The Development of a Standardized Framework for Primary Nurse Specialists in Diabetes Care in China: A Delphi Study

Qiuling XING1 • Mingxia ZHANG2 • Fang ZHAO3* • Yingxia ZHOU4 • Yongzhen MO5 • Li YUAN6

ABSTRACT

Background: The number of patients with diabetes has been increasing rapidly according to a 2017 report by the International Diabetes Federation. Diabetes has become one of the most challenging public health problems, and there will be an estimated 143 million patients with diabetes in China by 2035. This puts considerable pressure on nurses who specialize in the care of patients with diabetes in China and increases related social and financial burdens. Clinical practice has proven that strengthening the core competencies of nurses and establishing an evaluation system of core competencies improve both healthcare quality and patient quality of life. However, no core-competence system framework currently addresses the unique characteristics of nurses in China.

Purposes: The purpose of this study was to construct a core-competence system framework for primary nurse specialists in diabetes care.

Methods: A brainstorming approach was conducted that worked to conceptualize the core competencies of nurse specialists in diabetes care in China. Next, a study group organized this information and conducted a seminar; 50 experts and patients with diabetes were invited to develop the first draft of the framework. Afterward, 50 experts were selected to participate in the Delphi survey. Most indicators were retained after a three-round Delphi process, and the superiority chart was used to determine the weights of the six dimensions.

Results: Forty-seven experts completed the consultation. The experts’ rate of response ranged from 94% to 100%, the authority coefficient was .91, and the Kendall’s coefficients of concordance in Grades 1–3 were .793, .418, and .542, respectively. An increasingly detailed, three-grade system framework was developed, including six first-grade indicators (diabetes professional knowledge, diabetes-related knowledge, communication skills and health education ability, specialized skills, clinical judgment, and specialty development capacity), 23 second-grade indicators, and 87 third-grade indicators. The weights of the six first-grade indicators were .221, .149, .192, .209, .160, and .069, respectively.

Conclusions: The core-competence system framework includes six core competencies, which represent the main characteristics of primary nurse specialists in diabetes care who are highly recommended by experts. It is important to keep in mind that this is only a theoretical framework and thus must be further tested in clinical practice settings in China.

KEY WORDS: primary nurse specialists in diabetes care, core competence, systematic framework, index weight.

Introduction

The prevalence of diabetes was estimated to be 11.6% in the Chinese adult population (Xu et al., 2013) and the patient population is increasing rapidly. It has been estimated that China will have 142.7 million patients with diabetes in 2035 (Guariguata et al., 2014). Diabetes has lifelong impacts that affect patients both physiologically and psychologically (Wang, 2017), with professional medical personnel required to manage the diabetes and improve quality of care. As nurses are the primary providers of diabetes clinical care and education, their core diabetes-related competencies have become the key factors affecting the quality of diabetes management. Clinical practice in diabetes care domestically and internationally has shown that strengthening the core competencies of nurse specialists in diabetes care, and establishing core competencies with an evaluation system, improves the quality of healthcare and of life for those living with diabetes (Chan, Bond, Adamson, & Chow, 2016; Kalb, 2008). Therefore, this study was designed to introduce international, advanced experience into current diabetes management in China, develop a core-competence system framework with China’s own characteristics to meet the needs of clinical practice,

1 MS, RN, Professor, Department of Nursing, Tianjin Medical University Metabolic Diseases Hospital, Tianjin, China • 2 BSN, RN, Associate Professor of Nursing, Department of Endocrinology, Peking University People’s Hospital, Beijing, China • 3 BSN, RN, Associate Professor, Department of Nursing, China-Japan Friendship Hospital, Beijing, China • 4 BSN, RN, Associate Professor of Nursing, Department of Endocrinology, Rui Jin Hospital Shanghai Jiao Tong University School of Medicine, Shanghai, China • 5 MS, RN, Professor, Department of Nursing, Jiangsu Province Official Hospital, Nanjing, China • 6 BSN, RN, Professor of Nursing, Department of Endocrinology and Metabolism, West China Hospital, Sichuan University, Chengdu, China.

Copyright © 2019 The Authors. Published by Wolters Kluwer Health, Inc. All rights reserved.

This is an open access article distributed under the Creative Commons Attribution License 4.0 (CCBY), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.
and provide guidelines for training and career development paths for nurse specialists in diabetes care. The study group focused on constructing a system framework based on the British core competence framework to ensure that the developed framework was based on evidence and applicable in terms of training and assessing nursing staff at various levels (Trend, 2011).

