

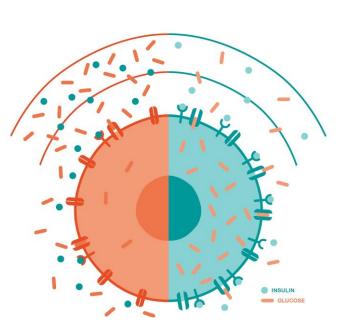


DIABETES

FACTS AND FIGURES

SYMPTOMS INCLUDE^{1,2} **FREQUENT URINATION EXCESSIVE THIRST CONSTANT HUNGER FATIGUE**

WEIGHT LOSS VISION CHANGES SLOW HEALING WOUNDS

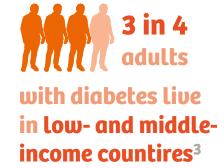


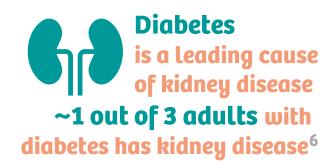
Global prevalence of diabetes in adults (20-79 years) in millions³



People with diabetes are more likely to have serious complications from COVID-19⁵

million deaths due to diabetes in 2021 worldwide³





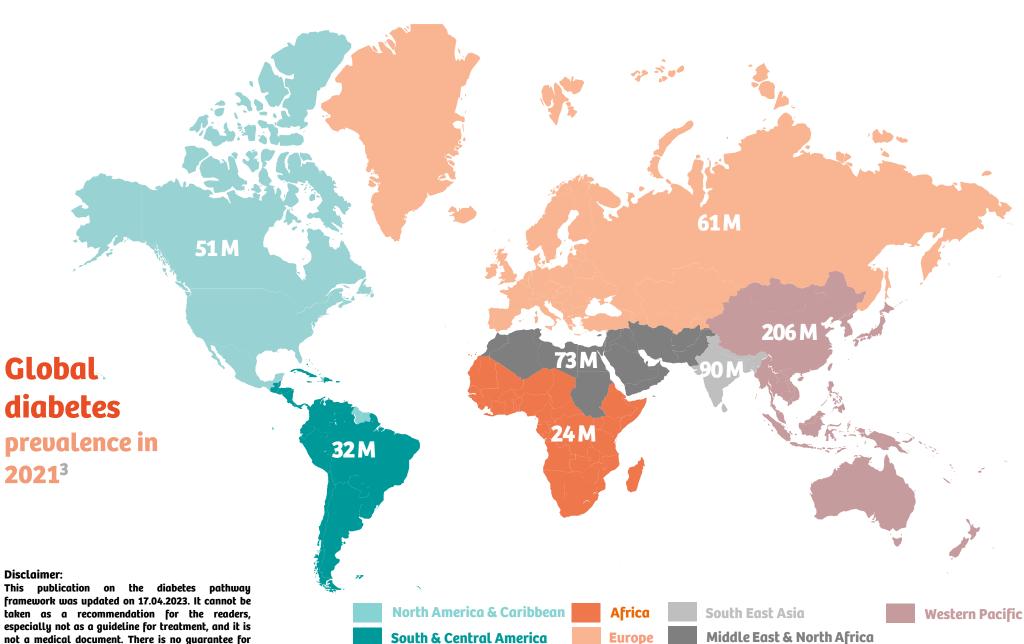
RISK FACTORS⁴

- ✓ Family history
- ✓ Race or ethnic background ✓ Cholesterol levels
- Age
- **Gestational diabetes**
- Obesity
- **Physical inactivity**
- ✓ High blood pressure
- **Smoking**
- **Alcohol**
- **Stress**



Adults with diabetes nearly twice as likely to have a heart disease or stroke as adults without diabetes⁷

Health expenditure due to diabetes in 2021: USD 966 billion3



not a medical document. There is no guarantee for completeness or global correctness, the various pain points, solutions, and statistical data are examples only. Sources are multiple, such as public statistics, expert opinions, open innovation workshops. research, own data and many more (see references). The products and features mentioned may not be available in all countries and their future availability cannot be guaranteed. Some products mentioned are planned and under development.

