Reducing Hypoglycaemic Risk through Structured Education Program

Group 3 Members

Shimen AU

Veronica HUNG

Jo Jo KWAN

Rachel LAM

Chin-san LAW

Carmen LEUNG

Content

- Prevalence and incidents of hypoglycaemia
- Clinical Problems
- EBP Question
- PICO
- Search Strategy
- Evidence synthesis
- Recommendations
- Inclusion and exclusion criteria
- Intervention: Structured Education Program
- Outcome measurement

Introduction

- **Hypoglycaemia**: plasma glucose level **≤ 3.9 mmol/L**
- Tx goal→achieve & maintain near-normal glycaemic control
- Tight control & intensive regimen→ ↑ risk of hypo

Global Prevalence of Hypoglycaemia

Hypoglycaemia Assessment Tool (HAT) study (2015):

- **46.5%** diabetic patients with at least one event of mild/moderate hypoglycaemia yearly
- 30% mild/moderate hypo
- 5% severe hypo

RESEARCH ARTICLE

Prevalence and Incidence of Hypoglycaemia in 532,542 People with Type 2 Diabetes on Oral Therapies and Insulin: A Systematic Review and Meta-Analysis of Population Based Studies

Chloe L. Edridge[1]*, Alison J. Dunkley[2], Danielle H. Bodicoat[3], Tanith C. Rose[4], Laura J. Gray[5], Melanie J. Davies[6], Kamlesh Khunti[7]

1 University of Leicester, Department of Health Sciences, Leicester Diabetes Centre, Leicester General Hospital, Leicester, United Kingdom, 2 University of Leicester, Diabetes Research Centre, Leicester Diabetes Centre, Leicester General Hospital, Leicester, United Kingdom, 3 University of Leicester, Diabetes Research Centre, Leicester Diabetes Centre, Leicester General Hospital, Leicester, United Kingdom, 4 University of Leicester, Diabetes Research Centre, Leicester Diabetes Centre, Leicester General Hospital, Leicester, United Kingdom, 5 University of Leicester, Department of Health Sciences, University Road, Leicester, United Kingdom, 6 University of Leicester, Diabetes Research Centre, Leicester Diabetes Centre, Leicester General Hospital, Leicester, United Kingdom, 7 University of Leicester, Diabetes Research Centre, Leicester Diabetes Centre, Leicester General Hospital, Leicester, United Kingdom

Results

46 studies (n = 532,542) met the inclusion criteria. Prevalence of hypoglycaemia was 45% (95%CI 0.34,0.57) for mild/moderate and 6% (95%CI, 0.05,0.07) for severe. Incidence of hypoglycaemic episodes per person-year for mild/moderate and for severe was 19 (95%CI 0.00, 51.08) and 0.80 (95%CI 0.00,2.15), respectively. Hypoglycaemia was prevalent amongst those on insulin; for mild/moderate episodes the prevalence was 50% and incidence 23 events per person-year, and for severe episodes the prevalence was 21% and incidence 1 event per person-year. For treatment regimes that included a sulphonylurea, mild/moderate prevalence was 30% and incidence 2 events per person-year, and severe prevalence was 5% and incidence 0.01 events per person-year. A similar prevalence of 5% was found for treatment regimes that did not include sulphonylureas.

Local Prevalence and Incidents

- **2.22**% DM patient admit/year with either hyper / hypo (HA Data)
- PWH 2014, severe hypo **3.69 per 1000** patient/year (published data)*
- PWH: 2016, **8.1%** recurrent mild hypo over 3.9 years (published data)**
- TMH: from Dec 2016 to May 2017, **18** patients attended AED & admitted to EMW, referred to DM center for ambulatory DM care

*Diabetes Care 2014:37:1024-31

**Journal medicine 2016:95:45

Impact of Hypoglycaemia

- Hypoglycaemia reduces QoL
  - Fear of hypoglycaemia
  - Nocturnal hypoglycaemia affect sleep quality
  - Patients with recurrent hypoglycaemia found to have chronic mood disorders, e.g. depression and anxiety
- Severe hypoglycaemia is life-threatening and can precipitate major cardiovascular and cerebrovascular events
- Economic burden $ / job performance

Clinical Problems

- **Recurrent** hypoglycaemia increases the risk of severe hypoglycaemia and the development of hypoglycaemia unawareness
- **Severe** hypoglycaemia & hypoglycaemia **unawareness** : ↑ risk of cardiovascular and all cause of mortality, morbidity and recurrent hospitalization

EBP Question ?

