EBP Project – Group 6

Practice Guide for Diabetes Nurses on Continuous Glucose Monitoring

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fppt.com

Background

The cornerstone of diabetes management is to prevent diabetes complications by

Achieving optimal glycemic control

minimize hypoglycemia

Continuous glucose monitoring (CGM) is rapidly developed and used popularly in recent years

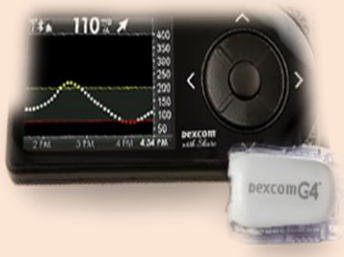
less frequency of sensor calibration

simple procedures of sensor insertion

less costing







Our EBP project question

Our concern :

How Diabetes nurses match with the quick improvement of technology & popularity of Continuous Glucose Monitoring (CGM)?

Our consensus :

- Review the effectiveness of CGM in the management of diabetes through literature search
- Diabetes nurses can recognize different brands and features of CGMS & provide care management to the patient individually for using CGM

P - population : nurses

I - intervention : training and practical guide on CGM

C - control: no structural method on CGM

O - outcomes: enhance patients' outcome

" How to enhance patient outcomes through training and practical guide for nurses on continuous glucose monitoring (CGM)?"

Learning journey to CGM

Monitoring:
SMBG
VS CGMS

2015

2016

Literature Search on CGMS/ SMBG
:
-indication / limitations for use of CGM
- Advances and types of CGM (Retrospective/ Real-time)
- Significance of CGM

2016

Finalize project question on CGMS

" How to enhance patient outcomes through training and practical guide for nurses on continuous glucose monitoring (CGM)?"

2016

Review practice guidelines, consensus & Recommendation in CGMS

2016 Evidence

- Questionnaire for current practice of diabetes nurses regarding their experience of CGM and clinical need for structured education and training for use of CGM

Result positive

Ovid®
Search Journals
Search History (0 searches

NCBI Resources
PubMed.gov
US National Library of Medicine
National Institutes of Health

