The role of digital technologies and AI in supporting clinical decision and driving personalized diabetes care

-The perspective of healthcare professionals

Dr Sufyan Hussain
Consultant Physician in Diabetes and Endocrinology and Honorary Senior Clinical Lecturer
Guy's and St Thomas' NHS Foundation Trust & King's College London

@sugarydoc

Disclosures

- I have received honorarium for non-promotional educational talks from Novo Nordisk
- The slides and views expressed are my own
- Personal experience of living and using diabetes technologies for ~30 years

The Problem?

537 million adults are living with diabetes

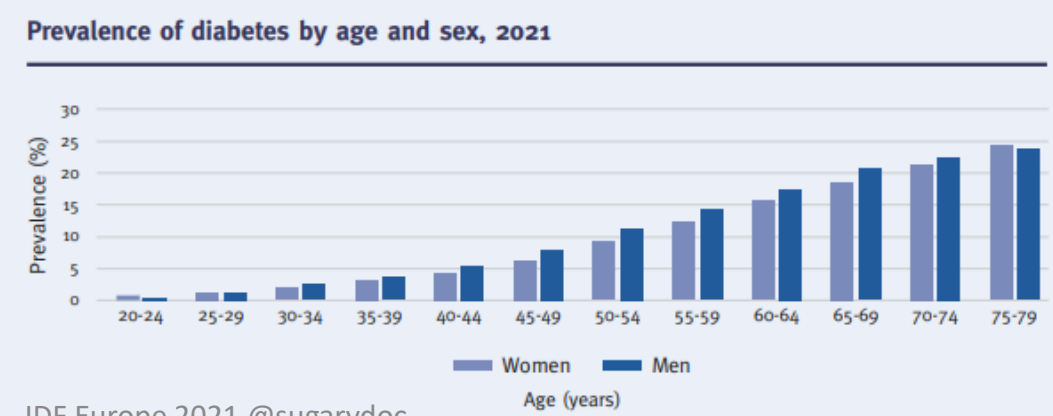
4 in 5 adults with diabetes live in low- and middle-income countries

6.7 million deaths due to diabetes in 2021

Europe

- **1 in 11 adults (61 million)** are living with diabetes.
- The number of adults with diabetes is expected to reach **67 million** by 2030 and **69 million** by 2045.
- **Over 1 in 3 (36%) adults** living with diabetes are undiagnosed.
- **USD 189 billion** spent on diabetes in 2021.
- **1.1 million deaths** due to diabetes in 2021.

Highest number of children and adolescents -295,000
Second highest average cost per person with diabetes ($3086)



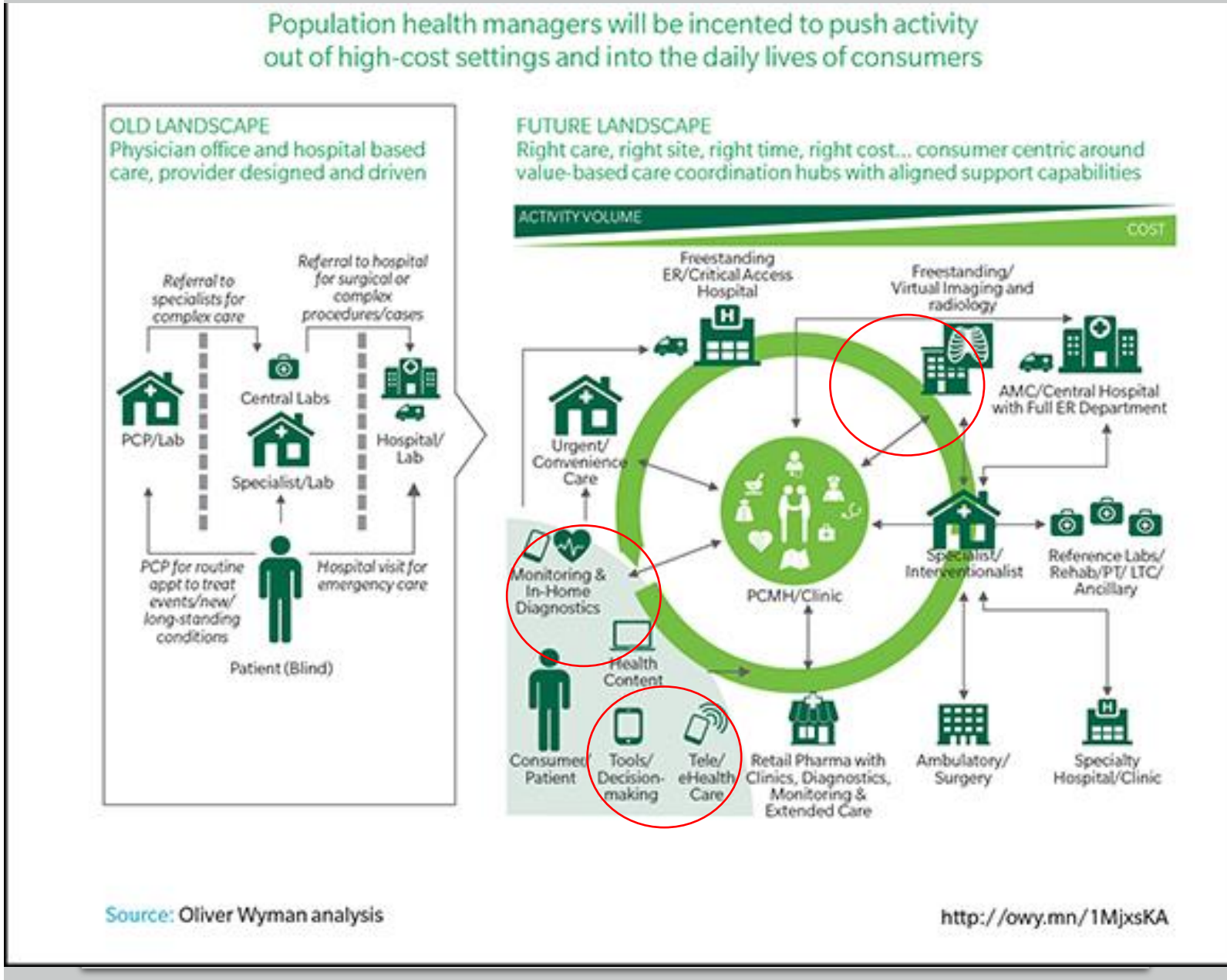
IDF Europe 2021 @sugarydoc

IDF atlas, 10th edition, 2021
https://diabetesatlas.org/

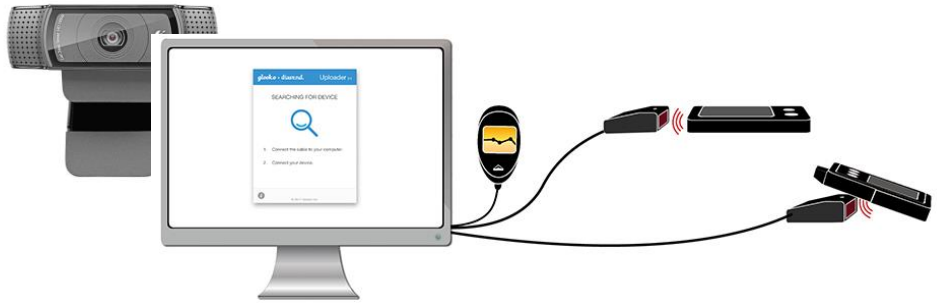
Solutions?

