Review Article
Effectiveness of comprehensive nursing on blood glucose control and birth outcomes in patients with gestational diabetes mellitus

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Abstract: Background/Objective: Routine nursing makes it relatively hard to trace the characteristics of disease changes, which can prolong the conditions. Driven by the gradual enhancement of people's health care awareness, a new patient-centered nursing method, which is comprehensive nursing, comes into being, and it had proven to yield favorable nursing results. This study focused on the application of comprehensive nursing in gestational diabetes mellitus (GDM) and observed the nursing outcomes to find that patients' blood glucose was better controlled and the birth outcome was improved. Therefore, this study was designed to explore the effect of comprehensive nursing on blood glucose control and birth outcomes with GDM. Methods: A total of 70 pregnant women with GDM in the Department of Gynecology and Obstetrics in Taizhou Enze Medical Center Taizhou Hospital were selected and divided into group A and group B. Among them, 33 cases in group A were treated with comprehensive nursing, and the remaining 37 cases in group B were treated with routine nursing. The patient's mood and related blood glucose indexes, the adverse birth outcomes, satisfaction and quality of life in the two groups were observed and compared. Results: The scores of self-rating anxiety scale (SAS) and self-rating depression scale (SDS) in group A were lower than those in group B after nursing. The post-nursing stability of blood glucose in group A was better than that in group B (P<0.05). The total incidence of adverse birth outcomes in group A was lower than that in group B (P<0.05). The self-care ability, overall satisfaction and quality of life in group A were higher than those in group B (P<0.05). Conclusion: Comprehensive nursing plays an important role in blood glucose control and birth outcomes of GDM.

Keywords: Comprehensive nursing, gestational diabetes mellitus, blood glucose control, birth outcomes

Introduction

Gestational diabetes mellitus (GDM) is the most common metabolic disorder occurring during pregnancy [1], affecting approximately 15% of pregnant women worldwide [2]. It is defined as any degree of hyperglycemia first recognized during pregnancy, which includes undiagnosed type 2 diabetes found in early pregnancy and later developed cases of true gestational diabetes [3]. If left untreated, perinatal morbidity and mortality may increase [4]. About 20% of pregnancies are associated with GDM, which leads to an increased risk of caesarean section, macrosomia and preeclampsia [5], and are associated with an increase in the

baby's gestational age, resulting in injury to the baby at birth and/or injury to the mother at delivery [6]. Research reports indicate that approximately 50% of mothers with GDM will develop diabetes within 10 years, which makes GDM one of the strongest predictors of type 2 diabetes [7]. However, current evidence shows that an increasing number of women are suffering from previously undiagnosed diabetes and related complications, leading to substantial medical costs [8].

Traditionally, insulin has been considered as the standard for the management of gestational diabetes when diet and exercise fail to achieve good maternal glucose control without

the risk of insulin trans-placental transfer [9]. Now, comprehensive nursing comes into being, which is specifically managed based on the patient's individual needs and preferences, disease progression, and response and tolerance to treatment [10]. The patient's journey with comprehensive nursing represents the interaction of patients with multiple healthcare environments distributed both spatially and temporally.

The purpose of this study is to explore the improvement of blood glucose control and birth outcomes of GDM by comprehensive nursing.

Materials and methods

General information

A total of 70 pregnant women with GDM in the Department of Gynecology and Obstetrics in Taizhou Enze Medical Center Taizhou Hospital were selected and divided into group A (n=33) and group B (n=37); among which, patients in group A received comprehensive nursing, while those in group B were treated with routine nursing. All the patients delivered in hospital and were nursed at the hospital's obstetric department for a week after delivery.

Inclusion and exclusion criteria

Inclusion criteria: All pregnant women were diagnosed with GDM [11] and had complete clinical data. All the patients and their families were informed about the details of this study, and signed the informed consent. This study was approved by the Medical Ethics Committee of Taizhou Enze Medical Center Taizhou Hospital.

Exclusion criteria: Patients with liver, kidney or heart insufficiency; Patients with major hematological diseases; Patients with communication disorders and any type of concealment from health care staff; Patients with diseases affecting activity; Patients with allergies.