World Health Organization. (2021). Diabetes. Retrigued February 08, 2023, from https://www.cdc.gov/diabetes/basics/symptoms.html Centers for Disease Control and Prevention. (2022, December 30). Diabetes Symptoms. Retrieved February 08, 2023, from https://www.cdc.gov/diabetes/basics/symptoms.html IDF Diabetes Altas. (2022). Diabetes around the world in 2021. Retrieved February 08, 2023, from https://www.heart.org/en/health-topics/diabetes/understand-your-risk-for-diabetes/ American Diabetes Association. (2021). How COVID-19 impacts people with Diabetes. Retrieved February 08, 2023, from https://diabetes.org/coronavirus-covid-19/how-coronavirus-impacts- people-with-diabetes#

. National Institute of Diabetes and Digestive and Kidney diseases. (2017, February). Diabetic Kidney Disease. Retrieved February 08, 2023, from https://www.niddk.nih.gov/health-

information/diabetes/overview/preventing-problems/diabetic-kidney-disease#
National Institute of Diabetes and Digestive and Kidney Diseases. Diabetes, heart disease, & stroke. Retrieved April 10, 2023, from https://www.niddk.nih.gov/health-information/diabetes/overview/preventing-problems/heart-disease-stroke

DIABETES

Disease pathway analysis with pain points and solution examples

Receives diagnostic services from

Laboratory

personnel

research-based scientific hospital workflow experience allowed the identification of pain points and solutions.

These solutions were proposed biosensors, nanorobotics smart wearable technologies.

THROUGH THIS CAREPLAN WE HIGHLIGHT DATA FROM A COLLECTION OF



connected to different stakeholders

Solution categories



Existing in healthcare



This publication on the diabetes pathway framework was updated on 17.04.2023. It cannot be taken as a recommendation for the readers, especially not as a guideline for treatment, and it is not a medical document. There is no guarantee for completeness or global correctness, the various pain points, solutions, and statistical data are examples only. Sources are multiple, such as public statistics, expert opinions, open innovation workshops, research, own data and many more (see

The products and features mentioned may not be available in all countries and their future availability cannot be guaranteed. Some products mentioned are planned and under

^aAtellica CH Enzymatic Hemoglobin A1c assay (SHS): The products/features (mentioned herein) are not commercially available in all countries. Due to regulatory reasons, their future availability cannot be guaranteed.

Microalbumin/Creatinine Urine Test (SHS): The products/features shown on this web page are not commercially available in all countries. Due to regulatory reasons, their future availability cannot be guaranteed.

bDCA® HbA1c Reagent Kit* for DCA Vantage® Analyzer (SHS): DCA HbA1c test kit 10698915 (an aid to diagnose diabetes and identify patients at risk for developing diabetes) is not available for sale in the U.S. Product availability varies by country. CDCA Vantage® Analyzer (SHS): The products/features (mentioned herein) are not commercially available in all

countries. Due to regulatory reasons their future availability

https://www.siemens-healthineers.com/innovation-think-tank

cannot be guaranteed.

b,dDCA® HbA1c Reagent Kit* for DCA Vantage® Analyzer & DCA® DCA, DCA Vantage, and all related marks are trademarks of Siemens Healthcare Diagnostics Inc., or its affiliates. All other trademarks and brands are the property of their respective 1 PRENATAL Scenario: At the obstetrician's office **STAKEHOLDERS**



In charge of the health

A pregnant woman is being examined by the doctor during her antenatal

checkup. She is worried about the health of her unborn child.

PAIN POINT

ildren of mothers and/or fath

th type 1 diabetes have a highe

risk of developing the disease.1

Process innovation

T Genetic counseling

Genetic counseling for diabetes to

provide empiric risk information

based on family history and/o

the effects of materna

hyperglycemia on pregnancy

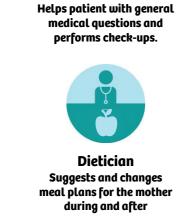
P O

Obstetrician

Takes care of monitoring

the pregnancy and helps with all related health





PAIN POINT

hildren exposed to materno

at an increased risk of developing

Process innovation

Preventive strategies

These include enhancing parents'

awareness and knowledge of

predisposing factors, avoiding

exposure to them, providing

appropriate prenatal care, lifestyle

interventions like healthy diet and

physical activity, regular blood

glucose monitoring and optimum

follow-up to evaluate the efficacy

of these interventions.^{3,4}

PAIN POINT

eases the risk of the cl

loping type 1 diabetes.4

TScreening for preeclampsia

Screening in the first trimester by a

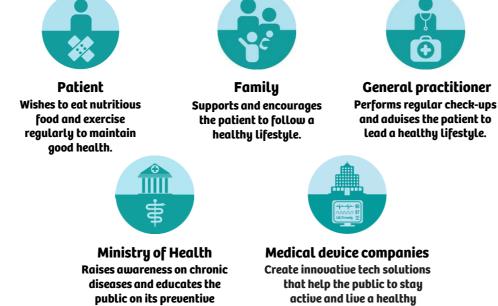
combination of maternal factors

mean arterial pressure, uterine

artery pulsatility index, and serum

placental growth factor (triple test)