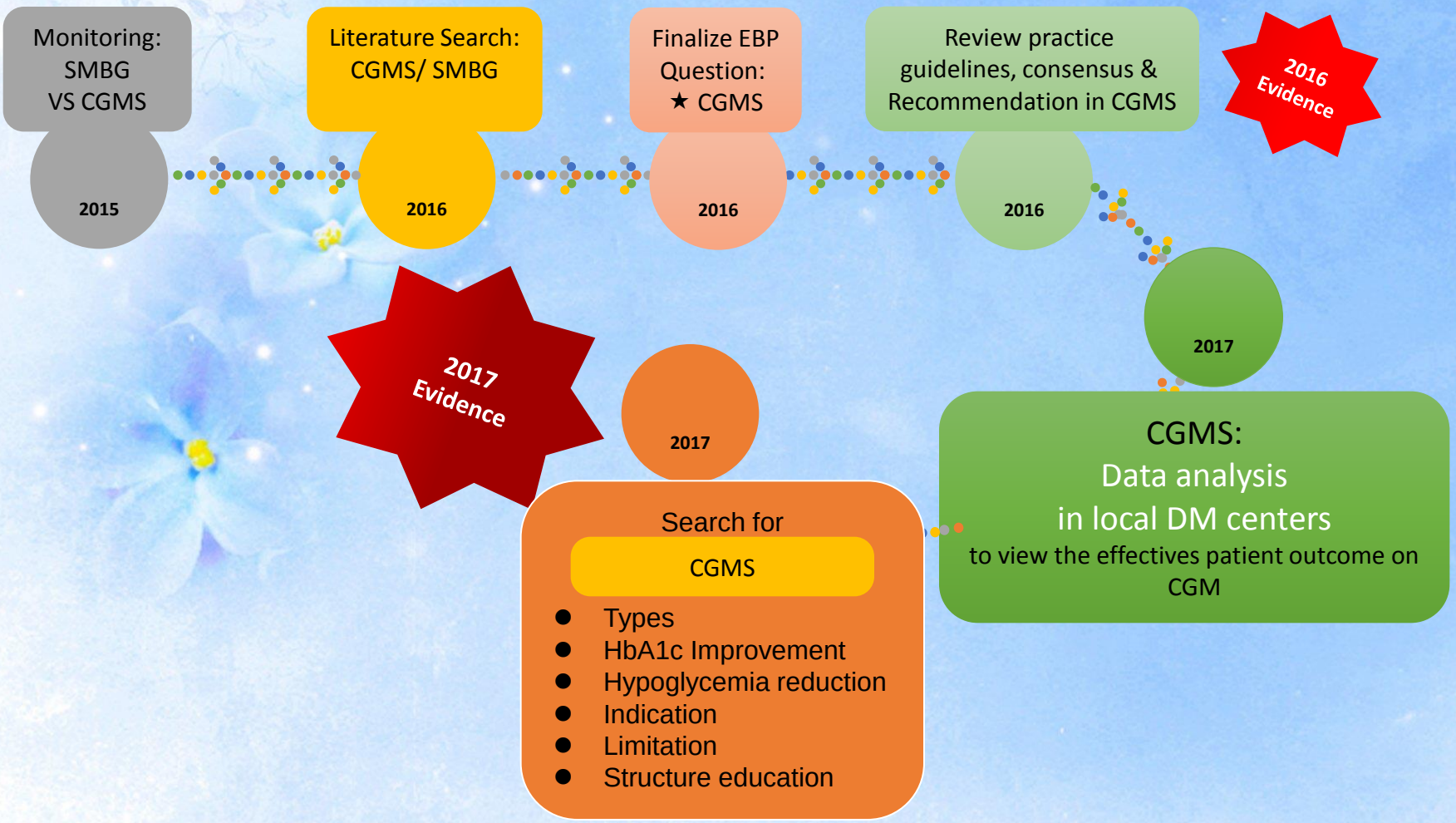
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Cochrane Library
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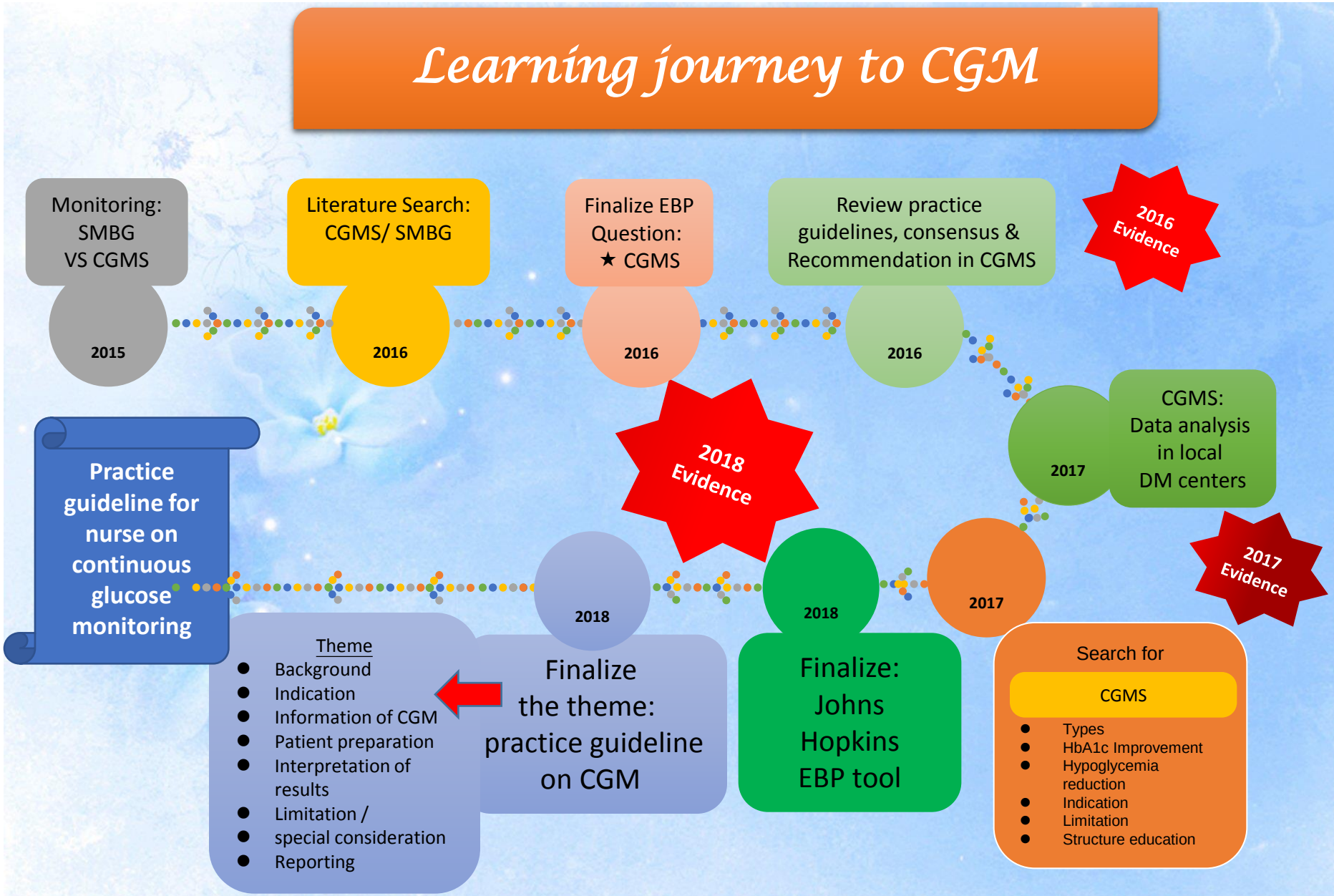
Google Scholar

