.41).

Nurses who had no prior diabetes diagnosis had significantly higher overall knowledge scores, higher nutrition and diabetes scores, higher nutrition and obesity scores than nurses who reported diabetes diagnoses (Table 3). Nurses who did not report a diagnosis of diabetes had a significantly higher overall mean knowledge scores (55.24%±16.67) than

those who were living with diabetes (40.10%±16.74) *p*=.000. Nurses with no self-reported diagnosis had significantly higher nutrition and diabetes scores 63.86±26.07 than nurses who had diabetes 43.00±26.96 *p*=0.001. Nurses with no self-reported diabetes diagnosis had significantly higher nutrition and obesity knowledge scores 49.55±20.80 than those who did not have diabetes 35.50±18.24 *p*=0.004. Nurses with no self-reported diabetes diagnosis had significantly higher nutrition and cardiovascular disease knowledge scores 53.30±15.70 than those who did not have diabetes 47.76±20.63 *p*=0.007.

Self-reported weight status and diagnoses	Nurses N (%)	Nutrition and diabetes knowledge Mean±SD	Nutrition and obesity knowledge Mean±SD	Nutrition and cardiovascular disease knowledge Mean±SD	Overall Mean (SD)
Weight status:					
Recommended weight	86(44.1%)	57.90±27.09	47.93±21.68	50.41±15.27	52.08±17.19
Overweight	95(48.7%)	70.10±22.76	50.50±20.74	53.00±16.57	57.87±15.94
Underweight	14(7.2%)	25.17±14.52	32.53±16.57	40.75±13.54	33.00±10.41
<i>p-value</i>		0.059	0.257	0.510	0.275
Diabetes diagnosis:					
No diabetes	176(89.8%)	63.86±26.07	49.55±20.80	53.30±15.70	55.24±16.67
Diabetes	20(10.2%)	43.00±26.96	35.50±18.24	47.76±20.63	40.10±16.74
<i>p-value</i>		0.001*	0.004*	0.007*	0.000*
Hypertension diagnosis:					
No hypertension	164(83.2%)	63.17±26.30	48.70±20.83	51.50±16.84	54.48±16.99
Hypertension	33(16.8%)	54.54±28.40	44.78±21.24	50.08±18.78	49.80±18.61
<i>p-value</i>		0.091	0.317	0.653	0.155

**Table 3:** Nurses’ therapeutic nutrition knowledge and self- reported diagnosis (N=198).

\*Means are significantly different at *p value* < 0.05 by students’-t-test.

Nurses who reported no previous hypertension diagnosis had higher overall knowledge scores, higher scores on nutrition and diabetes, nutrition and obesity, or nutrition and cardiovascular diseases than nurses who had been diagnosed with hypertension. However, none of these scores were significantly different.

Overall, the item with the highest correct response rate (80%) was that high blood cholesterol increases the incidence of heart disease (Table 4).

This was also the item with the highest correct response rate among cardiovascular disease related questions. The item with the highest mean score among diabetes mellitus related questions was that fruits should be consumed by persons living with diabetes (77.3% response rate). The item with the highest mean score among obesity related questions was that nurses agreed a high fiber diet is recommended for obesity (62.9% response rate).

High blood cholesterol increases the incidence of heart disease.	A. Agree* B. Disagree C. Don't know	156 33 6	80.0 16.9 3.1
Fruits should not be consumed by the diabetic patients.	A. Agree B. Disagree* C. Don't Know	35 153 10	17.7 77.3 5.1
For the treatment of hypertension, a low sodium diet is routinely recommended.	A. Agree* B. Disagree C. Don't know	152 39 6	77.2 19.8 3.0
Omega-3 fatty acids such as fish oil help to reduce hyperlipidaemia	A. Agree* B. Disagree C. Don't know	128 42 25	65.6 21.5 12.8
A lower intake of saturated fat decreases the risk of coronary artery disease.	A. Agree* B. Disagree C. Don't know	127 48 20	65.1 24.6 10.3

**Table 4:** Top 5 Most frequently correct responses (N=198).

The five most frequently incorrect statements are presented in Table 5. Only 8.1% of nurses knew that decreased total fat intake is recommended for an obese 45-year-old adult who had a blood cholesterol level of 239 mg/dl. This was the item with the lowest correct response rate among all questions. This was also the item with the highest correct response rate among obesity related questions. Among cardiovascular disease related

questions, 19.2% of nurses agreed that intake of <300mg of cholesterol is recommended for a low cholesterol diet—the lowest correct response rate among cardiovascular disease related questions. Among diabetes related questions, 47.7% (the lowest correct response rate) of nurses knew that sugar-free carbonated beverages should not be used for patients with hypoglycemia.

Question	Responses	N	% correct
An obese 45-year-old adult has a blood cholesterol level of 239 mg/dl. Which of the following dietary therapies is the first recommended?	A. Decrease monounsaturated fat intake B. Decrease polyunsaturated fat intake C. Decrease total fat intake* D. Decrease total cholesterol intake E. Decrease carbohydrate intake F. Don't know	23 55 55 37 16 12	11.6 27.8 8.1 18.7 27.7 6.1
Intake of less than __mg of cholesterol is recommended for a low-cholesterol diet.	A. 100 B. 200 C. 300* D. 400 E. 500 F. Don't know	49 62 38 3 4 41	24.9 31.5 19.2 1.5 2.2 20.7
Which of the following foods is not a source of cholesterol	A. Meat B. Egg C. Margarine* D. Milk E. Fish F. Don't know	20 2 41 14 106 13	2.2 1.0 29.0 7.1 54.1 6.6
The dietary therapy which is not recommended for preventing coronary artery disease is:	A. Replace iso-calories of unsaturated by saturated fatty acids* B. Consume complex carbohydrates as the majority of daily caloric intake C. Reduce food high in cholesterol D. Decrease total fat intake E. Increase fruits and non-starch vegetables F. Don't know	58 45 52 10 10 18	30.1 23.3 26.9 5.2 5.2 9.3