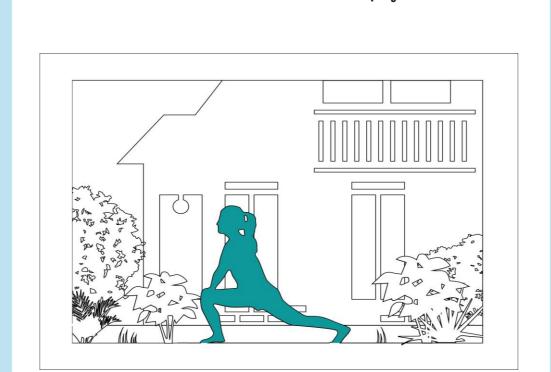
stational diabetes mellitus are



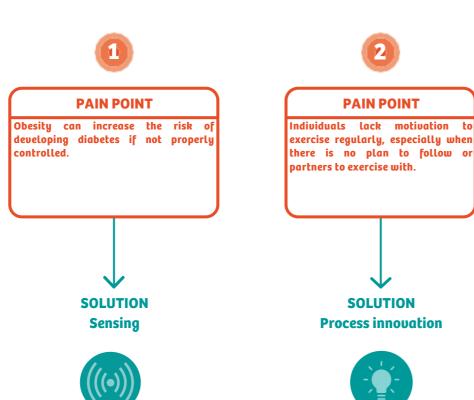
2 PREVENTION

STAKEHOLDERS

Scenario: In the garden



Patient exercises regularly and tries to keep up a healthy lifestyle.