- What are the best practices to reduce hypoglycaemia for patients with diabetes

PICO

- P = Adult patient with diabetes on glucose lowering agent
- I = Hypoglycaemia patient education
- C = Current practice
- O = Decrease / minimize the incident of hypoglycaemia and unplanned admission

Search Strategy

- English medical literature published between

  Jan 2000 and Dec 2017

- **MEDLINE** database of the National Library of Medicine
- **Cochrane Library** database
- **eKG** database of the Hospital Authority

Key Words

- Diabet*
- Insulin therapy & insulin injection
- Hypoglycaemia
- Hypo* education, management or prevention
- Unplanned admission
- Risk of hypoglycaemia
- Fear of hypoglycaemic
- Hypoglycemia unawareness
- Impair awareness of hypoglycaemia
- Blood glucose

Evidence Synthesis

Category (Level Type)	Total Number of Sources / Level	Types of Evidence
Level I	0	---
Level II	1	Systematic Review
Level III	2	Observational Study x 1 Qualitative Study x 1
Level IV	2	Expert Consensus
Level V	6	Literature Review

Johns Hopkins Nursing Evidence-Based Practice Model

Recommandations

- ***Structured patient education*** *including leading factors of hypo, hypo signs & symptoms and management, blood glucose monitoring, and lifestyle modification* should be provided to patient with diabetes since diagnoses and each follow-up visit
- ***Setting of individualized glycemic goal*** especially *for hypo risk group*, such as: advanced age, patient with renal insufficiency, autonomic neuropathy, advanced complications, comorbidities and cognitive impairment, is essential
- Adopting ***multidisciplinary*** diabetes care
- ***On-line training*** for hypo management
- ***CSII*** **and Real-time** ***CGM*** / FGM might help to reduce the risk of hypo
- **Combination** ***of analog insulin and non-sulfonylurea drugs*** might help to reduce the risk of hypo
- ***Prevention of nocturnal hypo*** include: adding of bedtime snack, using long-acting or ultra-long-acting insulin analogues rather than NPH

Objectives

- To apply a **hypoglycaemia checklist** into clinical care
- To translate evidence into designing a **structured education program** on hypoglycaemia prevention and management

Inclusion Criteria

- 1. Type 2 diabetes, and
- 2. Age >/= 18, and
- 3. Chinese, speak Cantonese, and
- 4. ADL independent, and
- 5. Having episodes of hypoglycaemia within 4 months, and / or
- 6. Impaired awareness of hypoglycaemia, and / or
- 7. Admission due to hypoglycaemia

Exclusion Criteria

- 1. Pregnant woman
- 2. Unstable psychiatric illness / admission within 1 year
- 3. Mental and cognitive impairment
- 4. Non-ambulatory status

Structured Education Program

Interactive Group Education

- 5-8 patients
- patients share experience of hypoglycaemia and management
- educate on hypoglycaemia symptoms
- educate to treat hypoglycaemia
- teach the possible attributing factors of hypoglycaemia
- educate on prevention of hypoglycaemia

Outcome Measurement

Pre & Post 6-month measurement:

- Pre and post episodes of hypoglycaemia with home blood glucose monitoring data chart



- Patient's alertness on hypoglycaemia self management checklist



- Unplanned admission due to hypoglycaemia *retrieved* from Clinical Management System (CMS)

- Patient satisfaction (modified from existing nurse clinic patient satisfaction survey)



Hypoglycaemia Patient Questionnaire (Hypoglycaemia Checklist)