**Background**

The International Diabetes Federation estimates that 642 million people worldwide between 20 and 79 years old will have diabetes in 2040 (Ogurtsova et al., 2017). Diabetes has become one of the most challenging public health problems. With a dramatic increase in the prevalence of diabetes, China now has the largest number of people with diabetes in the world (Guariguata et al., 2014; Whiting, Guariguata, Weil, & Shaw, 2011). Because of serious dangers and complex management, diabetes places a particularly high burden on nurse specialists in diabetes care as well as on society and national finances (Bermudez-Tamayo et al., 2017). As a country with more than 90 million people with diabetes (Yang et al., 2010), China needs to do more than simply increase the numbers of nursing staff engaged in diabetes care. The clinical practice of developed countries such as the United States and United Kingdom has shown that the knowledge and skills of nurse specialists in diabetes care are key to improving the healthcare of patients and enhancing the quality of patient self-management (American Association of Diabetes Educators [AADE], 2011; Trend, 2011). Therefore, strengthening the core competencies of nurse specialists in diabetes care is the most urgent task.

The AADE (2011) established a training and evaluation system and set up the National Certification Board of Diabetes Educators. Certification is intended to improve the quality of self-management education, clinical care, and management of people with diabetes. In addition, the United Kingdom developed a career and competency framework for diabetes nursing (Douglass & Ruddle, 2009; Hicks, 2010; Trend, 2011). The British “integrated career and competency framework for diabetes nursing” model reflects this framework. There are five levels of competency for, respectively, unregistered practitioners, competent nurses, experienced or proficient nurses, senior practitioners or expert nurses, and consultant nurses. Areas of competence in the British system include prevention and early detection of Type 2 diabetes to facilitate patient self-care, care for diabetic individuals with mental illnesses, provide nutritional guidance, monitor biochemical indices, ensure the safe administration of therapies, identify and treat blood glucose, manage complications, manage gestational diabetes, support diabetic individuals who reside in prisons or young offender units, care for diabetic individuals living in residential or nursing homes, and care for patients with diabetes at the end of life.

China has the largest population of people with diabetes in the world (International Diabetes Federation, 2017). The most important difference is that patients with diabetes in China are educated and managed primarily in hospital settings, which puts considerable pressure on nurse specialists in diabetes care, especially in the areas of communication, education, and follow-up care. To date, there is no standardized framework for evaluating care implementation. Therefore, developing a comprehensive framework that provides criteria for competency evaluation, training, and guidance for the professional development of nurse specialists in diabetes care is critical. As a recently joined member of the International Council of Nurses, the Chinese Nursing Association, in establishing an effective framework, would help boost international communication and collaboration in diabetes care. Regrettably, lack of experience inhibits China from constructing a higher level, complex framework. Thus, this study aimed to construct a core-competence system framework for primary nurse specialists in diabetes care to lay the foundation for development of a multilevel framework that improves the quality of clinical nursing care.

**Methods**

**Study Design and Sample**

**Theoretical basis**

This study was based on the British “integrated career and competency framework for diabetes nursing” model (Trend, 2011). To address the role of nurse specialists in diabetes care in China as educators, the framework referred to some relevant studies of the AADE (2011) and the Australian Diabetes Educators Association (2008). In addition, domestic nurses in emergency care, peripherally inserted central catheter care, intensive care units, and other specialties (Fan & Xi, 2011; Yao, 2012) provided basic information for this study.

**Creating the research group**

This research study obtained the ethical approval of the Tianjin Medical University Metabolic Disease Hospital Ethics Committee (No. DXBYYhMEC2015-26) and guidance from the Chinese Nursing Association. The Chinese Nursing Association Diabetes Professional Committee proposed appointments to the Steering Committee and Project Execution Team.

**The concept of core competencies**

Twenty experts were invited by the Steering Committee to a brainstorming session to clarify the definition of core competencies of nurse specialists in diabetes care and to discuss the contents and outline of core competencies. A system framework of three grades was proposed for primary nurse specialists in diabetes care. First-grade indicators consisted of the dimensions of the core competencies. Second-grade indicators were drawn from the main competencies in the dimensions of the framework; and third-grade indicators, from the detailed content of the competencies.
Development of the first draft of the framework

After the brainstorming phase, the Project Execution Team organized the information and held a seminar to determine the first draft of the core competence framework. The 50 participants in this seminar included three diabetologists, 37 nurse specialists in diabetes care, five nursing managers, and five patients with diabetes.

Expert panel selection and recruitment
Fifty diabetes experts from 28 provinces and municipalities joined the expert panel to (a) balance the differences among regions and (b) maximize information diversity to make the framework more universal and comprehensive. The experts included clinical diabetes nurse specialists, nursing managers, and diabetologists who had 10 years or more of experience in diabetes treatment and care.

Data Collection
The Project Execution Team applied the Delphi method (Aljamal, Ashcroft, & Tully, 2016) to carry out three rounds of consultation between October 2015 and March 2016. In the first round, experts gave their advice on the first draft of the framework, with advice focused mainly on the deletion, addition, or modification of indicators. In the second round, experts continued to provide new suggestions and assigned a value to all of the indicators based on a 5-point Likert scale from 5 = very important to 1 = not important. Afterward, group members readjusted and formed new indicators based on the following screening criteria: mean > 3.5, coefficient of variation < 0.25, and expert approval rate > 70% (Guo, 2005; Wu, 2011). The third round mirrored the process in the second round and assigned weights to the first-grade indicators using the superiority chart (Cabral et al., 2005). All of the opinions were summarized to form the core competencies of primary nurse specialists in diabetes care.