Nursing methods

Group A was treated with comprehensive nursing, with the measures as follows: (1) Psychological nursing: As patients' would develop anxiety, the nursing staff was there to relieve patients' anxiety, keep patients physically and mentally happy and reduce their tension by diverting their attention. In addition, the nursing staff adopted the suggestions put forward by the patients, understood any deficiencies and made the corresponding rectification and the enhancement, so as to continuously provide the high quality personalized nursing for patients. (2) Health education: Before health education, patients' demands were understood and questions were answered. In addition, nursing staff also carried out health popularization to patients, so that patients understood relevant medical knowledge and some first aid measures. During health education, the nursing staff constantly communicated with the patient and kept a close eye on the condition of patients. (3) Life nursing: Patients were taken out of their rooms, accompanied by the nursing staff for relaxation every day to avoid emotional depression. Frequent sterilization of the ward, and reasonable adjustment of the ward temperature and humidity were carried out. What's more, patient's physical indicators were closely observed every day and the patients were asked to report any discomfort. In case of any problem, the nursing staff contacted the doctor as soon as possible so as not to delay the treatment. Moreover, the patients were informed and guided to pay attention to their personal hygiene. (4) Dietary nursing: The patients' diet was carefully adjusted according to their own conditions and eating habits, and different feeding plans were formulated according to different stages of pregnancy. In addition, patients were informed of dietary contraindications, to avoid eating spicy and stimulating food, and to supplement the corresponding nutrition products according to their own conditions, so as to prevent patients from lack of nutrition and physical weakness. (5) Exercise nursing: According to the patient's own situation, a gentle after-dinner exercise plan was made, such as yoga or walking, lasting for half an hour. (6) Blood glucose monitoring: Fasting blood glucose and 2 h postprandial blood glucose were measured every day. If the blood glucose was detected to be out of range, the doctor was informed in real time, and the diet was adjusted. If the effect of dietary adjustment was not ideal, the corresponding drug treatment was selected according to the patient's own conditions.

Group B adopted routine nursing, which mainly included observing the changes of patients' conditions, providing life guidance for patients,

and instructing matters needing attention, as well as communicating with doctors about patients' conditions and solving any issues in real time.

Outcome measures

Self-rating anxiety scale (SAS) [12] and self-rating depression scale (SDS) [13] were employed to determine the anxiety and depression of patients, and the score was directly proportional to the anxiety and depression.

With reference to Short-Form 36 Item Health Survey (SF-36) scale [14], patients in the two groups were scored in terms of physical functioning (PF), role-physical (RP), role-emotional (RE) and quality of life (QOL). On a 100-points scale in each dimension, the higher the score, the better the quality of life.

The pre- and post-nursing fasting blood glucose (FBG), 2 h postprandial blood glucose (2h-PG) and glycated hemoglobin (HbAlc) concentration were measured by a glucometer purchased from Zeyuan Medical Equipment Sales Co., Ltd., Henan, China.

According to exercise of self-care agency scale (ESCA) [15], the self-care ability of patients, including self-care concepts, skills, knowledge and responsibility, were observed in the two groups. The total score was 100, and the score was in direct proportion to the ability.

Statistical methods

The statistical analysis was performed by SPSS 20.0 (SPSS Inc., Chicago, IL, USA). The measurement data, which were expressed as mean ±standard deviation (x ± SD), were verified by t-test, and the pre- and post-nursing comparisons were conducted by paired t test. The counting data were tested by chi-square test and expressed as percentage (%). When P<0.05, the difference was statistically significant.

Results

General information of patients in the two groups

Comparasion of the general information did not identify any significant difference between the two groups (P>0.05) (**Table 1**).

Anxiety of patients in the two groups before and after nursing

The SAS scores before and after nursing in group A were (34.32±3.23) points and (14.14±2.31) respectively, and the SAS scores before and after nursing in group B were (35.13±3.54) points and (20.58±3.02) points respectively. From the data, we can see that there was no marked difference in the SAS score between the two groups before nursing, while after nursing, the SAS score dropped in both groups, and the post-nursing SAS score in group A was lower than that in group B (P<0.05), indicating that comprehensive nursing could effectively relieve the anxiety of patients (**Figure 1**).