**Table 5:** The five most frequently incorrect statements.

The profile of a knowledgeable nurse was a female registered nurse from the Western region who had less than five years' experience, who was more than 36 years old, who was overweight but had not been diagnosed with neither diabetes nor hypertension. The profile of a less than knowledgeable nurse was a male licensed practical nurse from the South region, who had 11-15 years' experience, who was more than 35 years

old, who had been diagnosed with diabetes mellitus and hypertension, and who was underweight.

## Discussion

As has been demonstrated in earlier studies, Belizean nurses have low levels of therapeutic nutrition knowledge (mean score=53.30%±17.20). The two most recently reported mean knowledge scores were for



Jordanian nurses 58.8%  $\pm$ 13.2 in 2013 [17], and for Ghanaian nurses 44.9%  $\pm$  3.17 in 2015 [19]. The only published studies which have shown higher levels of nurses' nutrition knowledge were from Australia 60% $\pm$ 8.4 in 2005 [15], and the United States of America 65% $\pm$ 11 in 2001 [20]. Nurses in Belize's West region had a significantly higher overall mean, higher mean knowledge scores for nutrition and diabetes; and for nutrition and cardiovascular diseases; compared to nurses in other regions. The West region of Belize is the site of the capital city, Belmopan.

No other published studies have assessed the relationship between nurses' nutrition knowledge scores and their weight status and previous diagnosis of diabetes and hypertension. Nurses who had not been diagnosed with diabetes had significantly higher knowledge scores overall, in nutrition and diabetes, nutrition and cardiovascular diseases, and in nutrition and obesity. This was a surprising, if not troubling, discovery. Ideally, nurses who have been diagnosed with a non-communicable disease should not only be knowledgeable about disease management but they should have achieved success in managing the condition. Since Afro-Trinidadian adolescents and Jamaica adults have been shown to view overweight and obesity are viewed favorably as signs of happiness or wealth [22-24], it would be important for future research to compare Caribbean nurses' actual and perceived weight status to nutrition knowledge. Future research could address the extent to which nurses' nutrition knowledge is related to glycemic control and blood pressure levels.

These data did not confirm the data from one earlier study which showed a direct relationship between knowledge scores and age, and years of nursing experience. Using a different 48-item instrument, Australian nurses who were more than 36 years of age had statistically significant higher nutrition knowledge scores 65.2% than nurses who were 35 years or younger 52.5%  $p = 0.004$  [15]. Similarly, Australian nurses with more than 10 years of experience had a statistically significant higher knowledge score than nurses with 10 years or less experience  $p = 0.024$ , although actual scores were not stated.

Earlier studies have reported inconsistencies in the relationship between nurses' knowledge and educational preparation. In Australia, nurses with a Diploma or General Nurse Training (less than four years of preparation) had a statistically significantly higher knowledge score 63.5%, than nurses with a four-year degree 54.6%  $p = 0.029$  [15]. However, among Turkish nurses, knowledge scores were significantly higher as educational preparation increased  $p < 0.001$  (16). Approximately 45.2% graduate nurses had "good" (13-16 points) mean scores, 39.3% undergraduate nurses had "adequate" (9-12 points) mean scores, and 15.2% of secondary education nurses had "inadequate" ( $\leq 8$  points) mean scores.

Earlier studies have also identified statistically significant but an inconsistent relationship between nurses' nutrition knowledge and gender. In Jordan, nutrition knowledge on cardiovascular diseases was significantly higher for female nurses 56.6%, compared to male nurses 51.9%  $p = 0.04$  [17]. However, in Ghana, male nurses had a significantly higher nutrition knowledge score 12.93 $\pm$ 3.10 than females 11.34 $\pm$ 3.05  $p = 0.003$  using a 21-item instrument [19]. The variation in results from different studies may be related to the different types of questionnaires used in the studies, the size of the sample, differences in the scope of practice of the nurses among countries, and variation in the nursing school curriculum among different countries.

The low level of therapeutic nutrition knowledge of Belizean nurses 53.30% $\pm$ 17.20 is similar to levels described in Jordan and Turkey, but lower than studies in the USA 65% $\pm$ 11.0 [20], and Australia 60% $\pm$ 8.4 [15].

One study limitation is that completing questionnaires during work hours may have influenced nurses' interpretation and responses to questions. These data were derived from a convenience sample and should therefore not be generalized to all Belizean nurses. Future research may need to

quantify the extent to which nurses provide nutrition services—screening, counseling, and monitoring—to hospitalized patients.

## Conclusion

This study showed that nurses in Belize have suboptimal level of therapeutic nutrition knowledge (53.30% $\pm$ 17.20). In small countries such as Belize where nutrition professionals are uncommon, and there is no national plan to increase the number of trained dietitians and nutritionists, it is even more important to ensure that nurses have adequate therapeutic nutrition knowledge. Nurses need to have access and to be rewarded for continuing education in therapeutic nutrition as part of their licensing requirements. Mandatory continuing education in nutrition could be part of nurses' licensing requirements. To improve compliance, nurses need to be consulted on their preferences for learning modalities such as e-learning and Medscape [25].

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