Data Analysis
Microsoft Excel 2007 (Microsoft, Redmond, WA, USA) and IBM SPSS Statistics 17.0 software (SPSS, Inc., Chicago, IL, USA) were used to conduct data analysis and processing. Data were presented as means and standard deviations for continuous variables. In general, the authoritative coefficient (Cr) is composed on the basis of expert judgment (Ca) and of familiarity with the questions (Cs). The formula is Cr = (Ca + Cs) / 2. The value of Ca and Cs is obtained mainly through expert self-evaluation. The variables Ca and Cs reflect, respectively, the judgment and familiarity of the experts with regard to survey content. Kendall's coefficient of concordance (W) refers to the level of intraexpert agreement on all of the indicators. A nonparametric test was applied for Kendall's coefficient of concordance (W).

Results

Reliability of Expert Consultation

Expert information
Of the 50 consultants who participated in the Delphi survey, three did not reply and two provided incomplete information; thus, five were excluded. Demographic data on the remaining 45 included mean age, 44.69 ± 6.48 years; years of work experience in diabetes care, 15.75 ± 4.81; nursing managers, 13 (28.9%); diabetologists, 5 (11.1%); and diabetes nurse specialists, 27 (60%). In terms of education, three (6.7%) were educated to the college level, 28 (62.2%) held undergraduate degrees, 11 (24.4%) held a master’s degree, and three (6.7%) held a doctoral degree.

Rate of response of experts
Fifty questionnaires were distributed, and 45 valid questionnaires were received via e-mail. The response rate for each round was 94%, 100%, and 95.7%, respectively.

Authoritative coefficient
The assignments of Ca and Cs are shown in Table 1. With the judgment coefficient of .91 and the familiarization coefficient of .90, the authority coefficient of experts was .91.

Kendall’s coefficient of concordance (W)
Kendall’s coefficient of concordance (W) values for the second and third rounds of expert consultations are shown in Table 2.

Selection of Indicators

Three rounds of Delphi consultations
In the first round of consultations, experts indicated a high level of recognition on first- and second-grade indicators. In addition, three third-grade indicators were eliminated, three third-grade indicators were added, and the descriptions of some indicators were modified based on expert opinions.

Table 1. The Assignment of Expert Judgment (Ca) and Familiarity With the Questions (Cs)

| Judgment Basis | High | Middle | Low | Familiarization | Cs |
|----------------|------|--------|-----|----------------|----|
| Theoretical analysis | .30   | .20    | .10 | High familiarity | 1.0 |
| Experience | .45   | .35    | .20 | Familiarity     | 0.8 |
| Information | .20   | .15    | .10 | Understand      | 0.6 |
| Feeling | .05   | .05    | .05 | Unclear         | 0.4 |
TABLE 2.
Kendall’s Coefficient of Concordance (W)

| Consulting/Index | W   | $x^2$  | p     |
|------------------|-----|-------|-------|
| **Second round** |     |       |       |
| First grade      | .892 | 160.56 | < .001 |
| Second grade     | .378 | 356.96 | < .001 |
| Third grade      | .485 | 1849.40 | < .001 |
| **Third round**  |     |       |       |
| First grade      | .793 | 145.62 | < .001 |
| Second grade     | .418 | 403.59 | < .001 |
| Third grade      | .542 | 2021.34 | < .001 |

In the second round, three second-grade indicators and 15 corresponding third-grade indicators were deleted on the basis of analysis methods, clinical applicability, and expert opinions. In the third round, one second-grade indicator and five corresponding third-grade indicators were deleted. The study process is shown in Figure 1.

After three rounds of Delphi consultation, a three-grade system was constructed, consisting of six first-grade indicators, 23 second-grade indicators, and 87 third-grade indicators. The relationships among these are shown in Table 3.

Weights of the dimensions

According to the results of the consultation, the weights of the six dimensions (diabetes professional knowledge, diabetes-related knowledge, communication skills and health education ability, specialized skills, clinical judgment, and specialty development capacity) were .221, .149, .192, .209, .160, and .069, respectively.