Maximising value by using resources optimally

AI and devices key enablers

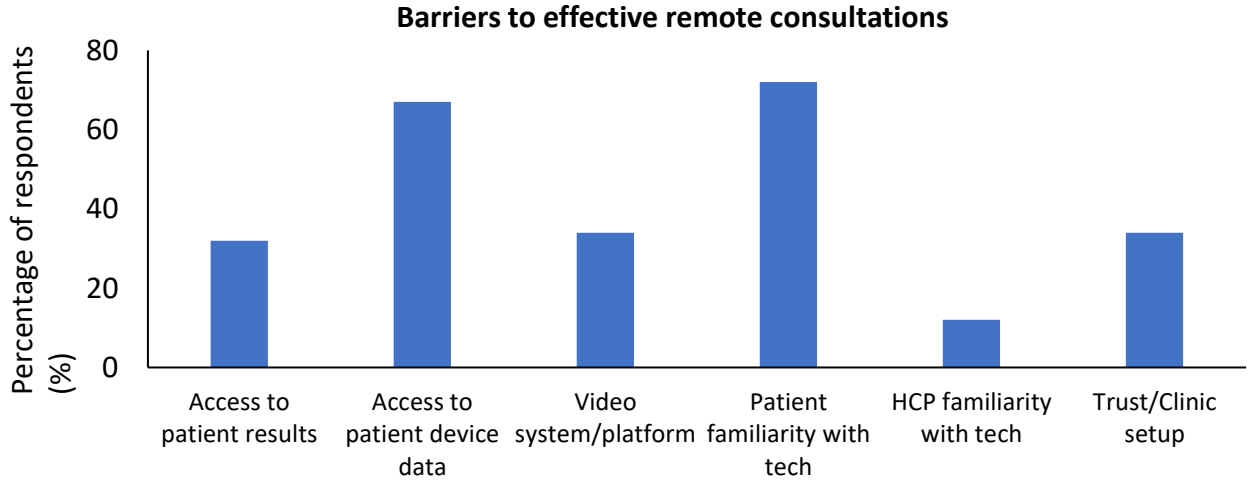


Clinical decision making – Remote follow-up



Consultations	Face-to-face	Video	Telephone	p value
Average mins per consultation	30 (20-36)	30 (20-30)	20 (15-30)	<0.001

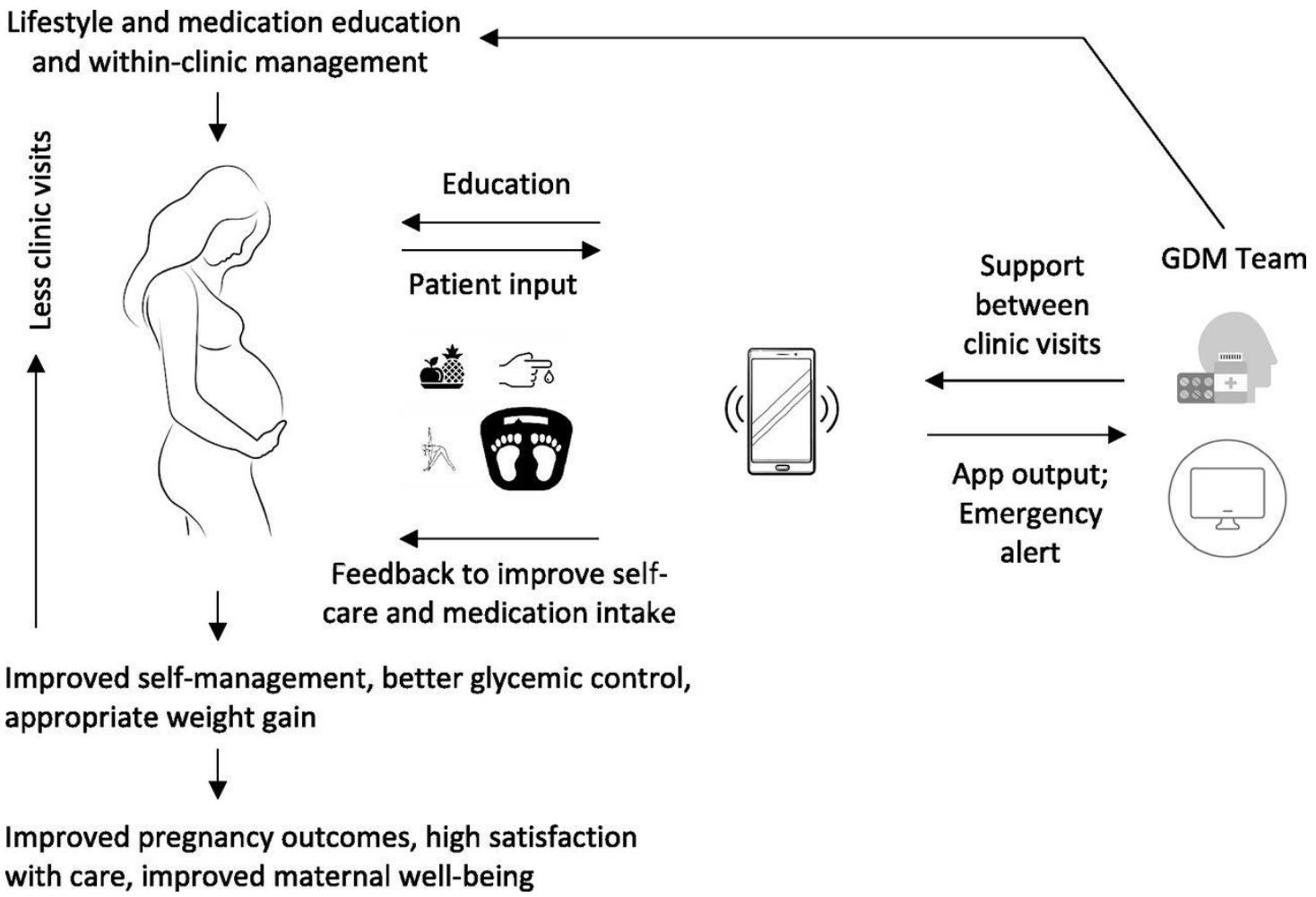
May not save time but offers ability to reach out further and operational cost savings