Joanna Briggs Institute

Learning journey to CGM



Learning journey to CGM

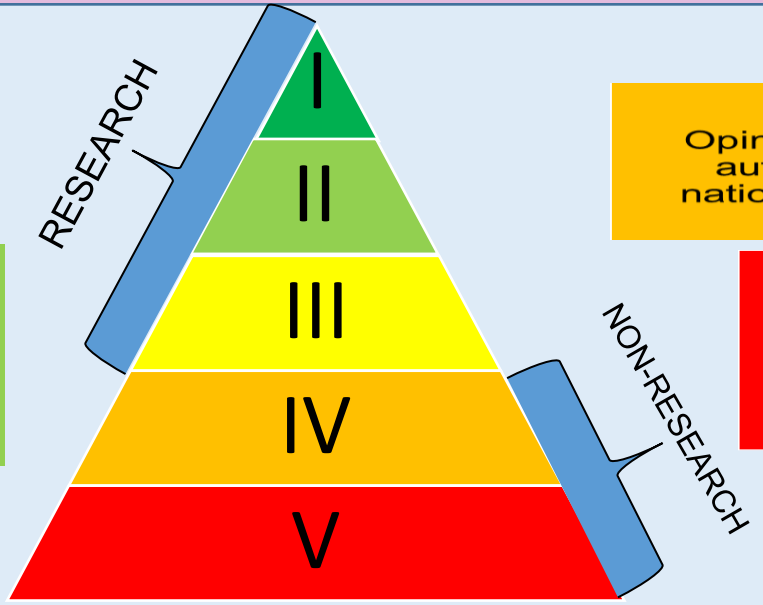


Johns Hopkins Nursing Evidence-Based Practice (JHKEBP) Appraisal Tool

Level I:
Experimental Study
Randomized Controlled Trial(RCT)
Systematic review of RCTs
With or without Meta-analysis

LEVEL II:
Quasi-experimental Studies with or without meta-analysis
Systematic review of a combination of RCTs and quasi-experimental

LEVEL III:
Non-experimental study
Qualitative study



LEVEL IV:
Opinion of respected authorities and/or nationally recognized experts

LEVEL V:
Based on experiential and non-research evidence-literature reviews, QI/program evaluation, case reports, opinion of expert based on experiential evidence

HIGHEST
randomized control research trial

1 >>> 2 >>>3 >>> 4 >>> 5
LEVEL of EVIDENCE

LOWEST
expert opinion and case studies

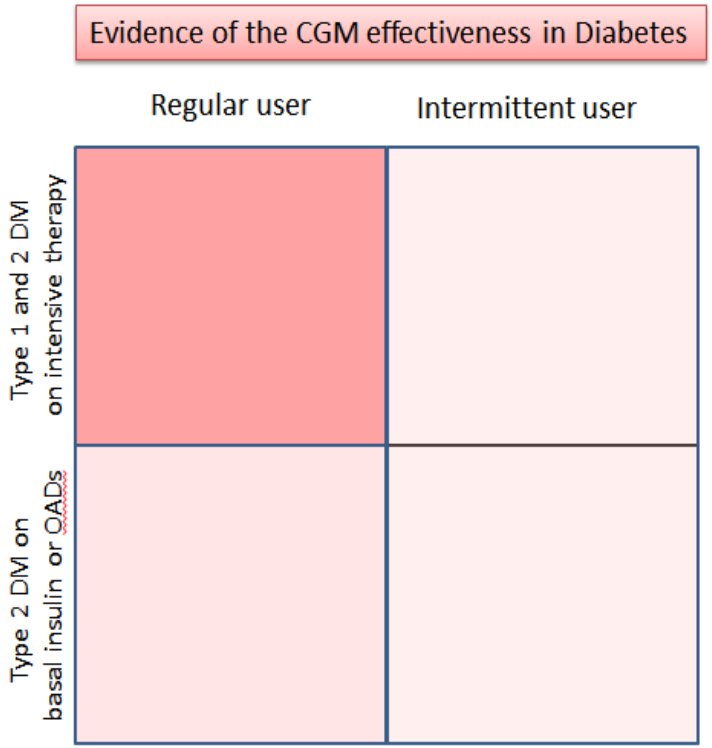
Quality Rating

A
High quality

B
Good quality

C
Low quality
Study with major flaws

Practice Guide: Theme





Practice Guide:
Indication for Real Time CGM (rtCGM) (I)

- provides the current glucose level, glucose trend and rate of change to aid patients and health care providers in both the daily management of blood glucose levels and retrospective review of glucose patterns.
- to complement self-monitoring blood glucose (SMBG) for treatment decision except Dexcom G5

	Improved Glycemic control	Deduction of hypoglycemia	Intensive treatment	Other
T1DM in Adult	Level 1A	Level 1B	Level IA	
T1DM in Adult with using CSII	Level 1A	Level 1A		
T2DM in Adult on MDI	Level IA	Level 1B		
Pregnancy women on insulin therapy		Level VA		Unstable blood glucose levels (Level VA)
T1DM in children & adolescent	Level 1A	Level 1C		- Intensive physical activity/ have comorbidities/ treatment make glucose brittle (Level VA) -Detect abnormal patterns of glycemia (Level IIA)
T1DM in Neonates, infants & pre-school children	Level VA			