Discussion

The Indicator Selection of the Framework

After three rounds of consultation, some indicators were deleted or added according to the analysis methods, clinical applicability, and expert opinions. Moreover, the expressions of some indicators were modified. For example, the content of “psychological knowledge” was revised from “mastering the conception of psychology,” “understanding the application of psychology in nursing work,” and “be able to use the psychological assessment instrument” to “learn common psychological problems in patients with diabetes” and “become familiar with the care regimen of common psychological problems” to make the framework more suitable to clinical requirements. However, the expert approval rating was only 70% for several indicators, including “ability to judge social support” and “understand the relevant laws and ethics.” These indicators were retained for one or both of the following reasons: (a) These competencies facilitate the provision of individualized care and improve clinical safety, and (b) in the current healthcare environment in China, the indicator is necessary for competency among specialty nurses to meet changing healthcare demands. The final first-grade indicators represented the six dimensions of the core competencies of primary nurse specialists in diabetes care. “Diabetes professional knowledge” included five aspects (epidemiology, classification and characteristics, pathophysiology, complications, and hypoglycemia) with 16 indicators. “Diabetes-related knowledge” included three aspects (nutrition, exercise, and psychology) with 12 indicators. “Communication skills and health education ability” included four aspects (communication, assessment, organization and planning, and expression and explanation) with 17 indicators. “Specialized skills” included two aspects (specialized nursing skills and emergency response capacity) with 12 indicators. “Clinical judgment” included four aspects (clinical evaluation, judgment of social support, analysis of potential risk, and mastery of relevant laws and ethics) with 13 indicators. “Specialty development capacity” included five aspects (teaching, training, team coordination, continuous nursing, and learning) with 17 indicators.

External Validity of the Framework

This framework, which broadly reflects the professional characteristics of nurse specialists in diabetes care, was constructed...
| Indicator (First/Second/Third-Grade) | Approval Rating (%) | M       | SD      | Coefficient of Variation |
|-------------------------------------|---------------------|---------|---------|--------------------------|
| I. Diabetes professional knowledge  |                     |         |         |                          |
| 1. The epidemiological trends of diabetes | 81.0 5.00 0.00 0.21 |
| (a) Know the epidemiological feature of diabetes | 83.3 4.17 0.88 0.21 |
| (b) Know the risk factors for diabetes | 100.0 4.64 0.48 0.10 |
| (c) Know the latest diabetes prevention strategies and measures | 88.1 4.52 0.77 0.17 |
| 2. Classification and characteristics of diabetes | 97.6 4.74 0.50 0.11 |
| (a) Know the classification and diagnostic criteria for diabetes | 100.0 4.76 0.43 0.09 |
| (b) Know the characteristics of the different types of diabetes | 100.0 4.71 0.46 0.10 |
| (c) Identify diabetes-related metabolic parameters | 100.0 4.74 0.45 0.09 |
| 3. Pathophysiology characteristics of diabetes | 83.3 3.90 0.85 0.22 |
| (a) Understand normal blood glucose metabolism | 90.5 4.33 0.85 0.20 |
| (b) Understand the causes and mechanisms of diabetes | 83.3 4.19 0.77 0.18 |
| (c) Understand the physiological role of insulin and other hormones | 88.1 4.26 0.73 0.17 |
| 4. Knowledge of complications of diabetes | 100.0 4.93 0.26 0.05 |
| (a) Know diabetes acute and chronic complications | 100.0 4.88 0.33 0.07 |
| (b) Know the causes of diabetes complications | 100.0 4.83 0.38 0.08 |
| (c) Know clinical the symptoms and outcomes of various complications | 95.2 4.40 0.59 0.13 |
| (d) Master nursing key points of diabetes acute and chronic complications | 100.0 4.95 0.22 0.04 |
| 5. Knowledge of hypoglycemia | 100.0 4.95 0.22 0.04 |
| (a) Know hypoglycemia prevention | 100.0 5.00 0.00 0.00 |
| (b) Know hypoglycemia cause | 100.0 4.88 0.33 0.04 |
| (c) Clear diagnosis criteria of hypoglycemia | 100.0 4.95 0.22 0.04 |
| II. Diabetes-related knowledge | 97.6 4.62 0.62 0.13 |
| 1. Nutrition knowledge |                     |         |         |                          |
| (a) Clear the purpose of diabetes nutrition therapy | 97.6 4.57 0.63 0.14 |
| (b) Know the general principles of diabetes nutrition therapy very well | 100.0 4.90 0.30 0.06 |
| (c) Know the reasonable regulation of the total calories and nutrients very well | 97.6 4.71 0.51 0.11 |
| (d) Know food exchange portion and daily food glycemic index | 95.2 4.43 0.59 0.13 |
| (e) Master the principles of nutrition therapy of complications of diabetes | 97.6 4.83 0.44 0.09 |
| 2. Kinematics knowledge |                     |         |         |                          |
| (a) Understand the benefits of exercise in patients with diabetes | 97.6 4.71 0.51 0.11 |
| (b) Master the indications and contraindications of exercise therapy | 100.0 4.90 0.30 0.06 |
| (c) Master the movement type suitable for patients with diabetes | 100.0 4.81 0.40 0.08 |
| (d) Master movement intensity, duration, frequency, and precautions | 97.6 4.90 0.37 0.08 |
| (e) Know the appropriate exercise tools for diabetes | 90.5 4.43 0.74 0.17 |
| 3. Psychological knowledge | 88.1 4.31 0.68 0.16 |
| (a) Learn common psychological problems in patients with diabetes | 92.9 4.38 0.62 0.14 |
| (b) Become familiar with the care regimen of common psychological problems | 97.6 4.55 0.55 0.12 |
| III. Communication skills and health education ability |                     |         |         |                          |
| 1. Ability to communicate with patients |                     |         |         |                          |
| (a) Evaluate effective methods of communicating with patients | 100.0 4.86 0.35 0.07 |
| (b) Choose appropriate methods to communicate with diabetes | 97.6 4.74 0.50 0.11 |
| 2. Ability to assess diabetes education needs |                     |         |         |                          |
| (a) Evaluate the health education needs of patients | 97.6 4.76 0.48 0.10 |
| (b) Use education methods appropriate to patient ability to comprehend | 95.2 4.74 0.54 0.11 |
| 3. Ability to organize and plan diabetes education |                     |         |         |                          |
| (a) Collect and select useful educational information to make courseware | 95.2 4.52 0.67 0.15 |
| (b) Deliver specific information to patients and their families accurately | 95.2 4.74 0.54 0.11 |
| (c) Deliver educational programs together with patients | 100.0 4.83 0.38 0.08 |
| (d) Develop goals together with the patient in behavior change | 97.6 4.67 0.53 0.11 |
| (e) Evaluate educational results effectively | 92.9 4.57 0.63 0.14 |
| (f) Ability to organize different forms of educational activities | 83.3 4.12 0.82 0.20 |
### TABLE 3.
**Expert Opinion on First-, Second-, and Third-Grade Indicators, Continued**