Forde, Choudhary, Lumb, Willmott, Hussain
Currently being revised for Diabetic Medicine

Clinical decision making – App based management

- Smartphone based apps in diabetes management
- Example during gestational diabetes in pregnancy
  - High-frequency visits reduced
  - Regular feedback and optimisation



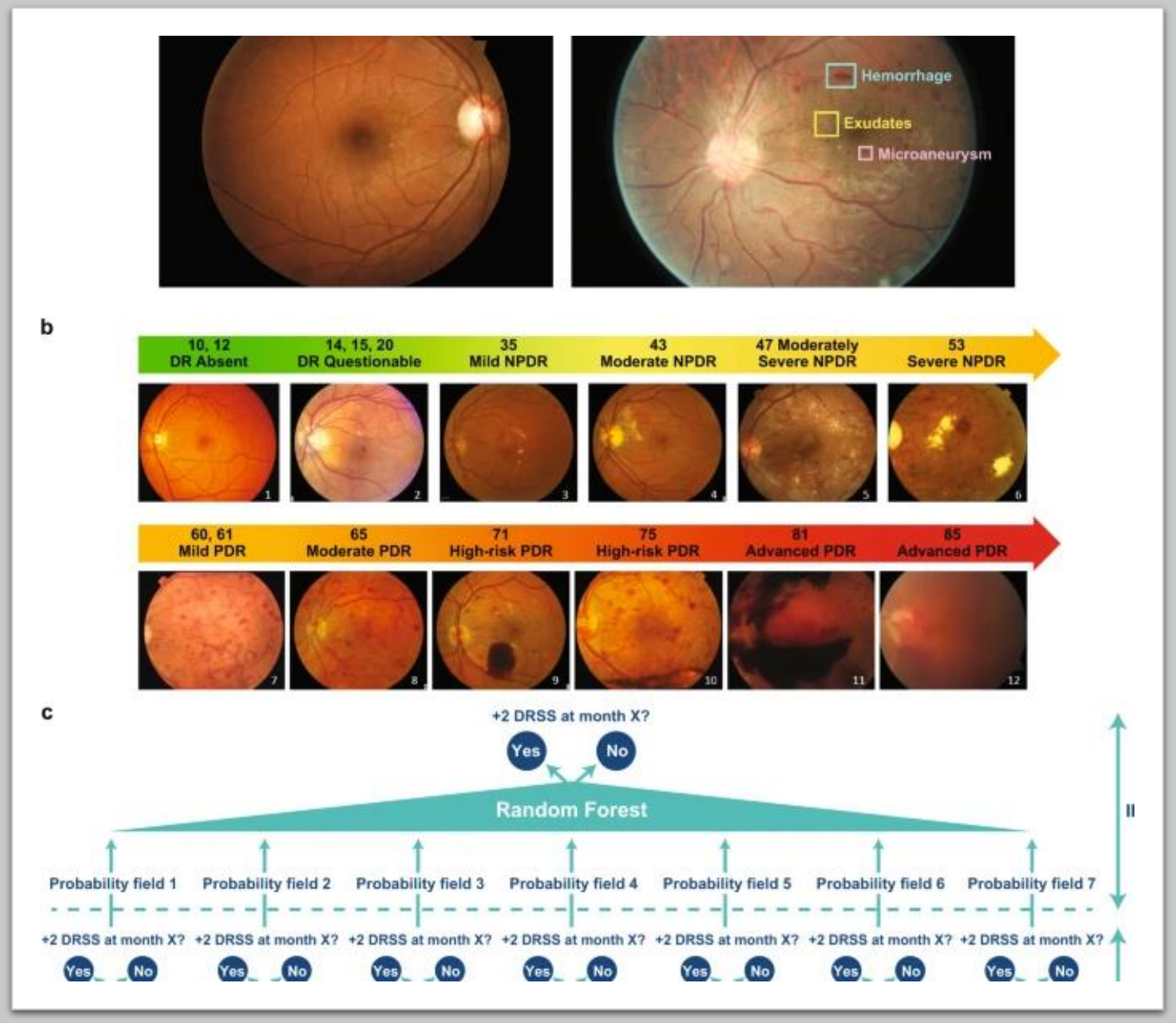
Diabetes Care 2021 Feb; 44(2): 313-315.https://doi.org/10.2337/dci20-0068

Clinical decision making – Artificial intelligence

Need for ecosystem with “clean data”