Practice Guide:
Indication for Real Time CGM (rtCGM) (II)

RCTs & MA → improved glycemic control >>> target A1c + reduction of severe hypoglycemia events in adult and children

Let's view: T1DM in adults

- Real-time CGM is recommended for adult patients with T1DM who have A1c levels above target and who are willing and able to use devices on nearly daily basis.
- In intensively treated adults with type 1 diabetes, CGM use and benefit can be sustained for 12 months. (Level IA)
- Real-time CGM can reduce hypoglycemia exposure. (Level IB)

*** Fallback from observational studies: → large drop out rate, bias in patient recruitment: inclusion & exclusion criteria, patient willingness & ability, knowledge gap on CGM.

Practice Guide: Indication for Respective CGM(rCGM)

Use to review glucose patterns for sharing decision-making in Endocrinology Clinics and Primary Care for T2DM

- **Short term for diagnostic tool**
- **Long term as therapeutic tool (Level IVA)**

*** Not much quality studies found, only have positional statement & international guidelines available

Target group & indication:

- To discover previously hyperglycemia, hypoglycemia and brittle diabetes (Level IIIA)
- To measure glycemic variability, percent of time within, below & above target glucose levels and severity of hypoglycemia & hyperglycemia throughout the day & night (Level IIIA)
- For special / difficult clinical situations:
  Haemodialysis, chronic dialysis, pregnancy, cystic fibrosis, bariatric surgery, insulinoma, Hirata's disease, shift-work schedules & defective compliance (Level IVA)
- To analysis glycemic effects of new interventions to facilitate decision making effectively & efficiently such as pharmaceuticals, clinical decisions, behavior modification, flexible insulin therapy, physical activity (Level IVA)

Nursing Practice Guide for Continuous Glucose Monitoring (CGM)

To recognize the difference between rCGM and rtCGM, different features of different brands rtCGM in Hong Kong market

Before using of CGM, to assess the following items:

- Medical history and treatment
- Using CGM pattern – regular or intermittent
- Readiness and ability
- Knowledge of diabetes management
- Education on retrospective CGM (rCGM)

Before CGM installation & After completion of rCGM

Let's view :

Education on Real time CGM (rtCGM)

Before rtCGM installation

- The difference between interstitial fluid and capillary glucose
- The lag time between interstitial fluid and capillary glucose
- The display information including glucose reading, glucose trend of previous few hours and arrow trends (rate of change (ROC) according to the manufactures' information

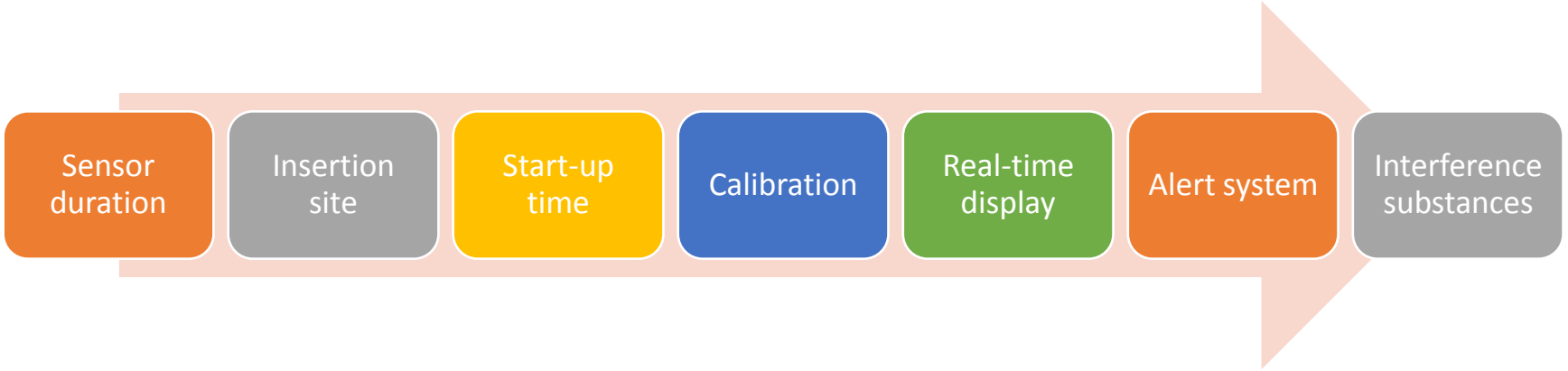
- Reviewing or intensify education on Insulin carbohydrate ratio (ICR), insulin sensitivity factor (ISF), insulin dose adjustment principles and safety using the ROC to manage their diabetes for diabetes patients on intensify treatment (CSII or MDI)
- Providing insight into the effects of medications and lifestyle choices
- Teaching the meaning of ROC to anticipate for appropriate action to prevent hypoglycemia for type 2 patients on basal insulin and OADs