Name _____
First Middle Last
Today's date _____

1. To what extent can you tell by your symptoms that your blood glucose is LOW?
_____ Never _____ Rarely _____ Sometimes _____ Often _____ Always

2. In a typical week, how many times will your blood glucose go below 70 mg/dL?
_____ a week

3. When your blood glucose goes below 70 mg/dL, what is the usual reason for this?
_____

4. How many times have you had a severe hypoglycemic episode (where you needed someone's help and were unable to treat yourself)?
Since the last visit _____ times
In the last year _____ times

5. How many times have you had a moderate hypoglycemic episode (where you could not think clearly, properly control your body, had to stop what you were doing, but you were still able to treat yourself)?
Since the last visit _____ times
In the last year _____ times

6. How often do you carry a snack or glucose tablets (or gel) with you to treat low blood glucose? Check one of the following:
Never ____ Rarely ____ Sometimes____ Often____ Almost always____

7. How LOW does your blood glucose need to go before you think you should treat it?
Less than _____mg/dL

8. What and how much food or drink do you usually treat low blood glucose with?
_____

9. Do you check your blood glucose before driving? Check one of the following:
Yes, always____ Yes, sometimes ____ No____

10. How LOW does your blood glucose need to go before you think you should not drive?
_____mg/dL

11. How many times have you had your blood glucose below 70 mg/dL while driving?
Since the last visit _____ times
In the last year _____ times