Depression of patients in the two groups before and after nursing

The SDS scores before and after nursing in group A were (37.42±4.24) points and (20.31±2.53) respectively, and the SAS scores before and after nursing in group B were (38.12±4.19) points and (26.97±3.32) points respectively. It was clear that there was no marked difference in the SDS score between the two groups before nursing, while after nursing, the SAS score decreased in both groups, and the post-nursing SDS score in group A was lower than that in group B (P<0.05), suggesting that comprehensive nursing was better than routine nursing in reducing the depression of patients (**Figure 2**).

Comparison of blood glucose indexes before and after nursing between the two groups

The FPG before and after nursing in group A were (8.45±1.49) mmol/L and (4.28±1.04) mmol/L respectively, while the FPG before and after nursing in Group B were (8.52±1.48) mmol/L and (6.14±1.13) mmol/L, respectively. The 2h-PG before and after nursing in group A were (12.31±1.32) mmol/L and (6.36±0.83) mmol/L, while the 2h-PG before and after nursing in group B were (12.58±1.29) mmol/L and (8.25±1.14) mmol/L, respectively. The HbAlc before and after nursing in group A were (7.79±1.21)% and (4.13±0.89)%, while the HbAlc before and after nursing in group B were (7.86±1.20)% and (5.73±1.13)%, respectively. After nursing, the related blood glucose indexes decreased in both groups (P<0.05), but the

Table 1. General information of patients [n (%)] (x±sd)

Categories	Group A (n=33)	Group B (n=37)	t/χ² value	P value
Age (years old)	33.13±4.28	32.41±4.11	0.717	0.475
Height (cm)	166.28±3.56	167.53±3.13	0.122	1.563
Weight (kg)	64.28±5.29	65.27±5.23	0.434	0.786
Gestational age (week)	23.58±3.59	24.35±3.25	0.349	0.941
Blood glucose at admission (mmol/L)	5.23±1.34	5.11±1.42	0.718	0.362
Place of residence			0.017	0.893
Rural	13 (39.39)	14 (37.84)		
Urban	20 (60.61)	23 (62.16)		
Educational background			0.003	0.985
Below senior high school	10 (30.30)	11 (29.73)		
Senior high school or above	23 (69.70)	26 (70.27)		
Ethnicity			0.390	0.531
Han	27 (81.82)	28 (75.68)		
Ethnic minorities	6 (18.18)	9 (24.32)		
Economic level			0.137	0.933
Poor	6 (18.18)	8 (21.62)		
Comparatively well-off	18 (54.55)	19 (51.35)		
Well-off	9 (27.27)	10 (27.02)		
Staying up late			0.025	0.874
Yes	11 (33.33)	13 (35.13)		
No	22 (66.67)	24 (64.86)		
Exercise			0.009	0.922
Yes	13 (39.39)	15 (40.54)		
No	20 (60.60)	22 (59.46)		
Obesity			0.051	0.820
Yes	9 (27.27)	11 (29.73)		
No	24 (72.73)	26 (70.27)		
Parity			1.110	0.292
<2	26 (78.79)	25 (67.57)		
≥2	7 (21.21)	12 (32.43)		
Gravidity			0.087	0.767
<2	19 (57.57)	20 (54.05)		
≥2	14 (42.42)	17 (45.95)		
Birth mode			0.057	0.810
Natural labor	17 (51.51)	18 (48.65)		
Caesarean birth	16 (48.48)	19 (51.35)		

related indexes in group A were better than those in group B (P<0.05), demonstrating that comprehensive nursing could better control blood glucose levels (**Figure 3**).

Comparison of adverse birth outcomes between the two groups

The total incidence of adverse birth outcomes in group A and group B were 15.15% and 37.84% respectively, which indicated that the incidence of total adverse birth outcomes in group A was lower than that in group B (p<0.05), showing that comprehensive nursing could reduce adverse birth outcomes (**Table 2**).