After completion of rtCGM

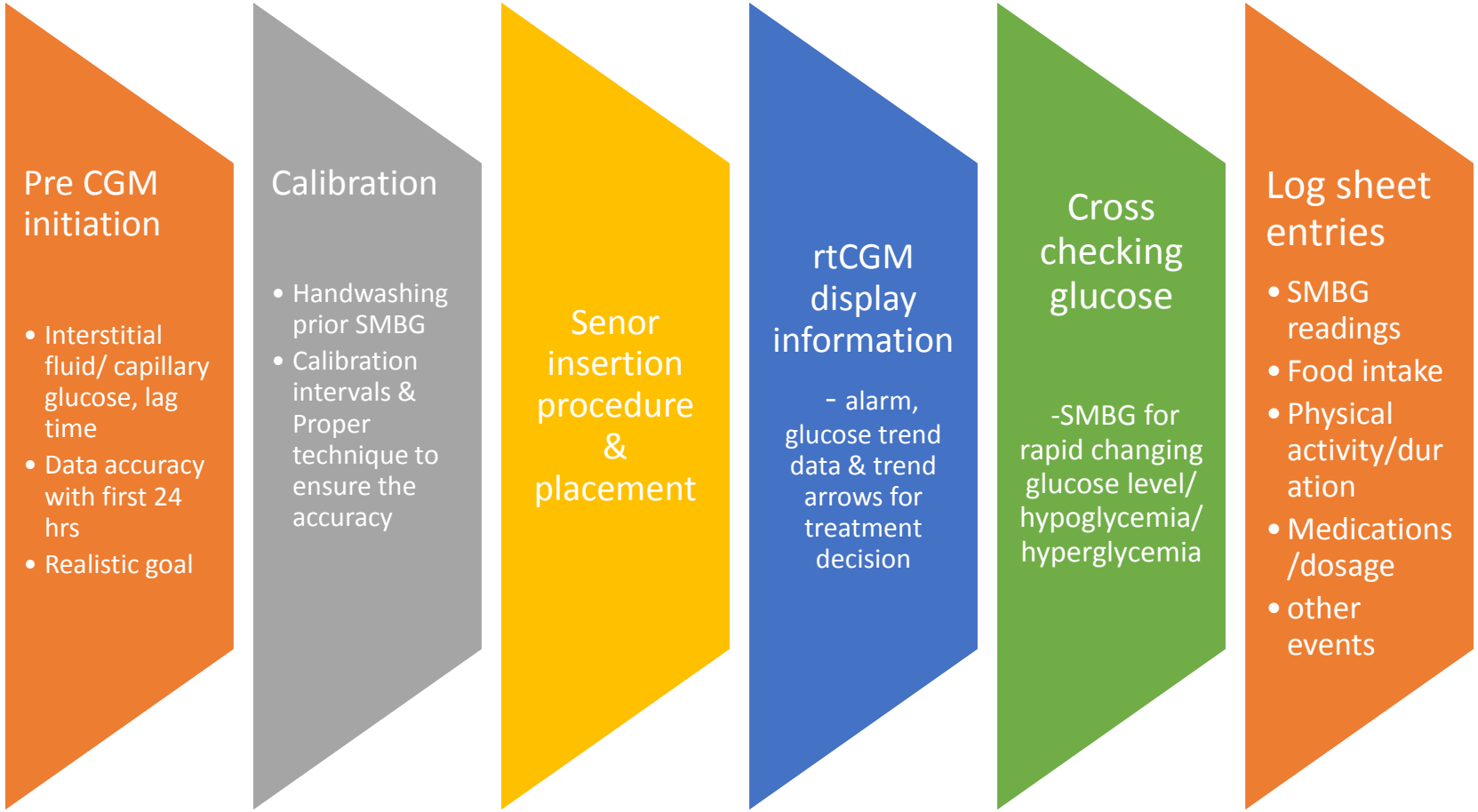
- Reviewing the quality of rtCGM data and identifying the important information such as glucose pattern, hypoglycemia during day and night time (aware and unaware), glucose variability and stability
- Discussing the report with patient's daily record to find out any modifiable behavior from patient and evaluate the immediately management or treatment decision in daily life
- Evaluating the appropriateness ratio of ICR and ISF for fine adjustment
- Picking up some special event such as intensive and long duration exercise, sick days for education
- Recording the findings in medical record

Information of CGM - Hong Kong Market

Freestyle Libre	Dexcom G4	Dexcom G5	iPro 2
			
Real Time	Real Time	Real Time	Retrospective



Patient education (I)

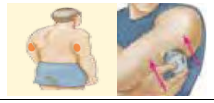


Patient education (II)