personalized management programs

and real-time feedback can improve

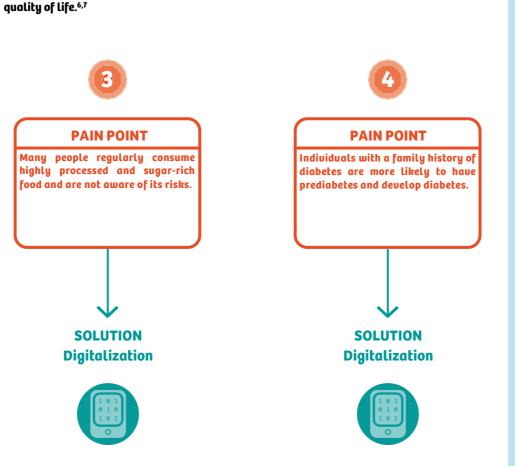
Online diet platform

followed by a personalized diet

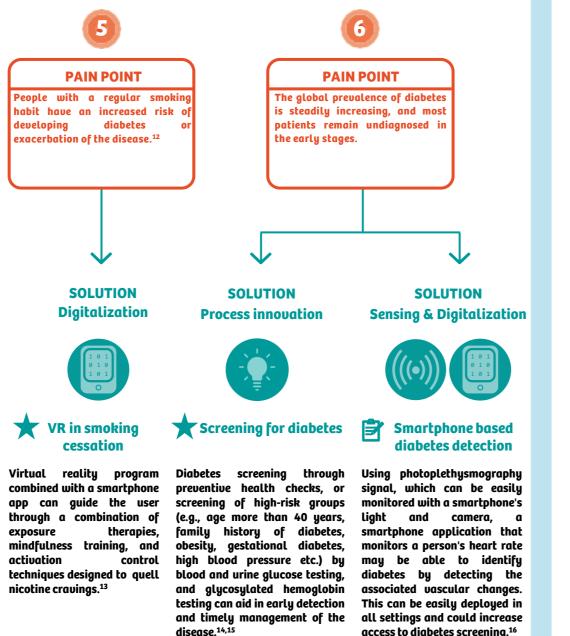
plan, as well as daily, weekly or

monthly doorstep delivery o

meals based on a subscription





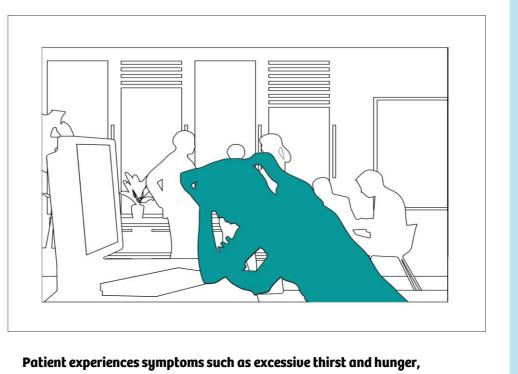


STAKEHOLDERS Patient General practitioner Notices change in patient's Can interpret the Suffers from symptoms Medical device companie Specialist of the disease who Create innovative tech

advises the patient on next

3 SYMPTOMS

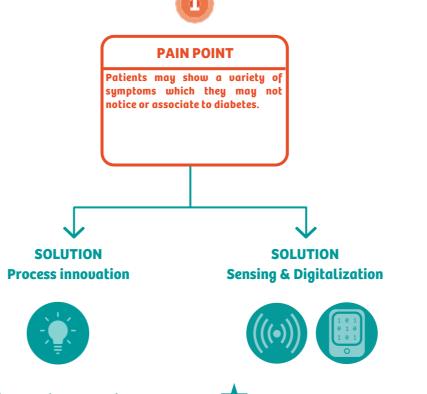
Scenario: At the office



solutions to help monitor and

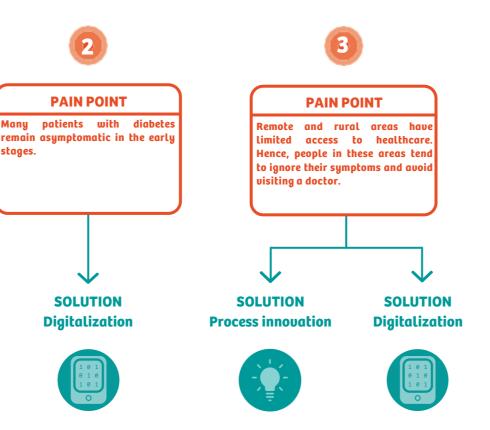
track the symptoms of

frequent urination and fatigue.

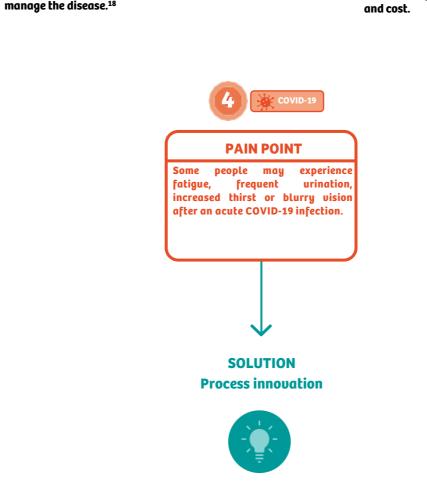




practitioner.17



Al based risk prediction	Access to primary healthcare	Telemedicine
An Al-based automated end-to-end patient-centric system that uses factors like patient demographics, lifestyle, medical condition, heredity and psychology to identify patterns in patient data by extracting correlations between risk factors and incidence of diabetes can be used to predict and	Ensuring easy access to primary care physicians and basic diagnostics, such as blood glucose testing in primary health care settings can enable timely diagnosis and treatment. ¹⁹	Virtual clinics for remote areas can allow patients to fully engage and communicate with their physicians, share their symptoms and get timely diagnosis with minimal effort, time



Post COVID measures

Emphasis should be laid on

potentially new onset diabetes

especially during the first 3

months of follow-up post COVID-

19 and regular tests for diabetes

detection must be conducted.