Comparison of self-care ability between the two groups after nursing

The scores of self-care concepts in groups A and B were (42.58±2.52) and (32.32±3.24), respectively. The scores of self-care skills
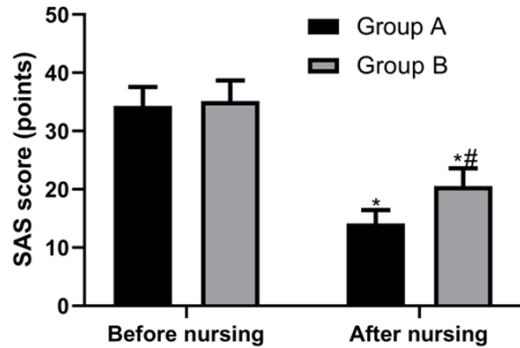
Figure 1. Comparison of SAS scores before and after nursing between the two groups. There was no significant difference in SAS score between the two groups before nursing (P>0.05). While after nursing, the SAS score declined in both groups (P<0.05), and the SAS score in group A was lower than that in group B (P<0.05). Note: * represents the comparison with the same group before nursing (P<0.05); # indicates the comparison with group A (P<0.05).
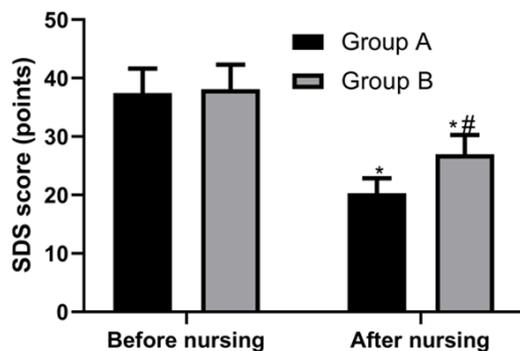
Figure 2. Comparison of SDS scores before and after nursing between the two groups. There was no marked difference in the SDS score between the two groups before nursing (P>0.05). While after nursing, the SDS score dropped in both groups (P<0.05), and the SAS score in group A was lower than that in group B (P<0.05). Note: * represents the comparison with the same group before nursing (P<0.05); # indicates the comparison with group A (P<0.05).

in groups A and B were (38.65±2.44) and (24.76±3.54), respectively. The scores of self-care knowledge in groups A and B were (40.43±2.13) and (31.59±3.53), respectively. The scores of self-care responsibility in groups A and B were (63.69±4.25) and (55.24±3.65), respectively. The self-care ability of group A was better than that of group B (P<0.05), indicating that comprehensive nursing could profoundly improve the self-care ability of patients (**Table 3**).

Comparison of QOL between the two groups

The QOL after nursing was compared between the two groups. The scores of PF, RP, RE and QOL in group A were all higher than those in group B (P<0.05), which was indicative that comprehensive nursing could improve patients' QOL (**Table 4**).

Comparison of nursing satisfaction between the two groups

The overall satisfaction in group A (90.91%) was higher than that in group B (67.57%) (P<0.05), suggesting that comprehensive nursing could improve patient satisfaction (**Table 5**).

Discussion

Although conventional nursing can save costs, its uniformity and lack of attention to important details makes it difficult to detect changes and characteristics of the patient's condition, resulting in poor nursing effects; which can delay treatment of patients' condition. There is now a broad consensus on the need for ongoing care redesign and better digital solutions that can help manage the growing complexity of healthcare and the increasing knowledge base of clinicians responsible for patients' needs [16]. Therefore, clinically, there has been the emergence of personalized nursing, among which comprehensive nursing is a novel patient-centered and mutually beneficial whole-person treatment plan [17, 18].