Let's view: FreeStyle Libre Flash Glucose Monitoring System



Patient Information on Using FreeStyle Libre Flash Glucose Monitoring System

Sensor Duration	14 days
Sensor Insertion Site	1) Apply sensors only on the back of upper arm. Avoid areas with scars, moles, stretch marks or lumps. 2) Select an area of skin that generally stays flat during normal daily activities (no bending or folding). Choose a site that is at least 2.5 cm (1 inch) away from an insulin injection site. To prevent discomfort or skin irritation, you should select a different site other than the one most recently used. 
Calibration	No calibration is necessary. Finger prick blood glucose testing would still be needed: 1) During times of rapidly changing glucose levels (as indicated by up or down arrows) when interstitial fluid glucose levels may not accurately reflect blood

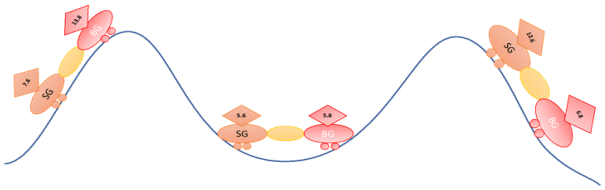
Sensor Storage
Waterproof/ Water Resistant
Receiver Distance
Additional Feature
Precaution
Accuracy
Approved for insulin adjustment without finger prick

hypoglycaemia or impending hypoglycaemia

match the system readings

sers must scan the sensor at least once every 8 hours.

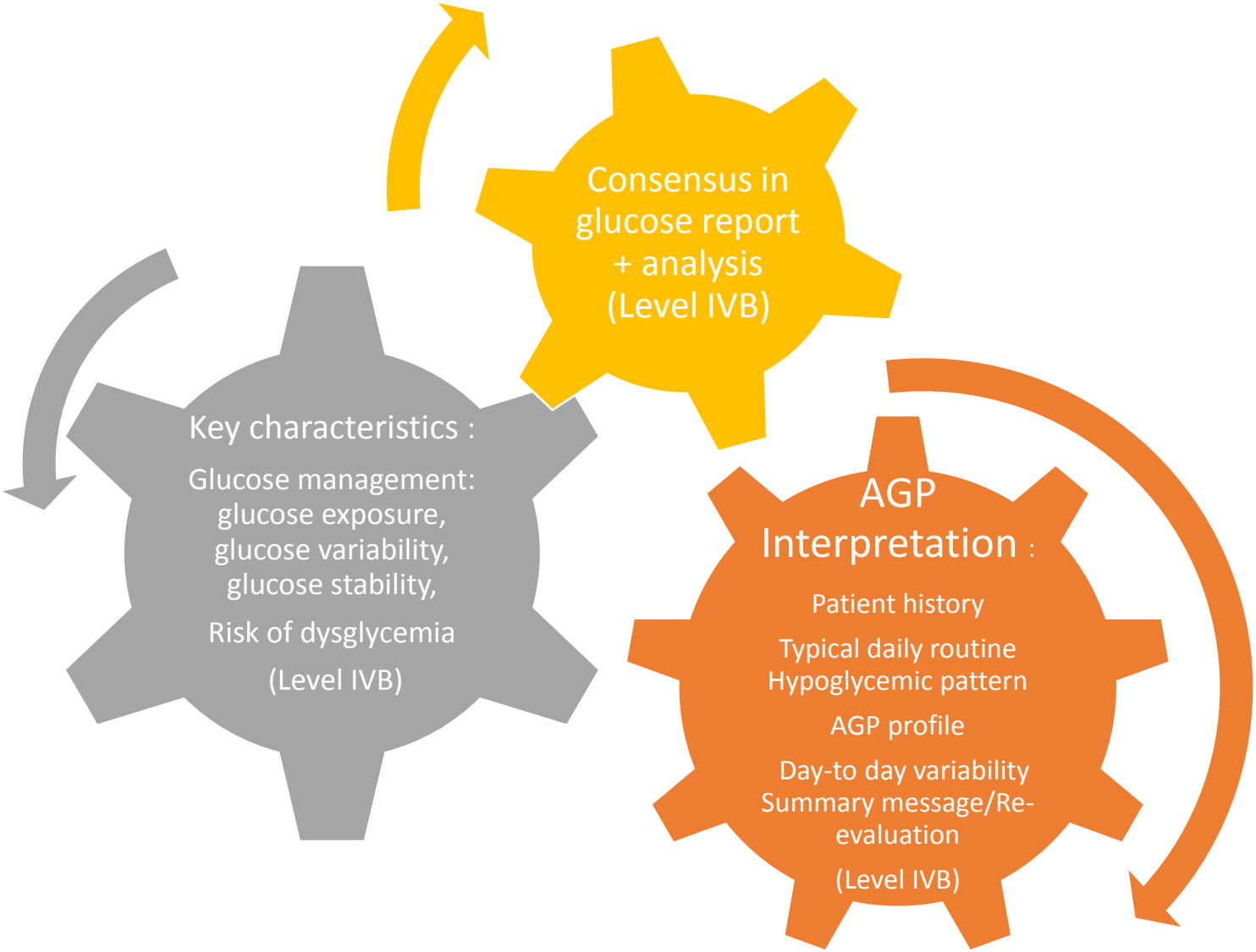
Blood glucose Vs Sensor glucose



General Patient Information Sheet for CGMS:
Pre CGM initiation, calibration, cross checking glucose, log sheet entries, skin reaction, travelling, sensor life.