Patients need to be educated on

the warning signs of the disease

and encouraged to make

appropriate adjustments to their

overall lifestyle by eating healthy

and exercising regularly.^{20,21}

Create innovative tech Help conduct laboratory Manages the health ests and provide results services provided to solutions to help diagnose that aid in diagnosis. diabetes correctly and Patient is in the hospital laboratory sample collection area where blood sample is collected for diagnosis. **PAIN POINT** People living with undiagn eriod are more likely to have liabetes are a threat to the vorse health outcomes.¹⁹ atient's health.²³

4 DIAGNOSIS

STAKEHOLDERS

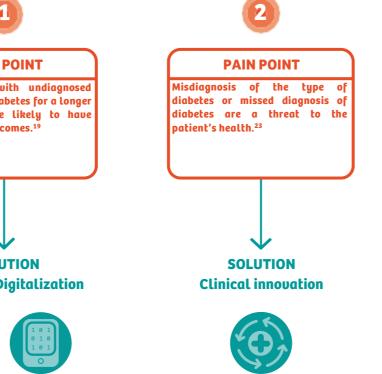
Supports patient

throughout the diagnostic

Scenario: At the hospital laboratory

Medical device

companies



amount of glucose in the urine. The

extracted data from any sample is

automatically sent to a secure, cloud-

based system which can be used to

monitor and flag signs of disease.22

PAIN POINT

With increasing prevalence

diabetes, there is a rising demar

An automated analyzer can improve

efficiency by streamlining the laboratory

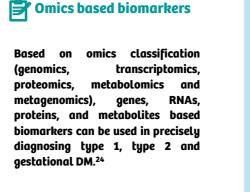
workflow to help achieve consistent

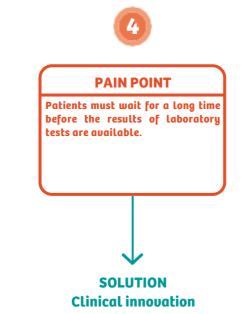
turnaround time and enhancing the

laboratory's productivity by increasing

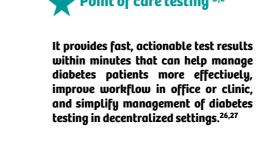
proof the lab for upcoming demand of

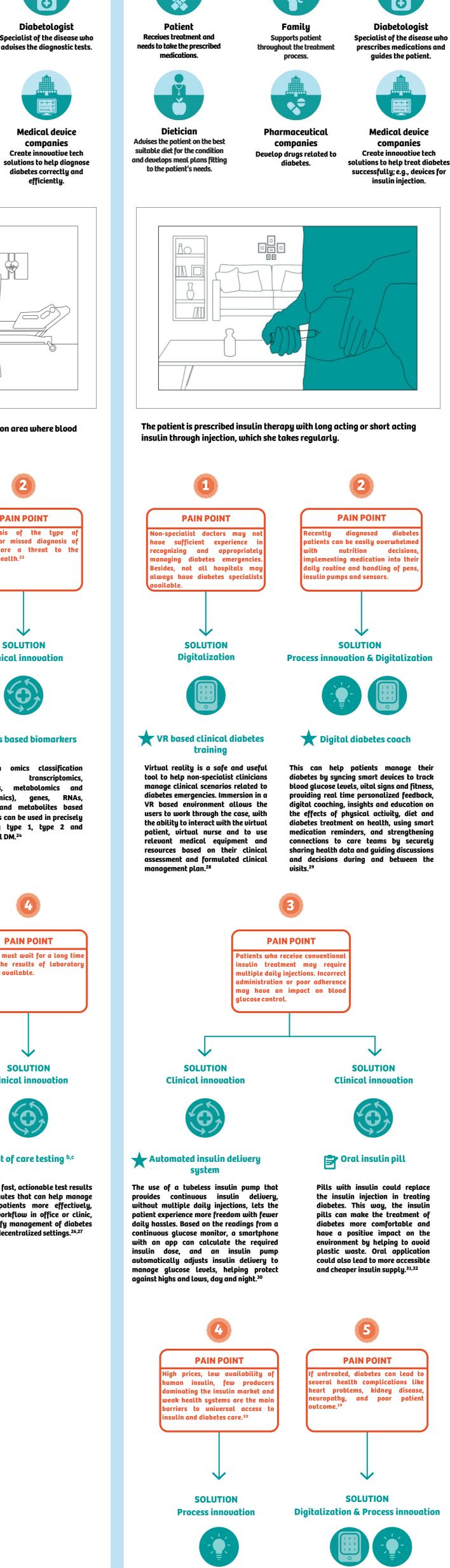
for laboratory testing.