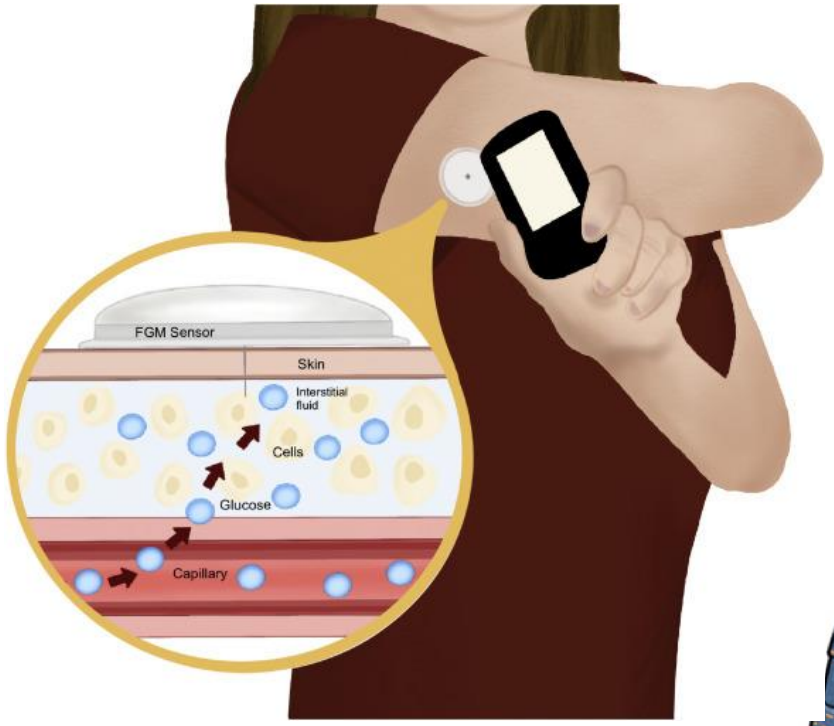
Diabetes retinal screening

Improved decision making



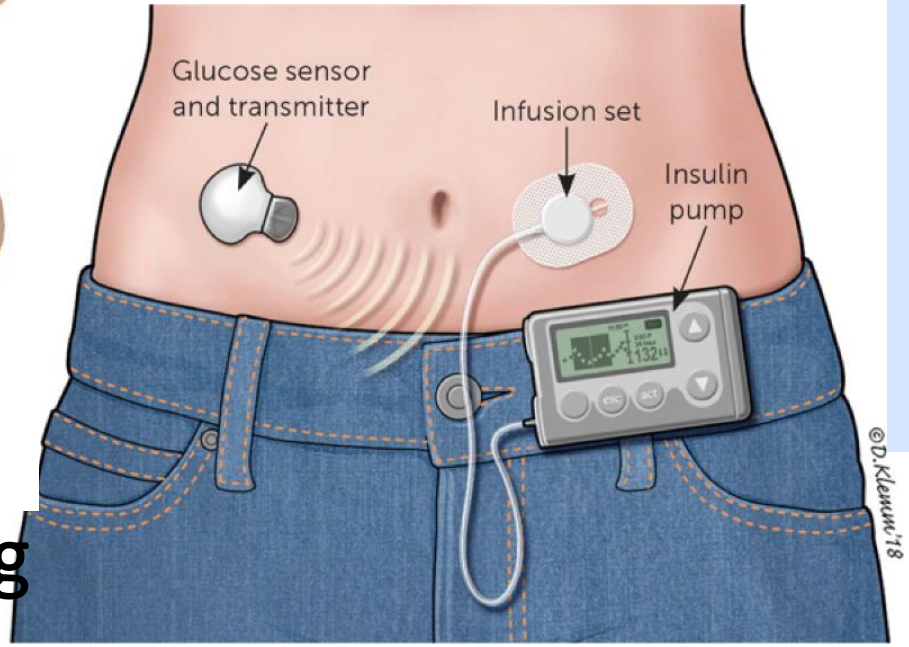
Arcadu, F., Benmansour, F., Maunz, A. et al. Deep learning algorithm predicts diabetic retinopathy progression in individual patients. npj Digit. Med. 2, 92 (2019). https://doi.org/10.1038/s41746-019-0172-3

Diabetes Technologies

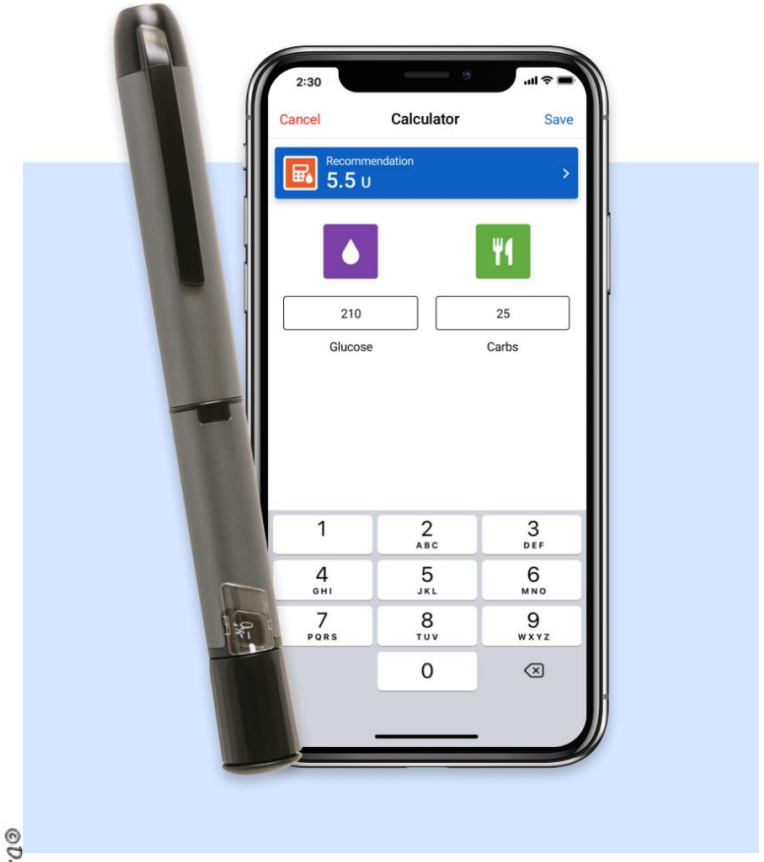


Flash glucose monitoring

CGM



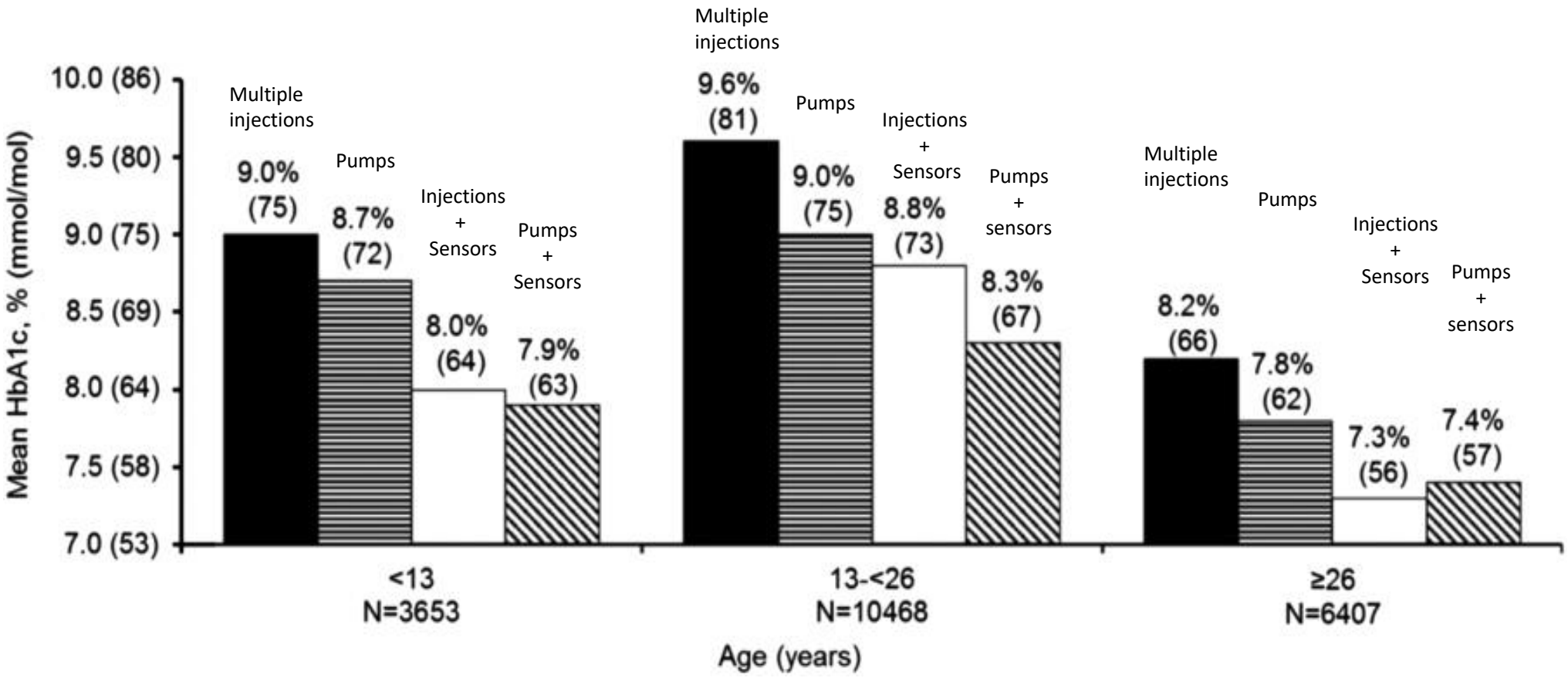
Insulin pumps (CSII)