In the course of the disease, the majority of patients develop mood disorders, which is of great concern because the delay in mood relief reduces the success of follow-up treatment, and depressive episodes have a negative cumulative effect on the brain and body [19]. Some studies have also shown that negative emotions can seriously affect self-perception and are closely related to both prevention and treatment [20]. Therefore, in this study, we asked medical staff to conduct emotional sorting of patients throughout the whole process, reducing their resistance to surgery and treatment, and the results revealed that group A patients were in a better mood. One study suggests that future research should consider incorporating psychosocial well-being into the regular intervention, since observational stud-
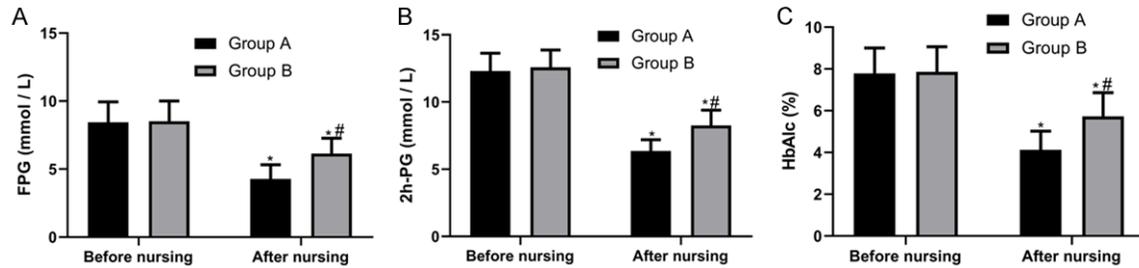
Figure 3. Comparison of blood glucose indexes before and after nursing between the two groups. A. Comparison of FPG before and after nursing between the two groups. There was no marked difference in FPG between the two groups before nursing (P>0.05). While after nursing, the FPG dropped in both groups (P<0.05), and the post-nursing FPG in group A was lower than that in group B (P<0.05). Note: * represents the comparison with the same group before nursing (P<0.05); # indicates the comparison with group A after nursing (P<0.05). B. Comparison of 2h-PG before and after nursing between the two groups. No marked difference was observed in 2h-PG between the two groups before nursing (P>0.05). While after nursing, the 2h-PG decreased in both groups (P<0.05), and the post-nursing 2h-PG in group A was lower than that in group B (P<0.05). Note: * represents the comparison with the same group before nursing (P<0.05); # indicates the comparison with group A after nursing (P<0.05). C. Comparison of HbAlc before and after nursing between the two groups. The HbAlc did not reveal any marked difference between the two groups before nursing (P>0.05). While after nursing, the HbAlc declined in both groups (P<0.05), and the post-nursing HbAlc in group A was lower than that in group B (P<0.05). Note: * represents the comparison with the same group before nursing (P<0.05); # indicates the comparison with group A after nursing (P<0.05).

Table 2. Comparison of adverse birth outcomes between the two groups

Adverse birth outcomes	Group A (n=33)	Group B (n=37)	X^2	P
Premature delivery	1 (3.03)	2 (5.41)	-	-
Premature rupture of membranes	0 (0.00)	3 (8.11)	-	-
Hydroamnious	1 (3.03)	1 (2.70)	-	-
Postpartum hemorrhage	0 (0.00)	3 (8.11)	-	-
Puerperal infection	1 (3.03)	2 (5.41)	-	-
Fetal distress	0 (0.00)	1 (2.70)	-	-
Neonatal hypoglycemia	1 (3.03)	1 (2.70)	-	-
Macrosomia	1 (3.03)	1 (2.70)	-	-
Total incidence	5 (15.15)	14 (37.84)	4.540	0.033

Table 3. Comparison of self-care ability between the two groups after nursing

Groups	n	Self-care concept	Self-care skills	Self-care knowledge	Self-care responsibility
Group A	33	42.58±2.52	38.65±2.44	40.43±2.13	63.69±4.25
Group B	37	32.32±3.24	24.76±3.54	31.59±3.53	55.24±3.65
t		14.66	18.88	12.49	8.949
p		<0.001	<0.001	<0.001	<0.001

ies have shown that social support and self-efficacy contribute to adopting a healthy lifestyle after diagnosis of GDM [21]. All these indicate that comprehensive nursing can relieve the psychological distress and negative effects of patients [22].

HbA1c is a reliable biochemical indicator for the control of blood glucose and has been widely used in daily clinical practice [23]. In addition, HbA1c levels have been recommended as a diagnostic tool to identify patients with undiagnosed or high risk of developing diabetes [24]. In this study, it was found that patients who received comprehensive nursing had more stable blood glucose control. What's more, evidence has shown that certain dietary patterns seem to reduce the risk of gestational diabetes, and since they have been shown to prevent other diseases, it is recommended that adherence to this diet may be one of the best ways to prevent GDM, currently [25]. There is also research demonstrating that GDM is associated with a moderately increased risk of adverse perinatal outcomes [26]. In the present study, we found that patients who received comprehensive nursing had a lower incidence of adverse birth outcomes. Studies have point-