12. If you take insulin, do you have a glucagon emergency kit?
Yes____/ No ____

13. Does a spouse, relative, or other person close to you know how to administer glucagon?
Yes____/ No ____

Elizabeth R. Seaquist et al. *Dia Care* 2013;36:1384-1395

Sample Size

- No. of local **DM Nurse clinic** involved: 7
- Expected sample size: 35

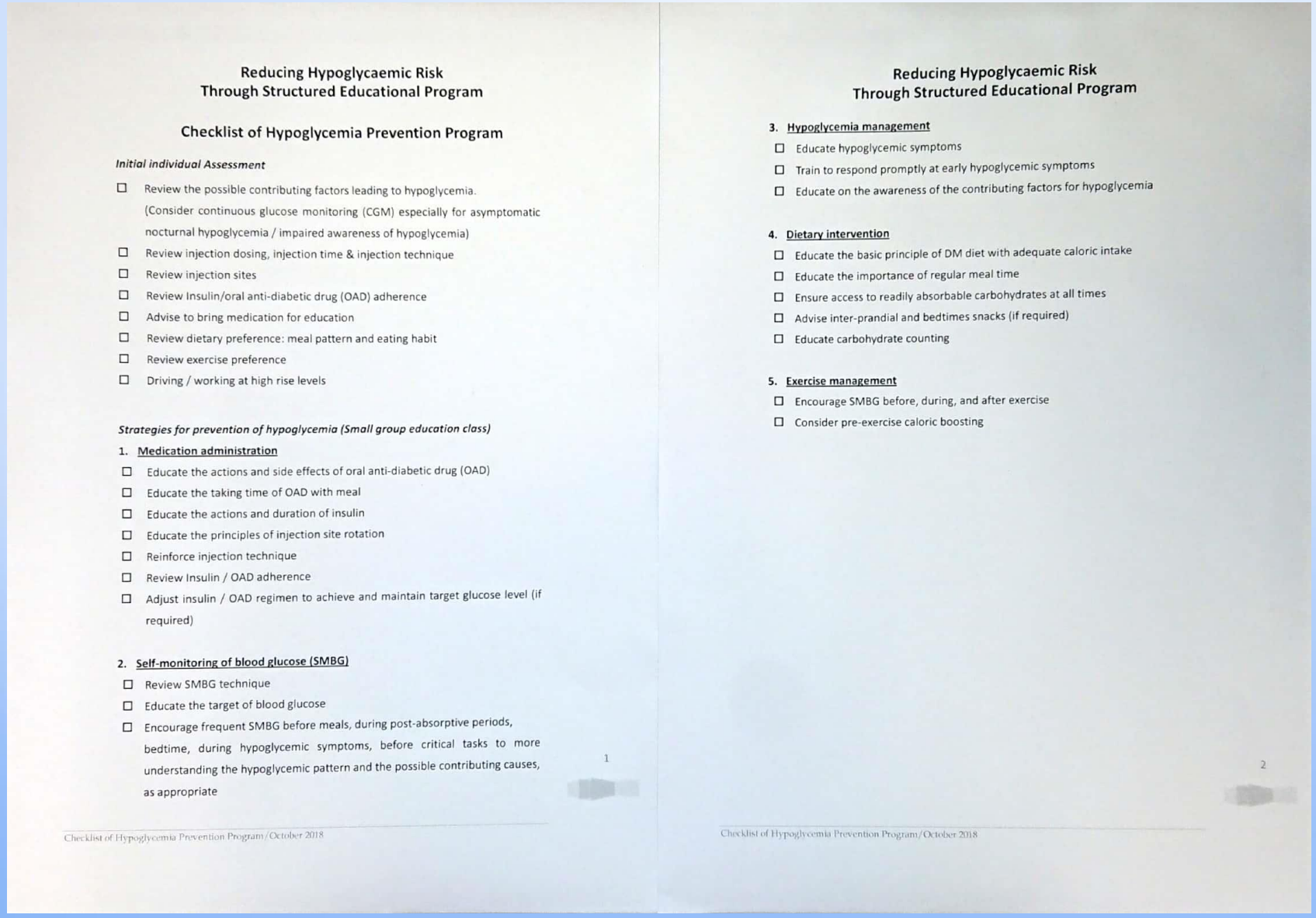
Program Rundown



Content	***Duration***	***Education Materials***
Ice-Breaking and introduction - Briefing of program objectives, duration and environment - Ground rules – active participation and keep confidentiality - Self-introduction among participants	15 minutes	White card for writing down the name of participants
Sharing of hypoglycemia (hypo) experiences and treatment modality - Reason of hypo - sign and symptoms - treatment of hypo	45 minutes	Hypo symptom cards, drug sample etc. for facilitating discussion
Break	10 minutes	------
Interactive discussion - Understanding the impact of hypo attack - Hypo prevention strategies	25 minutes	Hypo consequence powerpoint slide x 1
Provide accessories for reinforcement education - Hypo awareness cue card - Hypo education leaflet - Hypo bracelet	20 minutes	* Hypo cue card * Hypo education leaflet * Hypo bracelet
Q&A and Wrapped up	5 minutes	Follow-up appointment slip

Protocol of Hypoglycaemia Prevention Program

Microsoft Word 文件



Reducing Hypoglycaemic Risk
Through Structured Educational Program

Checklist of Hypoglycemia Prevention Program

Initial individual Assessment

- ☐ Review the possible contributing factors leading to hypoglycemia. (Consider continuous glucose monitoring (CGM) especially for asymptomatic nocturnal hypoglycemia / impaired awareness of hypoglycemia)
- ☐ Review injection dosing, injection time & injection technique
- ☐ Review injection sites
- ☐ Review Insulin/oral anti-diabetic drug (OAD) adherence
- ☐ Advise to bring medication for education
- ☐ Review dietary preference: meal pattern and eating habit
- ☐ Review exercise preference
- ☐ Driving / working at high rise levels

Strategies for prevention of hypoglycemia (Small group education class)

1. **Medication administration**
   - ☐ Educate the actions and side effects of oral anti-diabetic drug (OAD)
   - ☐ Educate the taking time of OAD with meal
   - ☐ Educate the actions and duration of insulin
   - ☐ Educate the principles of injection site rotation
   - ☐ Reinforce injection technique
   - ☐ Review Insulin / OAD adherence
   - ☐ Adjust insulin / OAD regimen to achieve and maintain target glucose level (if required)