“Smart” pens

Can diabetes devices improve outcomes?

U.S. T1D Exchange registry data

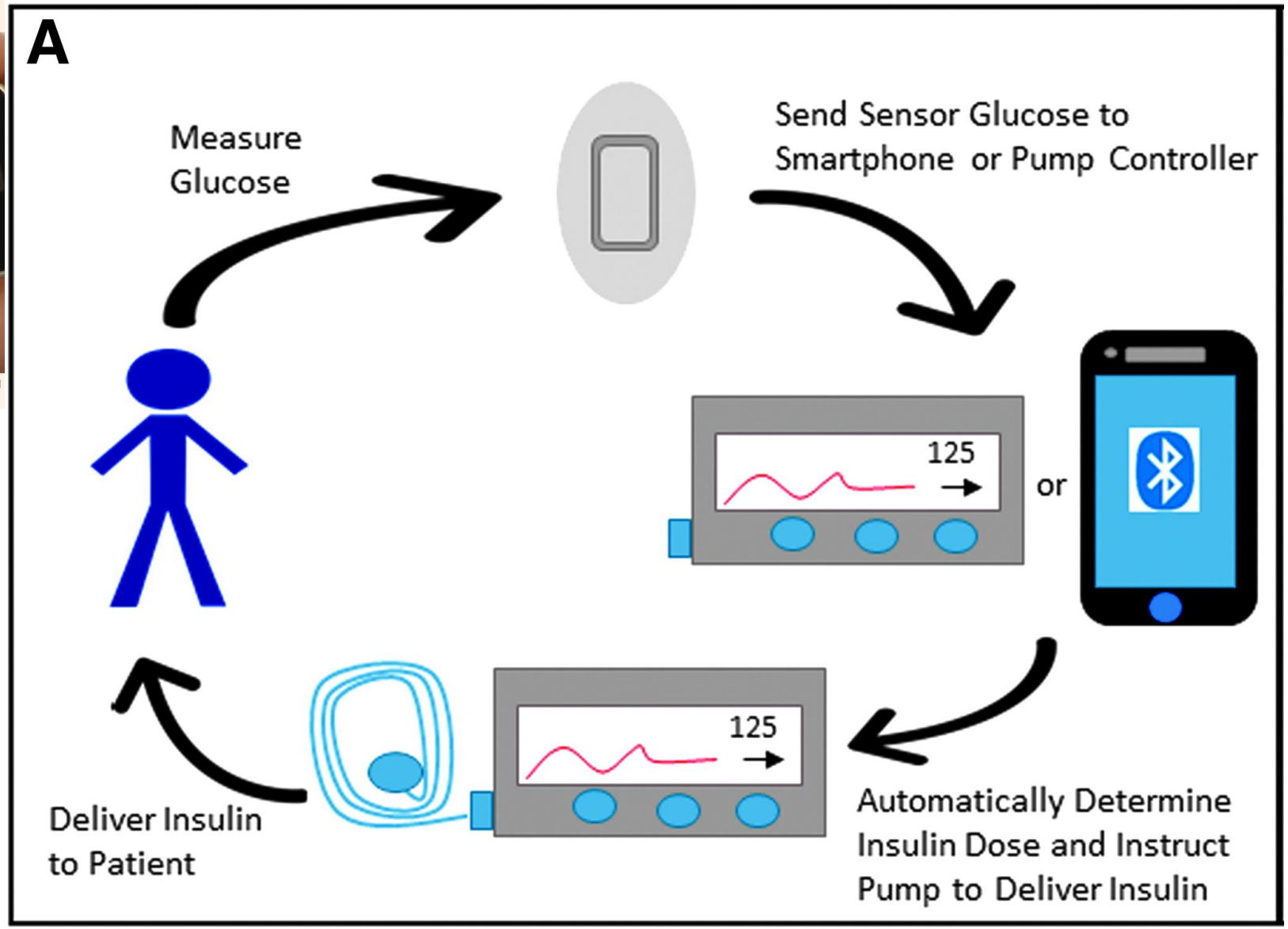


Foster et al Diab Technol. Ther. 2019

Artificial intelligence paves the way for fully automated diabetes kit

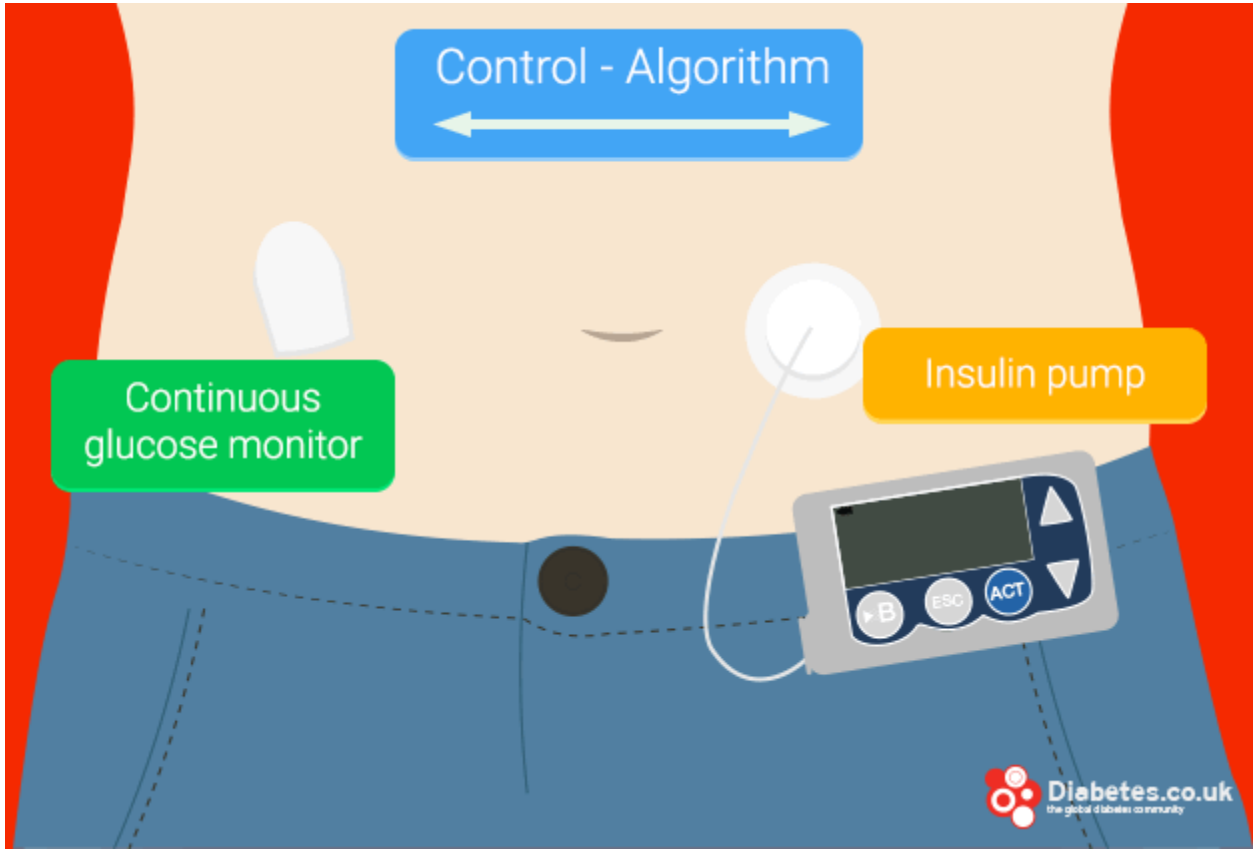
'DIY' monitoring systems are one answer to regulatory delays

Safe zone: programmable insulin pumps help keep blood sugar at the right level



Forlenza G 23 May 2019
https://doi.org/10.1089/dia.2019.0077

Automated insulin delivery systems

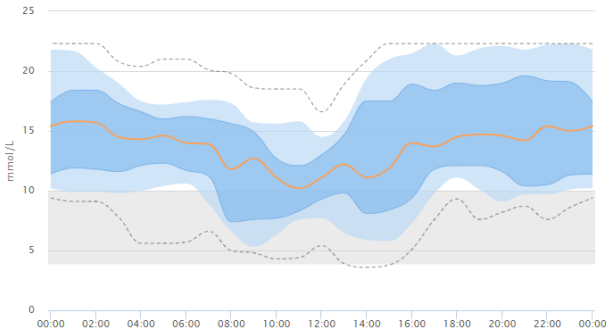


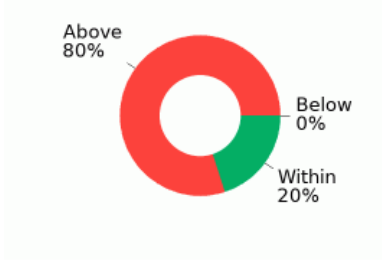
4 Commercial Systems in the UK

Hybrid closed loops
Or
“Artificial Pancreas systems”