Table 4. Comparison of quality of life between the two groups after nursing (x±sd)

Groups	n	PF	RP	RE	QOL
Group A	33	87.32±13.27	94.13±9.28	87.42±7.21	95.13±9.12
Group B	37	75.32±12.22	83.18±10.75	81.32±9.35	82.19±9.46
t		3.939	4.535	3.029	5.810
p		0.000	<0.001	0.003	<0.001

Table 5. Comparison of nursing satisfaction between the two groups [n (%)]

Satisfaction degree	Group A (n=33)	Group B (n=37)	X^2	P
Satisfied	7 (21.21)	6 (16.22)	-	-
Relatively satisfied	18 (54.55)	17 (45.95)	-	-
Basically satisfied	5 (15.15)	2 (5.41)	-	-
Dissatisfied	3 (9.09)	12 (32.43)	-	-
Overall satisfaction	30 (90.91)	25 (67.57)	5.644	0.017

ed out that moderately personalized lifestyle interventions can reduce the incidence of gestational diabetes in high-risk pregnant women by 39%. All these findings may have significant health consequences for both mothers and children [27], and these also suggest that individual lifestyles can reduce adverse birth outcomes.

In the end, we found that patients with comprehensive nursing had higher levels of satisfaction and quality of life, indicating that comprehensive nursing was conducive to the improvement of patients' quality of life. Other studies have shown that making treatment decisions that combine the values and preferences of individual patients and tailoring them to their biology may improve the prognosis of patients [28]. Comprehensive nursing can improve blood glucose control and birth outcomes of patients with GDM.

However, there are still some deficiencies in this study. We have not yet studied the prognosis of the patients or tested the inflammatory markers of the patients. In future research, we will continue to explore and update our findings.

In summary, comprehensive nursing can improve blood glucose control and birth outcomes of patients with GDM.

Disclosure of conflict of interest

None.

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References

[1] Johns EC, Denison FC, Norman JE and Reynolds RM. Gestational diabetes mellitus: mechanisms, treatment, and complications. Trends Endocrinol Metab 2018; 29: 743-754.

[2] Zhu Y, Hedderson MM, Quesenberry CP, Feng J and Ferrara A. Liver enzymes in early to mid-pregnancy, insulin resistance, and gestational diabetes risk: a longitudinal analysis. Front Endocrinol (Lausanne) 2018; 9: 581.

[3] Mirghani Dirar A and Doupis J. Gestational diabetes from A to Z. World J Diabetes 2017; 8: 489-511.

[4] Farrar D, Duley L, Dowswell T and Lawlor DA. Different strategies for diagnosing gestational diabetes to improve maternal and infant health. Cochrane Database Syst Rev 2017; 8: CD007122.

[5] O'Reilly S, Versace V, Mohebbi M, Lim S, Janus E and Dunbar J. The effect of a diabetes prevention program on dietary quality in women with previous gestational diabetes. BMC Womens Health 2019; 19: 88.

[6] Shepherd E, Gomersall JC, Tieu J, Han S, Crowther CA and Middleton P. Combined diet and exercise interventions for preventing gestational diabetes mellitus. Cochrane Database Syst Rev 2017; 11: CD010443.

[7] Damm P, Houshmand-Oeregaard A, Kelstrup L, Lauenborg J, Mathiesen ER and Clausen TD. Gestational diabetes mellitus and long-term consequences for mother and offspring: a view from Denmark. Diabetologia 2016; 59: 1396-1399.

[8] Rayanagoudar G, Hashi AA, Zamora J, Khan KS, Hitman GA and Thangaratinam S. Quantification of the type 2 diabetes risk in women with gestational diabetes: a systematic review and meta-analysis of 95,750 women. Diabetologia 2016; 59: 1403-1411.

[9] Nicholson W and Baptiste-Roberts K. Oral hypoglycaemic agents during pregnancy: the evidence for effectiveness and safety. Best Pract Res Clin Obstet Gynaecol 2011; 25: 51-63.

[10] Usvyat L, Dalrymple LS and Maddux FW. Using technology to inform and deliver precise personalized care to patients with end-stage kidney disease. Semin Nephrol 2018; 38: 418-425.