2. **Self-monitoring of blood glucose (SMBG)**
   - ☐ Review SMBG technique
   - ☐ Educate the target of blood glucose
   - ☐ Encourage frequent SMBG before meals, during post-absorptive periods, bedtime, during hypoglycemic symptoms, before critical tasks to more understanding the hypoglycemic pattern and the possible contributing causes, as appropriate

Reducing Hypoglycaemic Risk
Through Structured Educational Program

3. **Hypoglycemia management**
   - ☐ Educate hypoglycemic symptoms
   - ☐ Train to respond promptly at early hypoglycemic symptoms
   - ☐ Educate on the awareness of the contributing factors for hypoglycemia

4. **Dietary intervention**
   - ☐ Educate the basic principle of DM diet with adequate caloric intake
   - ☐ Educate the importance of regular meal time
   - ☐ Ensure access to readily absorbable carbohydrates at all times
   - ☐ Advise inter-prandial and bedtimes snacks (if required)
   - ☐ Educate carbohydrate counting

5. **Exercise management**
   - ☐ Encourage SMBG before, during, and after exercise
   - ☐ Consider pre-exercise caloric boosting

Hypoglycaemia Cue Card

糖尿患者咭

我是 ❑一型 ❑二型　糖尿患者

姓名：

現正使用：❑口服降血糖藥　❑胰島素

現於　醫院管理局專科門診　覆診

☎緊急聯絡人：

電話：

Diabetes Alert card

I am ❑ Type **1** DM　❑ Type **2** DM

Name:

Currently on ❑ Oral DM drug　❑ Insulin

Follow up:　HA outpatient clinic

☎ Emergency contact:

低血糖**症狀**包括：

頭暈、發抖、冒冷汗、嚴重饑餓或心跳加速

Symptoms of Hypoglycaemia:

Dizziness, weakness & shaking, sweating, severe hunger, fast heart beat

注意：

- ❑ **定時定量吃正餐**
- ❑ **帶備小食**
- ❑ **駕駛前驗血糖**

低血糖處理（血糖低過 4 度）

Hypoglycaemia (blood sugar below 4mmol/L)

立即進食 15 克易吸收的糖份

Take 15g simple sugar immediately



果汁糖 3 粒
3 pieces Candies



砂糖 3 茶匙
3 teaspoons Sugar



汽水/ 果汁 120 毫升
120ml Soft drinks/ Fruit juice

15 分鐘後再測試血糖，如仍低過 **4** 度請重複以上步驟一次

Re-check blood glucose after 15mins. If blood glucose is still below 4 mmol/L, repeat the above procedure for once.

若病人意識不清或進食 30 克糖份後，
低血糖情況仍沒有改善，請立刻送醫院治療

Immediately seek medical care if a person is unresponsive or persistent hypoglycaemia after taken 30g simple sugar.

☺ 血糖如高於 **4** 度，可進食 **10** 至 **15** 克澱粉質，如下圖：

If blood glucose is ≧4 mmol/L, take 10-15g carbohydrates as below:



麵包 **1** 塊
1 slice of bread

或/OR



餅乾 3 塊
3 pieces of biscuits

Running the small group interactive class

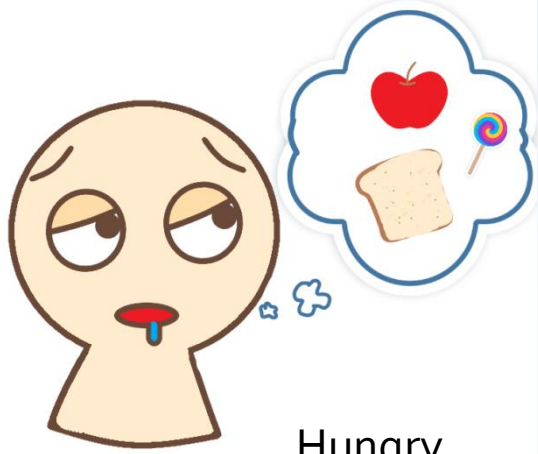


Using the teaching materials





Dizziness

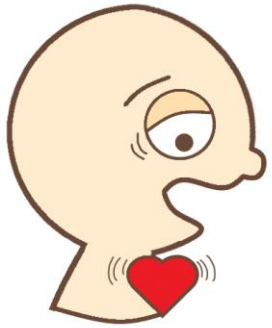


Hungry



irritable

Hypoglycaemia Symptoms Cue Cards



palpitation

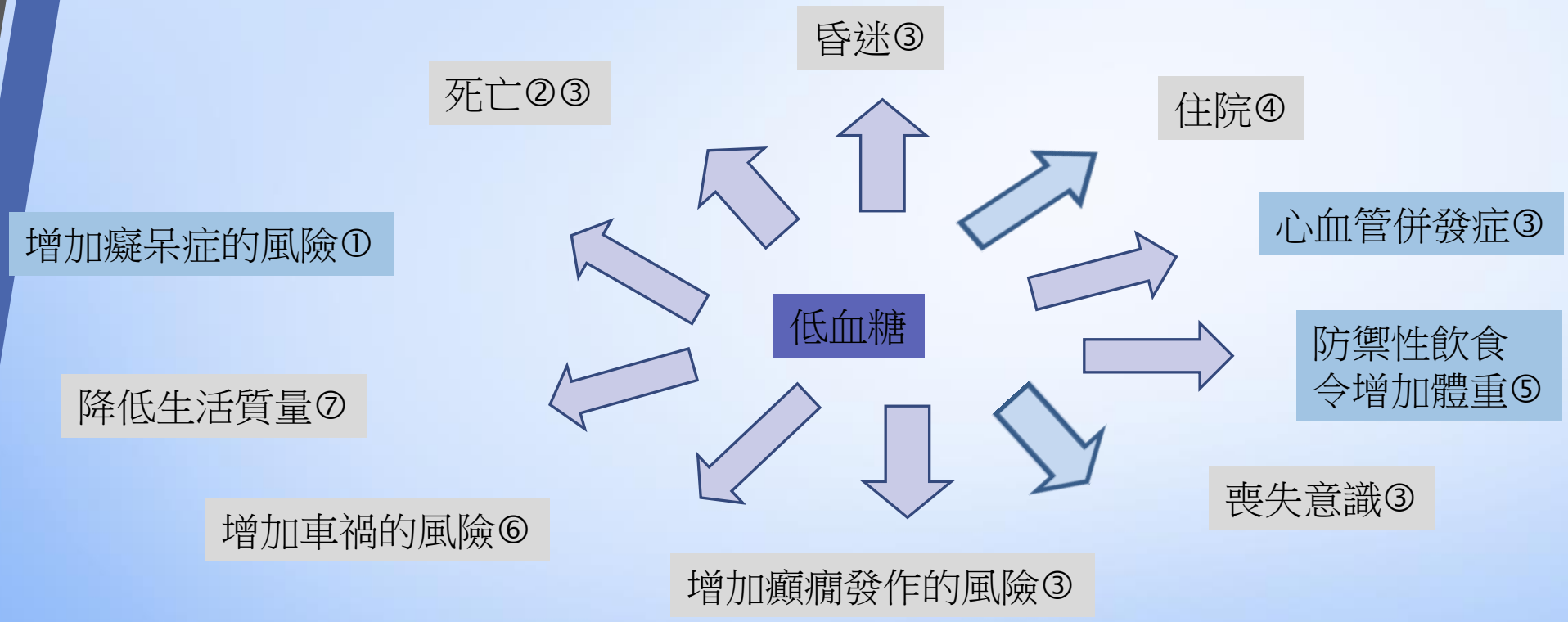


Cold sweeting



tremor

低血糖的後果



①Whitmer RA, et al. *JAMA*. 2009;301(15):1565-1572. ②Bonds DE, et al. *BMJ*. 2010;304:b4909.
③Barnett AH. *Curr Med Res Opin*.2010; 26(6):1333-1342.④Jönsson L, et al. *Value Health*. 2006;9(3):193-198.
⑤Foley JE, et al. *Vasc Health Risk Manag*.2010;6:541-548.⑥Begg IS, et al. *Can J Diabetes*. 2003;27:128-140.
⑦McEwan P, et al. *Diabetes Obes Metab*. 2010;12(5):431-436.