Artificial pancreas systems in T2DM on HD

MDI and CGM



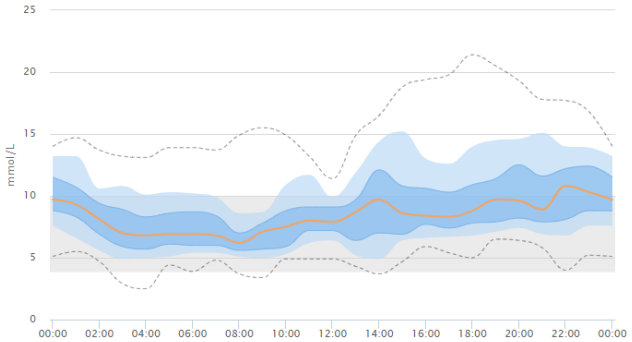


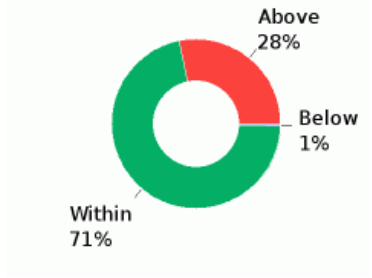
TDD 88 units of insulin

Insulatard 32 units AM 22 units PM

Novorapid 10/10/12 units

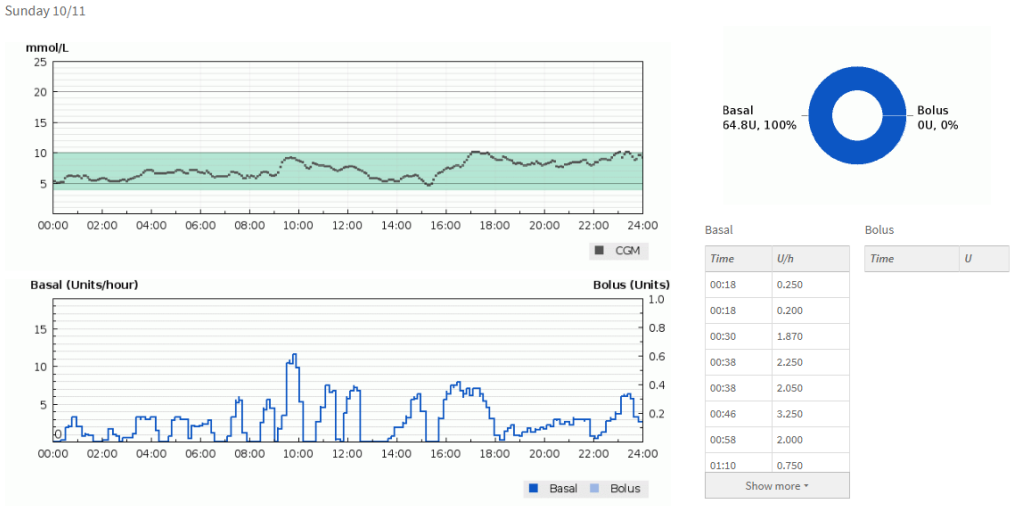
CAM APS HX system



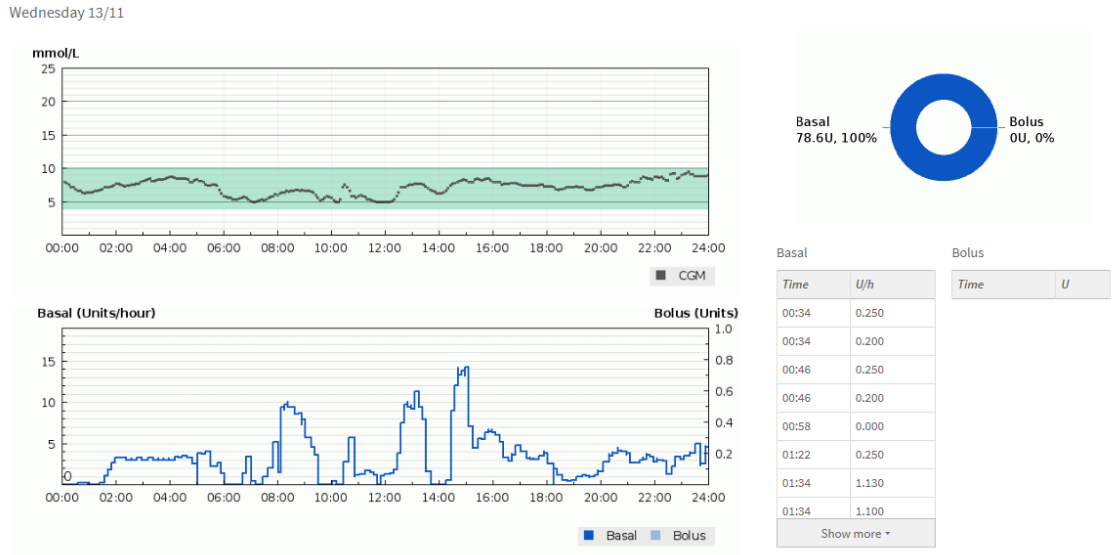


TDD 79 units of insulin

Non-dialysis day



Dialysis day

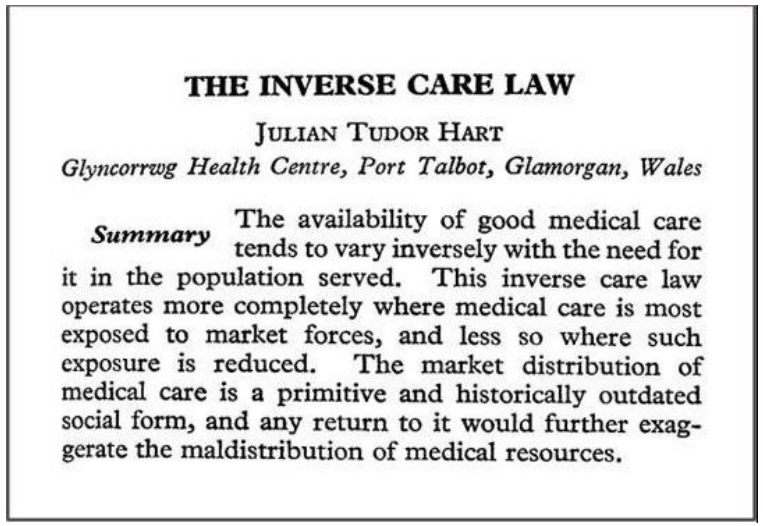


Acknowledgements: Charlotte Boughton, Sara Hartnell, Roman Horvorka

Boughton, CK et al. Nat Med; 4 Aug 2021; DOI: 10.1038/s41591-021-01453-z

Inverse care low and inequality gaps in technology access

Devices – expense, require digital & health literacy

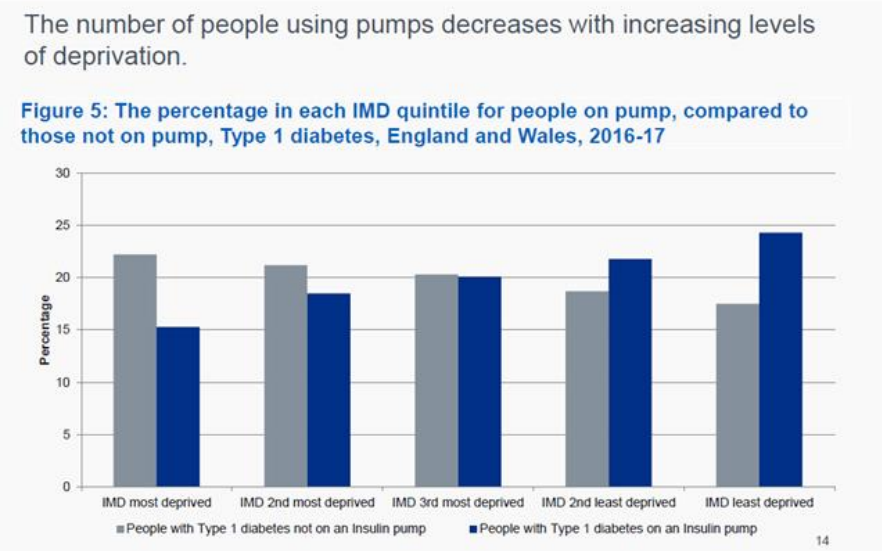


THE INVERSE CARE LAW

JULIAN TUDOR HART