| Indicator (First/Second/Third-Grade) | Approval Rating (%) | M     | SD   | Coefficient of Variation |
|-------------------------------------|---------------------|-------|------|--------------------------|
| 4. Ability to express and explain health knowledge | 100.0              | 4.86  | 0.35 | 0.07                     |
| (a) Make patients to master the basic knowledge of diabetes | 97.6               | 4.83  | 0.44 | 0.09                     |
| (b) Enable patients and their families to master individualized diet regimen | 97.6               | 4.76  | 0.48 | 0.10                     |
| (c) Enable patients and their families to master their exercise programmes | 92.9               | 4.7   | 0.6  | 0.13                     |
| (d) Enable patients and their families to master hypoglycemic drugs including basic knowledge, intake and adverse reactions, especially their uses | 97.6               | 4.81  | 0.55 | 0.11                     |
| (e) Enable patients to master the method of blood glucose monitoring | 97.6               | 4.93  | 0.34 | 0.07                     |
| (f) Enable patients to master the insulin injection | 100.0              | 4.95  | 0.22 | 0.04                     |
| (g) Enable patients to know acute and chronic complications and preventive measures | 95.2               | 4.69  | 0.56 | 0.12                     |
| IV. Specialized skills | 100.0              | 4.86  | 0.35 | 0.07                     |
| 1. Specialized nursing skills | 100.0              | 4.88  | 0.33 | 0.07                     |
| (a) Know the classification of oral agents, usage, and adverse reactions | 97.6               | 4.76  | 0.48 | 0.10                     |
| (b) Know how to inject different diabetes drugs | 100.0              | 4.98  | 0.15 | 0.03                     |
| (c) Know how to use and manage insulin pump | 97.6               | 4.83  | 0.44 | 0.09                     |
| (d) Know how to use and manage glucose meter | 100.0              | 4.95  | 0.22 | 0.04                     |
| (e) Know the frequency of blood glucose monitoring in a different state | 100.0              | 4.90  | 0.30 | 0.06                     |
| (f) Know how to use continuous glucose monitoring system | 88.1               | 4.29  | 0.74 | 0.17                     |
| (g) Know how to screen for the diabetes-related complications | 71.4               | 4.17  | 0.91 | 0.22                     |
| (h) Master the outline of evaluation in diabetes care | 90.5               | 4.62  | 0.66 | 0.14                     |
| 2. Emergency response capacity | 95.2               | 4.71  | 0.55 | 0.12                     |
| (a) Know how to treat hypoglycemia | 100.0              | 5.00  | 0.00 | 0.00                     |
| (b) Know how to discern and treat acute complications of diabetes (such as ketosis) | 95.2               | 4.86  | 0.47 | 0.10                     |
| (c) Know how to use relevant rescue equipment | 95.2               | 4.79  | 0.52 | 0.11                     |
| (d) Ability to judge diabetes-related critical value and deal with them | 95.2               | 4.76  | 0.62 | 0.12                     |
| V. Clinical judgment | 92.6               | 4.50  | 0.63 | 0.14                     |
| 1. Clinical evaluation capacity | 92.9               | 4.48  | 0.63 | 0.14                     |
| (a) Ability to evaluate individual cognition levels | 90.5               | 4.45  | 0.74 | 0.17                     |
| (b) Ability to evaluate behavioral changes in the patient | 90.5               | 4.38  | 0.79 | 0.18                     |
| (c) Ability to evaluate compliance of the patient | 92.9               | 4.50  | 0.71 | 0.16                     |
| (d) Ability to clearly evaluate patient condition | 95.2               | 4.52  | 0.67 | 0.15                     |
| (e) Ability to evaluate self-care ability of the patient | 95.2               | 4.57  | 0.67 | 0.15                     |
| (f) Ability to evaluate the psychological status of the patient | 88.1               | 4.36  | 0.82 | 0.19                     |
| 2. Ability to judge social support | 70.0               | 3.93  | 0.84 | 0.21                     |
| (a) Ability to evaluate family support | 83.3               | 4.21  | 0.84 | 0.20                     |
| (b) Ability to evaluate social support | 78.6               | 4.07  | 0.89 | 0.22                     |
| (c) Ability to evaluate financial support | 81.0               | 4.14  | 0.90 | 0.22                     |
| 3. Ability to analyze potential risk | 92.9               | 4.38  | 0.70 | 0.16                     |
| (a) Ability to evaluate diabetes complications | 95.2               | 4.69  | 0.56 | 0.12                     |
| (b) Ability to evaluate potential adverse events (such as pressure sores, falls, and so on) | 97.6               | 4.74  | 0.50 | 0.11                     |
| 4. Understand the relevant laws and ethics | 70.0               | 3.92  | 0.92 | 0.23                     |
| (a) Understand the relevant laws and regulations | 71.4               | 4.02  | 0.90 | 0.22                     |
| (b) Understand the clinical ethics | 70.0               | 3.86  | 0.87 | 0.23                     |
| VI. Specialty development capacity | 88.1               | 4.10  | 0.73 | 0.18                     |
| 1. Teaching ability | 78.6               | 4.24  | 0.85 | 0.20                     |
| (a) Be able to use the appropriate way of teaching (such as multimedia) | 95.2               | 4.48  | 0.60 | 0.13                     |
| (b) Be able to implement specialized teaching for students | 92.9               | 4.38  | 0.70 | 0.16                     |
| (c) Be able to conduct case report | 90.5               | 4.33  | 0.72 | 0.17                     |