Arrow Trends
Abbott Libre
↑ raising quickly >0.1 mmol/L per minute (more than 1.5 mmol/L in 15 minutes)
↖ raising 0.06 - 0.1 mmol/L per minute (between 0.9 – 1.5 mmol/L in 15 minutes)
→ change slowly <0.06 mmol/L per minute (less than 0.9 mmol/L in 15 minutes)
↘ falling 0.06 - 0.1 mmol/L per minute (between 0.9 – 1.5 mmol/L in 15 minutes)
↓ falling quickly >0.1 mmol/L per minute (more than 1.5 mmol/L in 15 minutes)

CGM Report interpretation (I)



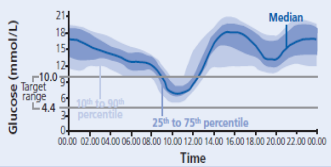
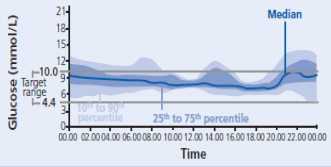
CGM Report interpretation (II)

Let's view: Ambulatory Glucose Profile (AGP) Report Interpretation (Abbott Libre)

- **7 Steps for AGP Report Interpretation (Abbott Libre)** (Level IV B)

1) Consider the patient history and quality of the data provided: How many days of data/ carbohydrate intake / insulin doses been logged
2) Understand the patient's typical daily routine; Insulin/ food intake/ physical activity
3) Identify hypoglycaemic patterns: Hypoglycaemic trends/symptoms/ or required external assistance for rescue
4) Review the AGP profile for each part of the day/ examine the median glucose levels
5) Evaluate day-to day variability
6) Summary message
7) Re-evaluation

Table 1 Example use of Ambulatory Glucose Profile (AGP) to assess a patient's glycaemic profile

	Baseline assessment	Week 4 assessment
Clinical history	• Male, 51 years old, type 2 diabetes (diagnosed 3 years ago) • Weight 93kg, body mass index (BMI) 32 • Received heart transplant 2 years ago, worsening of diabetes post-transplantation due to treatment with corticosteroids and immunosuppressants • Glucose measurements: HbA1c 8.9%, fasting blood glucose readings 180–250 mg/dL (10–14 mmol/l)	• Glucose measurements: fasting blood glucose readings 100–200 mg/dL (5.5–11 mmol/l)
AGP profile		
Interpretation of the AGP report		
1. Consider the quality of the data	• A 14 day AGP is available • Some information relating to meal timing and content has been provided by the patient • Insulin regimen and dosage are known from the medical records	• A 14 day AGP is available • Meal and insulin information is still available
2. Review the patient's typical daily routine	• The patient always skips breakfast but eats lunch and dinner • Insulin treatment (initiated by transplant physician) o Premix 50% 18 units at 08:00	• The patient still skips breakfast • Insulin treatment o Glargine: 14 units at 18:00 o Lispro: 6 units at 12:00 and 18:00
3. Identify any hypoglycaemic episodes	• There are no hypoglycemic episodes. Dose increase of Premix 50% is limited by an evident hypoglycemic risk in the morning	• No hypoglycemic episodes but some low glucose level in the evening
4. Review the AGP profile for each part of the day, examining the median glucose levels	• Overall hyperglycemia, especially during the night • Major glycaemic drop in the morning due to Premix 50% injection without meal • Major glycaemic rise after lunch and dinner	• Dramatic improvement of the overall profile • Median glucose stable within target range throughout day (low intra-day variability), no substantial rises or falls, only moderate rise after dinner
5. Evaluate day-to-day variability	• Low inter-day variation during night and morning demonstrated by narrow interquartile range (IQR) • Greater variability during afternoon and evening after lunch and dinner	• Low inter-day variation except after dinner, due to variable amounts of carbohydrate (patient statements)
6. Reinforce one key take-home message	• Treatment was therefore adapted as follows: o Premix insulin was discontinued o Basal-Bolus regimen was initiated with prandial insulin before lunch and dinner	• Dietary advice was given to the patient concerning the regularity of carbohydrate intake
7. Re-evaluate the patient	• The patient was reviewed after 4 weeks for a new Continuous Glucose Monitoring (CGM) recording	• A new AGP profile could be interesting in 3–6 months

Limitation/ special consideration

Qualification of the CGM data (Level VB)

- clock and data are set correctly
- sufficient calibrations
- conditions under special circumstances such as stress, travel, unusual physical activity, illness, or use of steroid medications
- Ensure that the data are reasonably accurate: according to respective companies' recommendation: such as AGP, the data sufficiency is required minimum 2 weeks of data and 70-80% of possible CGM data over a 2-week period
- keep written or computerized logs of factors that influences his or her glucose levels, such as

  - Timing and content of meals

  - Duration and nature of exercise

  - Doses of insulin and other diabetes medications

  - Noteworthy events (restaurant meals, illnesses, unusual stress, pump infusion set changes, menses, ets)