Glyncorrwg Health Centre, Port Talbot, Glamorgan, Wales

Summary The availability of good medical care tends to vary inversely with the need for it in the population served. This inverse care law operates more completely where medical care is most exposed to market forces, and less so where such exposure is reduced. The market distribution of medical care is a primitive and historically outdated social form, and any return to it would further exaggerate the maldistribution of medical resources.

Deprivation and access to CSII (insulin pumps)



National Diabetes Insulin Pump Audit Report, 2016-17

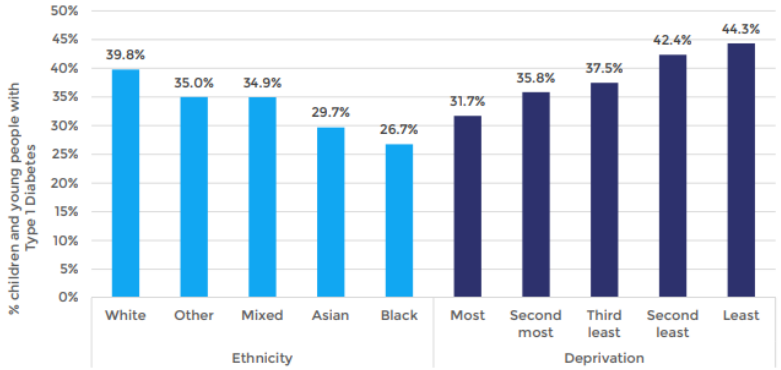


Figure 68: Percentage of children and young people with Type 1 Diabetes using Insulin Pump Therapy by ethnic group and deprivation, 2019/20