(continues)
based on the British career and competency framework for diabetes nursing (Trend, 2011). The process used in this study to select experts differed from other studies in terms of number and region (Gattinger et al., 2016; Gibson & Soanes, 2000). The number of experts was relatively high (50 recruited). Moreover, clinical diabetes nurse specialists, nursing managers, and diabetologists were involved with the aim of obtaining more information from multiple perspectives. In addition, the diverse regional backgrounds of the experts (28 provinces) were expected to ensure that regional differences were considered so that the framework was universally applicable and comprehensive. Research has shown that specialty nurses have better mastery of theoretical knowledge and skills than general nurses, which certainly affects the quality of nursing care (Yao, 2012). This framework is intended to provide a reference for clinical nursing managers to cultivate and evaluate the core competencies of nurse specialists in diabetes care to help them provide more effective patient care.

### Characteristics of the Indicators in the Framework

This framework was based primarily on the British career and competency framework for diabetes nursing (Trend, 2011). In addition, guidelines from the AADE (2011) and the Australian Diabetes Educators Association (2008) and domestic experience in the emergency, peripherally inserted central catheter, intensive care unit, and other settings (Fan & Xi, 2011; Yao, 2012) were incorporated. The career and competency framework for nurse specialists in diabetes care in the British model provided particularly important insights. However, the developed model differs significantly from the British model in several respects. First, the British model is a theoretical framework that emphasizes the core competencies of five different levels of nurses (unregistered practitioners, competent nurses, experienced or proficient nurses, senior practitioners or expert nurses, and consultant nurses). In contrast, the model that was developed in this study targets only nurse specialists in diabetes care. The framework contains the basic competencies that nurse specialists in diabetes care should have and provides the basis for the future establishment of a higher level framework. Because research and leadership competencies are more suited to senior nurse specialists in diabetes care, these competencies were not included in the study framework.

Second, the British framework covers competencies that focus partly on care for patients living in residential and nursing homes, confined to prisons and young offender units, and receiving end-of-life care. As patients in China are always managed in hospitals, this model did not consider patients in these categories.

Third, the two models have a number of competencies in common such as diet, exercise, blood glucose monitoring, use of antidiabetic agents, mental health, nursing for complications of the disease, and hypoglycemia prevention and treatment. However, because of differences in cultural background and health policies, certain indicators are more relevant