[11] Hanna FW, Duff CJ, Shelley-Hitchen A, Hodgson E and Fryer AA. Diagnosing gestational diabetes mellitus: implications of recent changes in diagnostic criteria and role of glycated haemoglobin (HbA1c). Clin Med (Lond) 2017; 17: 108-113.

[12] Svanborg P and Asberg M. A new self-rating scale for depression and anxiety states based on the comprehensive psychopathological rating scale. Acta Psychiatr Scand 1994; 89: 21-28.

[13] Zung WW. A self-rating depression scale. Arch Gen Psychiatry 1965; 12: 63-70.

[14] Zare R, Jafari P and Ghanizadeh A. Do adult attention deficit hyperactivity disorder quality-of-life (AAQoL) scale and the SF-36 scale measure the same construct of health-related quality of life? Atten Defic Hyperact Disord 2017; 9: 39-45.

[15] Gao H, Soderhamn U, Cliffordson C, Guo L, Guo Q and Liu K. Reliability and validity of the Chinese version of the self-care ability scale for the elderly. J Clin Nurs 2017; 26: 4489-4497.

[16] Carter J, Bababekov YJ and Majmudar MD. Training for our digital future: a human-centered design approach to graduate medical education for aspiring clinician-innovators. NPJ Digit Med 2018; 1: 26.

[17] Bolton RE, Bokhour BG, Hogan TP, Luger TM, Ruben M and Fix GM. Integrating personalized care planning into primary care: a multiple-case study of early adopting patient-centered medical homes. J Gen Intern Med 2020; 35: 428-436.

[18] Kang SK, Fagerlin A and Braithwaite RS. A roadmap for personalized care in radiology. Radiology 2015; 277: 638-643.

[19] Prendes-Alvarez S and Nemeroff CB. Personalized medicine: prediction of disease vulnerability in mood disorders. Neurosci Lett 2018; 669: 10-13.

[20] Bekker MH, van de Meerendonk C and Mollerus J. Effects of negative mood induction and impulsivity on self-perceived emotional eating. Int J Eat Disord 2004; 36: 461-469.

[21] Gilbert L, Gross J, Lanzi S, Quansah DY, Puder J and Horsch A. How diet, physical activity and psychosocial well-being interact in women with gestational diabetes mellitus: an integrative review. BMC Pregnancy Childbirth 2019; 19: 60.

[22] Raz DJ, Sun V, Kim JY, Williams AC, Koczywas M, Cristea M, Reckamp K, Hayter J, Tiep B and Ferrell B. Long-term effect of an interdisciplinary supportive care intervention for lung cancer survivors after surgical procedures. Ann Thorac Surg 2016; 101: 495-502; discussion 502-493.

[23] Qi W, Zhang N, Korantzopoulos P, Letsas KP, Cheng M, Di F, Tse G, Liu T and Li G. Serum glycated hemoglobin level as a predictor of atrial fibrillation: a systematic review with meta-analysis and meta-regression. PLoS One 2017; 12: e0170955.

[24] Ma Q, Liu H, Xiang G, Shan W and Xing W. Association between glycated hemoglobin A1c levels with age and gender in Chinese adults with no prior diagnosis of diabetes mellitus. Biomed Rep 2016; 4: 737-740.

[25] Donazar-Ezcurra M, Lopez-Del Burgo C and Bes-Rastrollo M. Primary prevention of gestational diabetes mellitus through nutritional factors: a systematic review. BMC Pregnancy Childbirth 2017; 17: 30.

[26] Billionnet C, Mitanchez D, Weill A, Nizard J, Alla F, Hartemann A and Jacqueminet S. Gestational diabetes and adverse perinatal outcomes from 716,152 births in France in 2012. Diabetologia 2017; 60: 636-644.

[27] Zhu Y and Zhang C. Prevalence of gestational diabetes and risk of progression to type 2 diabetes: a global perspective. Curr Diab Rep 2016; 16: 7.

[28] Hilbert J and Yaggi HK. Patient-centered care in obstructive sleep apnea: a vision for the future. Sleep Med Rev 2018; 37: 138-147.