Baseline Characteristics

- Total 35 participants from 7 nurse clinics
- M/F **17** (49%) / **18**
- Mean age +/-SD = **65.06** +/- 11.1 years old (N=35).
- Average duration of DM = **15** years
- HbA1c: **5.7**% to **12.5**%
- Rx modality: **SU** x 9; **Insulin** x 31 (basal analogue only x 8)
- CKD stages: **1** (15%); **2** (46%); **3a** (21%); **3b** (9%); **4** (9%)
- **91**% had **SMBG**
- Other hypo risk factors: decreased steroid x1; on beta blocker x 6; on correctional dose of insulin x 1

Reference

- Awoniyi O, Rehman R, Dagogo-Jack S. Hypoglycemia in Patients with Type 1 Diabetes: Epidemiology, Pathogenesis, and Prevention. *Current Diabetes Reports* 2013; 13: 669-678.
- Choudhary P, Rickels MR, Senior PA. Evidence-Informed Clinical Practice Recommendations for Treatment of Type 1 Diabetes Complicated by Problematic Hypoglycemia. *Diabetes Care* 2015; 38: 1016-1029.
- Desouza CV, Bolli GB, Fonseca V. Hypoglycemia, diabetes, and cardiovascular events. *Diabetes Care* 2010; 33:1389-1394.
- Elizabeth R. S, John A, Belinda C, Philip C, Samuel Dagogo-J, Lisa F, Simon RH, Henry R, James R, Robert V, Hypoglycemia and Diabetes: A report of a workgroup of the American Diabetes Association and The Endocrine Society. *Diabetes Care* 2013; 36(5): 1384-1395.
- Ester Y, Pratik C, Munachiso N, Salma A, Stephanie AA. Interventions that restore awareness of hypoglycemia in adults with Type 1 diabetes: A systemic review and meta-analysis. *Diabetes Care* 2015; 38: 1592-1609.
- Gerstein HC, Miller ME, Byington RP, Goff DC, Bigger JT, Buse JB, Cushman WC, Genuth S, Ismail-Beigi F, Grimm RH, Probstfield JL, Simons-Morton DG, Friedewald WT. Effects of intensive glucose lowering in Type 2 diabetes. *The New England Journal of Medicine* 2008; 358: 2545-2559.

Reference

- Grant L, Lawton J, Hopkins D et al. Type 1 diabetes structured education: what are the core self-management behaviours? *Diabetic Medicine* 2013; 724-730.
- Heller SR. Minimizing Hypoglycemia While Maintaining Glycemic Control in Diabetes. *Diabetes* 2008; 37: 3177.
- International Hypoglycaemia Study Group. Minimizing Hypoglycaemia in Diabetes. *Diabetes Care* 2015; 38: 1583-1591.
- Iqbal A, Heller SR. The role of structured education in the management of hypoglycaemia. *Diabetologia* 2018; 61: 751-760.
- Khunti K, Alsifri S, Aronson R, Cigrovski BM, Enters-Weijnen C, Forsen T, Galstyan G, Geelhoed-Duijvestijn P, Goldfracht M, Gydesen H, Kapur R, Lalic N, Ludvik B, Moberg E, Pedersen-Bjergaard U, Ramachandran A. Rates and predictors of hypoglycaemia in 27,585 people from 24 countries with insulin-treated Type 1 and Type 2 diabetes: The global HAT study. *Diabetes, Obesity and Metabolism* 2016; 18: 907-915.
- Unger J. Educating Patients about Hypoglycemia Prevention and Self-Management. *Clinical Diabetes* 2013; 31 (4): 179-188.

Thank you