### TABLE 3.

**Expert Opinion on First-, Second-, and Third-Grade Indicators, Continued**

| Indicator (First/Second/Third-Grade)                                                                 | Approval Rating (%) | M     | SD   | Coefficient of Variation |
|---------------------------------------------------------------------------------------------------|---------------------|-------|------|-------------------------|
| 2. Training ability                                                                               |                     |       |      |                         |
| (a) Be able to offer diabetes specialized training to others                                      | 81.0                | 4.14  | 0.78 | 0.19                    |
| (b) Be able to supervise and guide clinical professional nurses in professional operating skills | 83.3                | 4.24  | 0.79 | 0.19                    |
| 3. Team coordination ability                                                                      |                     |       |      |                         |
| (a) Ability of interpersonal communication                                                          | 92.9                | 4.55  | 0.63 | 0.14                    |
| (b) Play a greater influence in a team                                                              | 92.9                | 4.50  | 0.71 | 0.16                    |
| (c) Be able to communicate, coordinate, and cooperate effectively with team members               | 85.7                | 4.31  | 0.78 | 0.18                    |
| (d) Be able to adjust working pattern according to the opinions of others                          | 88.1                | 4.36  | 0.76 | 0.17                    |
| (e) Ability to implement plans                                                                    | 92.6                | 4.50  | 0.63 | 0.14                    |
| 4. Continuous nursing ability                                                                    |                     |       |      |                         |
| (a) Be able to follow up regularly                                                                 | 92.9                | 4.40  | 0.63 | 0.14                    |
| (b) Guide patients how to check regularly                                                          | 95.2                | 4.50  | 0.67 | 0.15                    |
| (c) Answer problems from outpatients with diabetes                                                 | 95.2                | 4.50  | 0.59 | 0.13                    |
| (d) Develop a wellness program for patients                                                         | 95.2                | 4.50  | 0.59 | 0.13                    |
| 5. Learning ability                                                                               |                     |       |      |                         |
| (a) Recognize personal learning needs                                                               | 100.0               | 4.60  | 0.50 | 0.11                    |
| (b) Take diabetes continuing education courses                                                     | 95.2                | 4.50  | 0.59 | 0.13                    |
| (c) Learn new knowledge and new information associated with diabetes                               | 95.2                | 4.60  | 0.59 | 0.13                    |

Note. The framework consists of six first-grade indicators, 23 second-grade indicators, and 87 third-grade indicators.
to Chinese healthcare. These include emphasizing judgment in social support and potential risks and understanding the laws, regulations, and clinical ethics to guarantee the safety of patients and deal with medical stress. Furthermore, team coordination ability and learning ability were added to improve the quality of nursing care.

Fourth, the dimension of competencies was made more consistent with the medical background of nurses in China by classifying basic diabetes knowledge and skills into the three dimensions of diabetes professional knowledge (classification and characteristics of diabetes, knowledge of hypoglycemia, complications nursing), diabetes-related knowledge (nutrition, kinematics, psychological knowledge), and specialized skills (insulin pump management, blood glucose monitoring). Moreover, the competencies were distinguished into three grades (dimensions, competencies, and detailed indicators), which formed a detailed hierarchical system.

Finally, diabetes education is a significant component of clinical work. Thus, the model reflected the specific characteristics of diabetes educators in terms of communication skills and health education ability.

Limitations

This study showed the development process and structure of the framework for primary nurse specialists in diabetes care. Although the research design and execution were rigorous, some limitations still exist. The result of the study was the formation of a theoretical framework, which must be verified and further improved in clinical settings. The framework was constructed for primary nurse specialists in diabetes care and offers clear standards for the training of primary nurse specialists in diabetes care only. This framework is unable to meet the demands of advanced nurse specialists in diabetes care. Thus, a multilevel core-competence system framework should be developed.

Conclusions

The core-competence system framework includes six core competencies, which broadly represent the main characteristics of primary nurse specialists in diabetes care. However, as this is a theoretical framework, it must be tested in clinical practice environments in China.

Acknowledgments

The authors gratefully acknowledge the assistance of Xiuhua Li and other members of the Chinese Nursing Association diabetes professional committee. The authors acknowledge the editorial assistance of Amparo B. González and Teresa L. Pearson. Thanks to Wei Xi for assistance with statistical methods and to Zhaojun Yang, Xianghai Zhou, Yuhong Zhang, several experienced nursing staffs, and physicians with diabetes expertise for helping with the project design and implementation.

References

Aljamal, M. S., Ashcroft, D., & Tully, M. P. (2016). Development of indicators to assess the quality of medicines reconciliation at hospital admission: An e-Delphi study. *International Journal of Pharmacy Practice, 24*(3), 209–216. https://doi.org/10.1111/ijpp.12234

American Association of Diabetes Educators. (2011). *Competencies for diabetes educators: A companion document to the guidelines for the practice of diabetes education.* Chicago, IL: Author.

Australian Diabetes Educators Association. (2008). *National core competencies for credentialled diabetes educators.* Canberra, Australia: Author.