Universal access to insulin

Access to insulin and related products

insulin production and supply,

improving affordability by regulating

prices and mark-ups, using pooled

procurement, promoting local

manufacturing capacity in underserved

regions, promoting R&D centered on the

needs of low- and middle-income

countries, using health resources wisely

and ensuring access to affordable

devices for blood sugar monitoring and

injecting insulin.³³

With the help of CDSS, health

professionals can anticipate th

patient's health trajectory, based on

which a series of cost-effective

interventions can be advised

including blood glucose control

through a combination of diet,

physical activity and, if necessary,

medication; control of blood pressure

and lipids to reduce cardiovascular

risk and other complications; and

regular screening for damage to the

eyes, kidneys and feet to facilitate

early treatment and improve patient

outcomes.19,34

5 TREATMENT

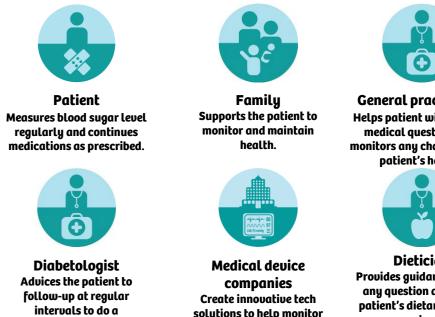
STAKEHOLDERS

guides the patient.

Scenario: At home

6 FOLLOW-UP Scenario: At home in the living room





The patient regularly monitors blood sugar levels using a glucometer during the follow-up period.

sulin pen into the same area co

lead to lipohypertrophy and

injected insulin.

therefore reduced effect of the

Process innovation

Proper injection site rotation

Educating the patient about practicing

proper injection site rotation, hygiene and

can help prevent lipohypertrophy from

occurring, and avoiding the site can treat

the issue as it gives the skin time to heal

between injections, thus improving blood

SOLUTION

learning can be used to estimate the risk of

CKD in diabetes using factors like age,

gender, ethnicity, eGFR, haemoglobin,

blood pressure, serum albumin, creatinine,

risk score would allow for intensifying

treatment for those most likely to benefit.3

e with diabetes are less lil

visit the hospital during th

SOLUTION

Teleconsultation

Patients can schedule an online

consultation to connect with their

physician virtually via text, audio

or video. It facilitates long-term

clinical care for monitoring and

prevention of complications of

diabetes mellitus.41

ndemic due to fear of infection.

idiagnosed CKD and of progression of

sugar control.36,37

PAIN POINT

eased risk of kidney dis

abetic nephropathy).

eplacing the needle after each injection

nventional method to che

blood glucose levels for diabete

monitoring is invasive. Thus

people tend to avoid testing

regularly since it is associate

Clinical innovation

Non-invasive continuous glucose

monitoring can be done using

optical, microwave and

electrochemical methods which

utilize body fluids like saliva,

tears, sweat and interstitial

fluids, apart from blood to

monitor glucose levels. Examples

include tattoo sensors, glucose-

sensing RFID microchip, smar

SOLUTION

Clinical innovation

Microalbumin/

Creatinine urine test d

ACR testing is recommended as an

initial screening test for early

detection of kidney disease and

should be performed annually in

patients with type 1 and type 2

diabetes. It requires a small

sample volume and delivers test

PAIN POINT

here is a dearth of reti

ecialists and ophthalmologis

and a high level of expertise i

required to manually diagnos

Al supported diagnosis

An AI tool that evaluates retinal

fundus images to detect diabetic

retinopathy can aid the physicians

in screening and early detection,

thus minimizing the requirement of

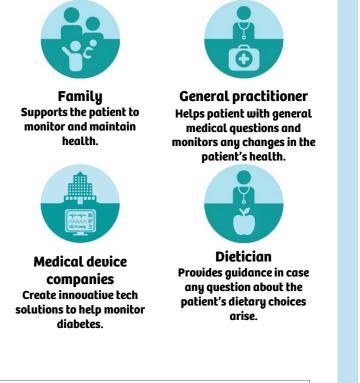
trained professionals.40

diabetic retinopathy.

results in minutes.38

contact lens etc.35

with pain and needles.

