Health Technology in the Prevention and Management of Diabetes

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Non-communicable diseases, mental health and environmental risks
The probability of dying from any of the four main non-communicable diseases – cardiovascular diseases, cancers, chronic respiratory diseases and diabetes – between the ages of 30 and 70 was 18 per cent in 2016. The risk remains markedly higher for men globally, at 21.6 per cent, compared with 15 per cent for women.

Progress in 2019
Major progress has been made in improving the health of millions of people, increasing life expectancy, reducing maternal and child mortality and fighting against leading communicable diseases. However, progress has stalled or is not happening fast enough with regard to addressing major diseases, such as malaria and tuberculosis, while at least half the global population does not have access to essential health services and many of those who do suffer undue financial hardship, potentially pushing them into extreme poverty. Concerted efforts are required to achieve universal health coverage and sustainable financing for health, to address the growing burden of non-communicable diseases, including mental health, and to tackle antimicrobial resistance and determinants of health such as air pollution and inadequate water and sanitation.

Sustainable Development Goal 3
Ensure healthy lives and promote well-being for all at all ages
Diabetes

- A serious, chronic disease characterized by elevated blood glucose
- Type 1 occurs when the pancreas does not produce enough insulin
  - Exact causes are unknown.
- Type 2 occurs when the body cannot effectively use the insulin
  - Risk is determined by genetic and metabolic factors
  - Overweight/obesity and physical inactivity are the strongest risk factors
  - Fetal & early childhood nutrition affect future risk
Rise in diabetes

2014

422 million

Mortality

Deaths due to high blood glucose
3.7 Million

Deaths due to diabetes
1.5 Million

43% of deaths occurred under the age of 70 years

Rise is faster in low- and middle-income countries

Prevalence

0% 2% 4% 6% 8% 10%


Low-income
Lower middle-income
Upper middle-income
High-income

Deaths due to high blood glucose
3.7 Million
Deaths due to diabetes
1.5 Million

43% of deaths occurred under the age of 70 years
Economic impact of diabetes

Significantly higher medical expenditure

Direct annual cost of diabetes globally

> US$ 827 billion

Estimated GDP losses worldwide from 2010 to 2030

US$ 1.7 trillion
Prevention: Health Literacy is essential strategy

Health literacy is the degree to which individuals have the capacity to *obtain, process, understand and use* health information and services needed to promote and maintain health and to make appropriate health decisions.

Health literacy is dependent on individuals, providers and system:

1. Communication skills
2. Knowledge and understanding of complex issues
3. Clarity and accuracy of health information
4. Cultural and linguistic targeting of health information and services
5. Public health infrastructure that facilitates and supports healthy behaviours
6. Community, educational, and workplace infrastructures that facilitate and support access to health information

Strategy for Health Literacy

**Sharing**
across disciplinary and organizational boundaries, information, findings, program successes, and areas for improvement

**Technology**
an essential tool for improving health literacy

**Evaluation**
what is important to different population groups

**Partnership**
create partnerships with communities and each other

**Participation**
community engagement
Compulsory education sets foundation for good health literacy rate.

Besides education, social marketing, program & environmental modifications are also designed to enhance health literacy.

Health information is part of the school curriculum for the first ten years of education.

These programs create and maintain healthy behaviors.

Government must have the determination to tackle lifestyle-related diseases, like Type 2 Diabetes.

Source: Health Literacy Study 2013, HPB
One country's effort: War Against Diabetes

Message: Better Health, Better Care, Better Life

Headlines: “Government declares war on diabetes”. (Today, 13 April, 2016)
Minister of Health Mr Gan Kim Yong chairs “Diabetes Prevention and Care Taskforce”

A multi-pronged and comprehensive strategy in the war on diabetes
Tackle diabetes on 5 fronts:

- **Prevent**
  - Healthy living to avert or delay the onset and progression of diabetes

- **Screen**
  - Early screening and intervention for individuals at risk or those who are unaware they have diabetes

- **Control**
  - Better disease management to prevent or delay complications, and ensure a good quality of life at all life stages

- **Understand**
  - Public education to raise awareness on the prevention and care for diabetes, and motivate individual behaviour changes

- **Do your part**
  - Stakeholder engagement to galvanise a whole-of-nation effort to make supporting changes to the environment, while caring for Singaporeans with diabetes
Prevention: Living Health Lifestyle

Delay or prevent type 2 diabetes:

Regular physical activity

The Diabetes Prevention Program study showed

**30 mins a day of moderate physical activity along with a 5 to 10% weight loss produced a 58% reduction in diabetes.**

Manage body weight and eat healthily

Healthy 365 is a health and diet tracking mobile from Health Promotion Board. The free app tracks daily steps count and calculate the corresponding calories burned. It also track daily food & drinks intake and the corresponding calories consumed.
Early Screening: Intervention for individuals at risk or those who are unaware they have diabetes

What is Pre-Diabetes?
• Comes before type 2 diabetes
• Blood glucose higher than normal, but not yet diabetes
• You can have pre-diabetes and not know it
• Reversible (low GI, fat & salt diet, regular exercise, reduce body weight)

Diabetes
Fasting blood glucose of 126 mg/dl or higher

Pre-diabetes
Fasting blood glucose of 100 - 125 mg/dl

A1C test measures the average blood glucose during the previous 2-3 months, but especially during the previous month.
Better Management: Prevent or delay complications, and ensure a good quality of life

Regular monitoring of blood glucose level

Variety of Glucose meters

Finger prick lancing and measurement

Genteel: Eliminate severe puncture marks, swelling, bruising and sensitivity using vacuum and depth control and start using the palm
Wearable technology

Contact Lenses: monitor blood glucose levels through human tears by Google. Novartis to license and commercialize them once available.

Abbott’s FreeStyle® Libre 14 Day Flash Glucose Monitoring System

Dexcom G6 CGM System

Metronics’ MiniMed™ 670G System
This is the first time the USFDA has allowed a device to actually administer insulin without human intervention.”
Smart Apps

**Fooducate**: search a food item’s nutritional value and wait for the app to suggest healthier alternatives. The app also creates a community in which you can share your progress and healthy recipes.

**Diabetik**: for quick and interactive data entry to help those with either Type 1 or Type 2 diabetes monitor their diet, blood glucose levels, and medication. The user can set medication or activity reminders according to time or location.

**Glooko**: aggregates biometric data with information gathered through syncing with other glucose monitoring and fitness apps. It allows physicians to easily download patient data through the **Glooko Kiosk** software, which provides doctors with vital information required during consultations.

**mySugr Junior**: motivates and rewards children to learn about diabetes and religiously monitor their glucose and activity levels. All data are synced with the caregiver’s smartphone.

**OneTouch Verio® Meter**: test a drop of blood and tell whether sugar levels are within range, as well as provide a summary of overall health performance.
Early detection and treatment of complications

- **End-stage renal disease**
  - Measurement of urine protein
    - Progression to kidney failure can be slowed by essential drugs
- **Cardiovascular diseases**
  - Measure and control cardiovascular risk factors
- **Blindness**
  - Periodic eye examinations and timely laser photocoagulation
- **Lower limb amputation**
  - Proper footwear and regular examination of feet
  - Provide rehabilitation
Sensor Technology

- Allow for real-time monitoring of dynamic gait & foot pressure
- Embedded sensors measure foot contact pressure
- Objective assessment for podiatrists & patients
Thank you