Statistical Summaries of the CGM data

The **mean** (average) sensor glucose represents a fairly true average

slightly lower than reality :

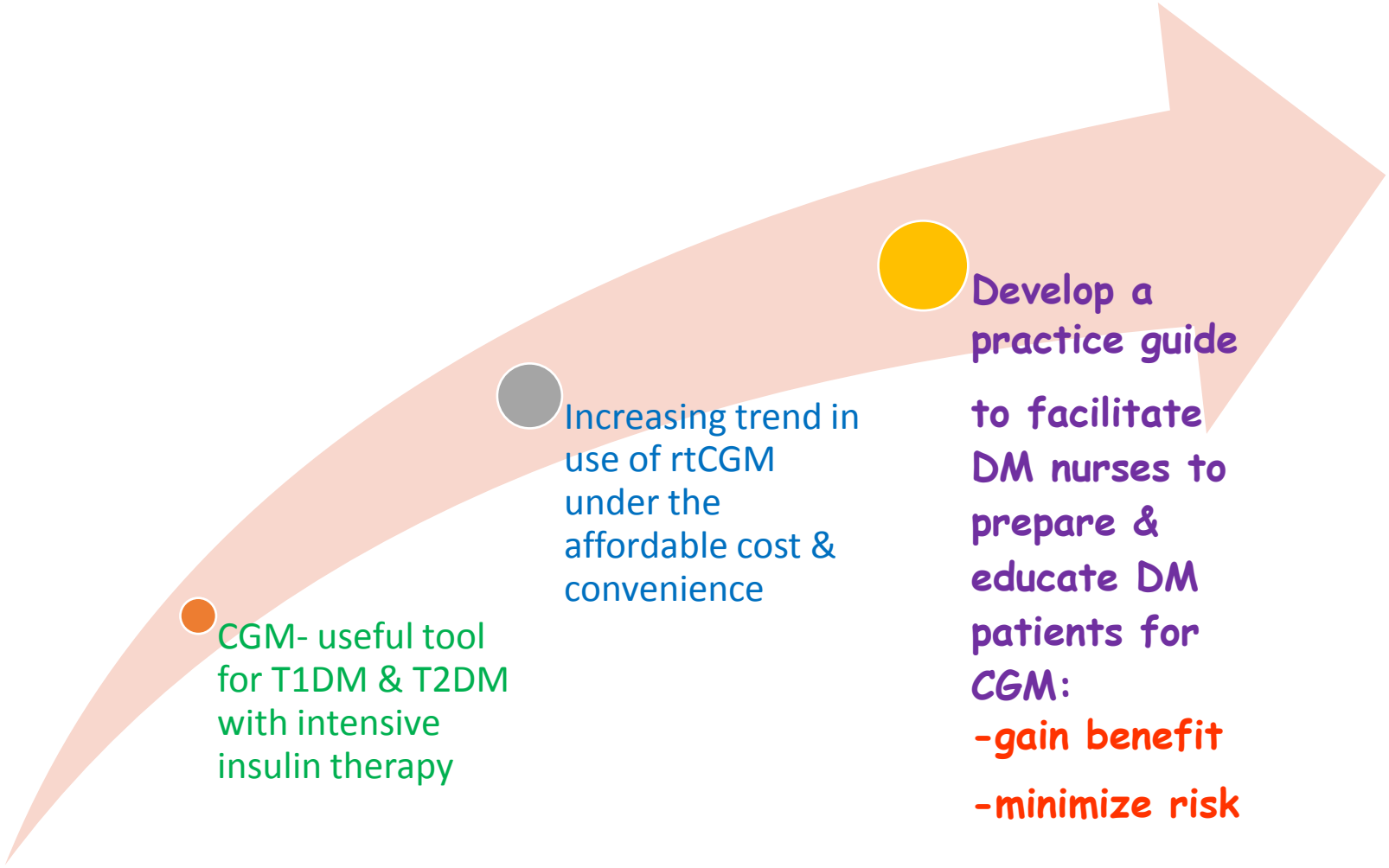
- a natural tendency for the systems to err on the side of lower rather than higher values
- the prolonged lag time that occurs when recovering from hypoglycemia

*** Adding 2-3% to a CGM average is a good way to correct for these system deficiencies

The **standard deviation** (SD) is a measure the amount of variation or dispersion of a set of data values

- A low SD indicates that the data points tend to be close to the mean of the set
- A high SD indicates that the data points are spread out over a wide range of values.
- An SD is less than 33% of the average is generally desirable
- As SD that is more than 50% of the average indicates excess variability

Reflection


CGM- useful tool for T1DM & T2DM with intensive insulin therapy
Increasing trend in use of rtCGM under the affordable cost & convenience
Develop a practice guide
to facilitate DM nurses to prepare & educate DM patients for CGM:
-gain benefit
-minimize risk

OUR EBP GROUP MEMBERS




Thank You
AHKDN to provide a valuable platform for learning EBP & Professor Winnie So's teaching !!