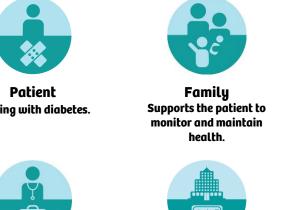


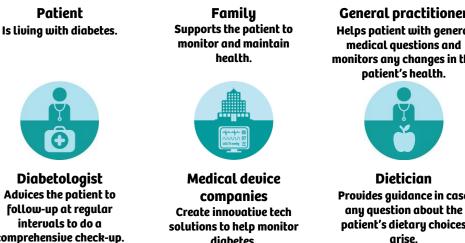


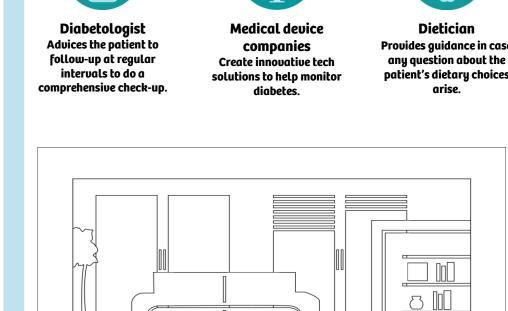
Innovation Think Tank

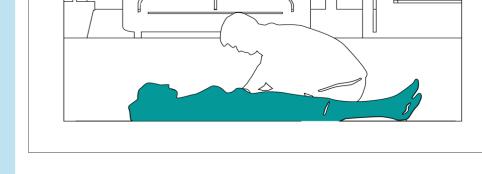
Proactively drive innovation to improve human life

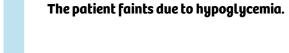


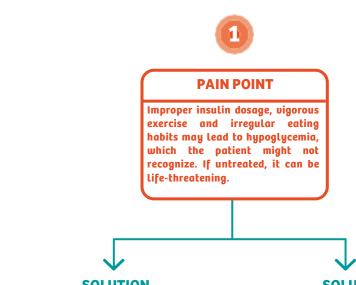






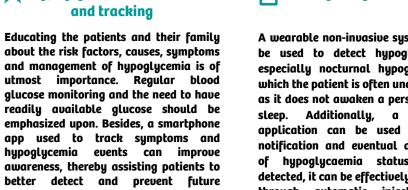


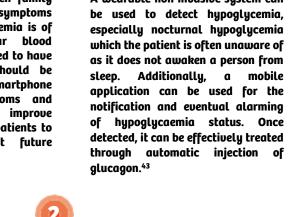


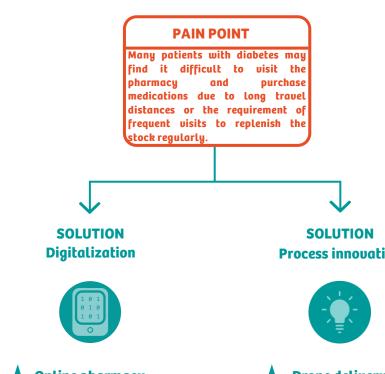




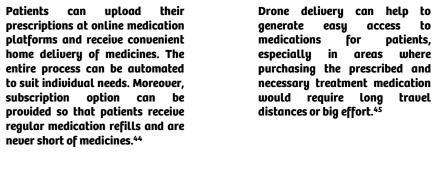


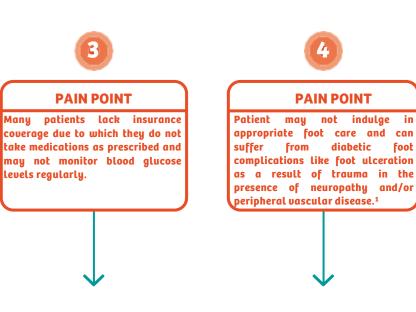


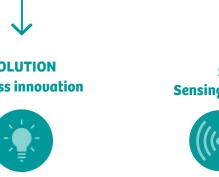
















Affordable access to essential care Wireless sensor-embedded socks for everyone with diabetes can be designed for daily wear can perform ensured by providing medications like continuous temperature monitoring of metformin, insulin, gliclazide, the feet of persons with diabetes in the strips, glucometers, and regular consultations with family doctors, nurses and dieticians, plus consultations with the appropriate specialists in the case of detection of ulcers and timely complications, as a minimum, thus effectively managing the condition.46

home environment. Combined with a mobile app, it informs the wearer about temperature increase in one foot relative to the other, to facilitate early

PAIN POINT

1. Rolston, S. H., Penman, I. D., Strachan, S. H., Penman, I. D., Strachan, M. W., & Hobson, R. H. (2014). Genetic Guine, S. C., Stein, S. H., Penman, I. C., Strachan, M. W., Moran Herican, M. G. Horis, J. C. (2015). Genetic Guine, S. H., Wight, M., Word Herican, S. Current genetic Guine, S. H. (2015). Genetic Guine, S. H. (2016). G