Bermudez-Tamayo, C., Besançon, S., Johri, M., Assa, S., Brown, J. B., & Ramaiya, K. (2017). Direct and indirect costs of diabetes mellitus in Mali: A case-control study. *PLoS ONE, 12*(6), e0176128. https://doi.org/10.1371/journal.pone.0176128

Cabral, D., Katz, J. N., Weinblatt, M. E., Ting, G., Avorn, J., & Solomon, D. H. (2005). Development and assessment of indicators of rheumatoid arthritis severity: Results of a Delphi panel. *Arthritis and Rheumatism, 53*(1), 61–66. https://doi.org/10.1002/art.20925

Chan, W. F., Bond, T. G., Adamson, B., & Chow, M. (2016). Identifying core competencies of infection control nurse specialists in Hong Kong. *Clinical Nurse Specialist, 30*(1), E1–E9. https://doi.org/10.1097/NUR.0000000000000174

Douglass, E., & Ruddle, G. (2009). Implementation of the NHS knowledge and skills framework. *Nursing Standard, 24*(1), 42–48. https://doi.org/10.7748/ns2009.09.24.1.42.c7260

Fan, L., & Xi, S. H. (2011). Study on the construction of core competency evaluation index system for emergency specialized nurses. *Chinese Journal of Nursing, 48*(2), 144–146. (Original work published in Chinese)

Gattinger, H., Leino-Kilpi, H., Hantikainen, V., Köpke, S., Ott, S., & Senn, B. (2016). Assessing nursing staff’s competences in mobility support in nursing-home care: Development and psychometric testing of the Kinaesthetics Competence (KC) observation instrument. *BMC Nursing, 15*(1), 65. https://doi.org/10.1186/s12912-016-0185-z

Gibson, F., & Soanes, L. (2000). The development of clinical competencies for use on a paediatric oncology nursing course using a nominal group technique. *Journal of Clinical Nursing, 9*(3), 459–469. https://doi.org/10.1046/j.1365-2702.2000.00404.x

Guariguata, L., Whiting, D. R., Hambleton, I., Beagley, J., Linnenkamp, U., & Shaw, J. E. (2014). Global estimates of diabetes prevalence for 2013 and projections for 2035. *Diabetes Research and Clinical Practice, 103*(2), 137–149. https://doi.org/10.1016/j.diabres.2013.11.002

Cite this article as:

Xing, Q., Zhang, M., Zhao, F., Zhou, Y., Mo, Y., & Yuan, L. (2019). The development of a standardized framework for primary nurse specialists in diabetes care in China: A Delphi study. *The Journal of Nursing Research, 27*(6), e53. https://doi.org/10.1097/njr.0000000000000330

Accepted for publication: October 14, 2018

*Address correspondence to: Fang ZHAO, No. 2, East Yinqiu, Chaoyang District, Beijing 100029, China. Tel: +86-10-6422-2952; E-mail: zhaoft01@aliyun.com

The authors declare no conflicts of interest.
Guo, X. H. (2005). *Practical medical investigation and analysis techniques*. Beijing, China: People’s Medical Publishing House. (Original work published in Chinese)

Hicks, D. (2010). Competency in practice: Are you fit for purpose? *Journal of Diabetes Nursing*, 14, 44-46.

International Diabetes Federation. (2017). *IDF diabetes atlas—8th edition*. Brussels, Belgium: Author. Retrieved from http://www.diabetesatlas.org

Kalb, K. A. (2008). Core competencies of nurse educators: Inspiring excellence in nurse educator practice. *Nursing Education Perspectives*, 29(4), 217–219.

Ogurtsova, K., da Rocha Fernandes, J. D., Huang, Y., Linnenkamp, U., Guariguata, L., Cho, N. H., … Makaroff, L. E. (2017). IDF diabetes atlas: Global estimates for the prevalence of diabetes for 2015 and 2040. *Diabetes Research and Clinical Practice*, 128, 40–50. https://doi.org/10.1016/j.diabres.2017.03.024

Trend, U. K. (2011). *An integrated career and competency framework for diabetes nursing* (3rd ed.). London, England: SB Communications.

Wang, R. H. (2017). Psychological care for patients with diabetes—Present and future. *The Journal of Nursing Research*, 25(2), 86–89. https://doi.org/10.1097/JNR.0000000000000207

Whiting, D. R., Guariguata, L., Weil, C., & Shaw, J. (2011). IDF diabetes atlas: Global estimates of the prevalence of diabetes for 2011 and 2030. *Diabetes Research and Clinical Practice*, 94(3), 311–321. https://doi.org/10.1016/j.diabres.2011.10.029

Wu, L. P. (2011). Construction of a core competency evaluation index system for diabetes specialist nurse (Master’s thesis). Anhui, China: Anhui Medical University. (Original work published in Chinese)

Xu, Y., Wang, L., He, J., Bi, Y., Li, M., Wang, T., … 2010 China Noncommunicable Disease Surveillance Group. (2013). Prevalence and control of diabetes in Chinese adults. *JAMA*, 310(9), 948–959. https://doi.org/10.1001/jama.2013.168118

Yang, W., Lu, J., Weng, J., Jia, W., Ji, L., Xiao, J., … China National Diabetes and Metabolic Disorders Study Group. (2010). Prevalence of diabetes among men and women in China. *The New England Journal of Medicine*, 362(12), 1090–1101. https://doi.org/10.1056/NEJMoa0908292

Yao, H. (2012). Construction of core competency evaluation indices for PICC specialized nurses and clinical investigation analysis (Master’s thesis). China: The Second Military Medical University, Shanghai City, China. (Original work published in Chinese)