National Paediatric Diabetes Audit report, 2019-2020

Tackling access & digital literacy

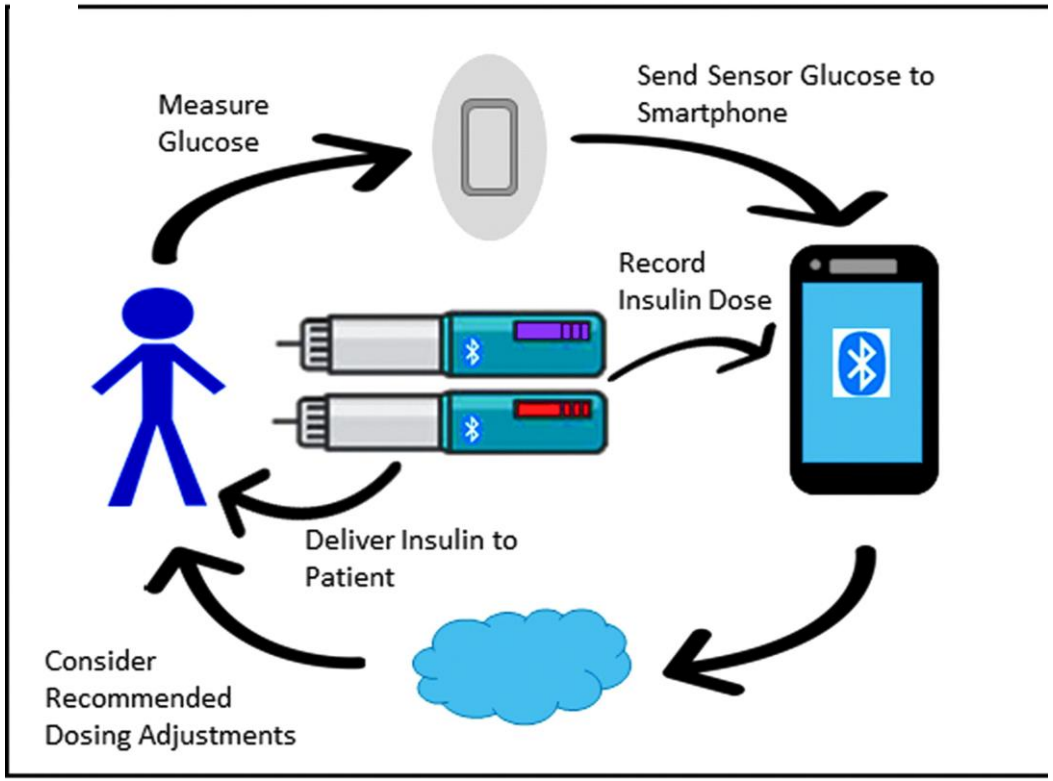
KEY PRIORITY

STRONG IMPLICATIONS FOR TYPE 2 DIABETES

Non-invasive glucose monitoring

Lower cost sensors

Lower cost pumps



Forlenza G 23 May 2019
https://doi.org/10.1089/dia.2019.0077

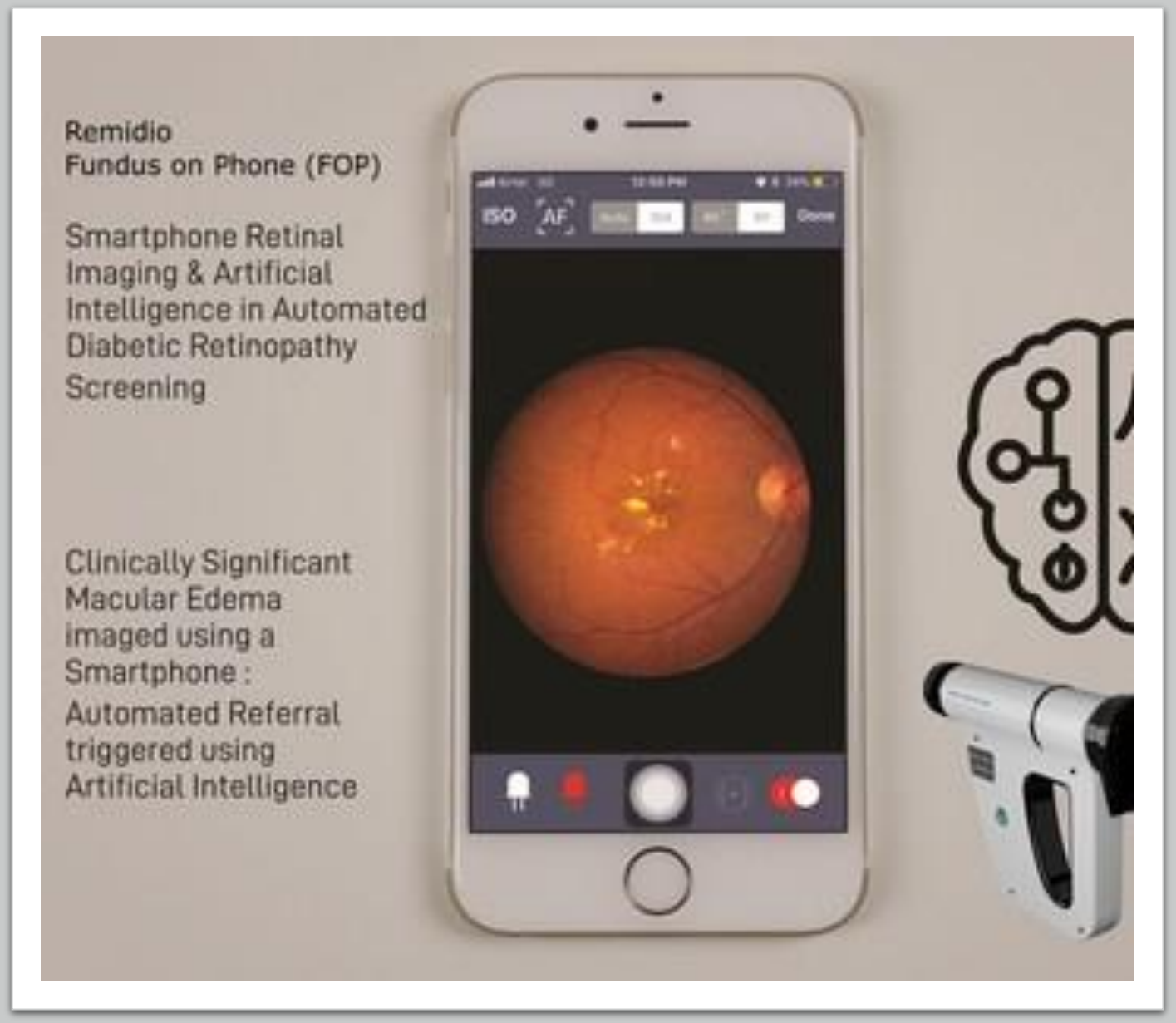
The future?

Combining personal digital technologies with AI

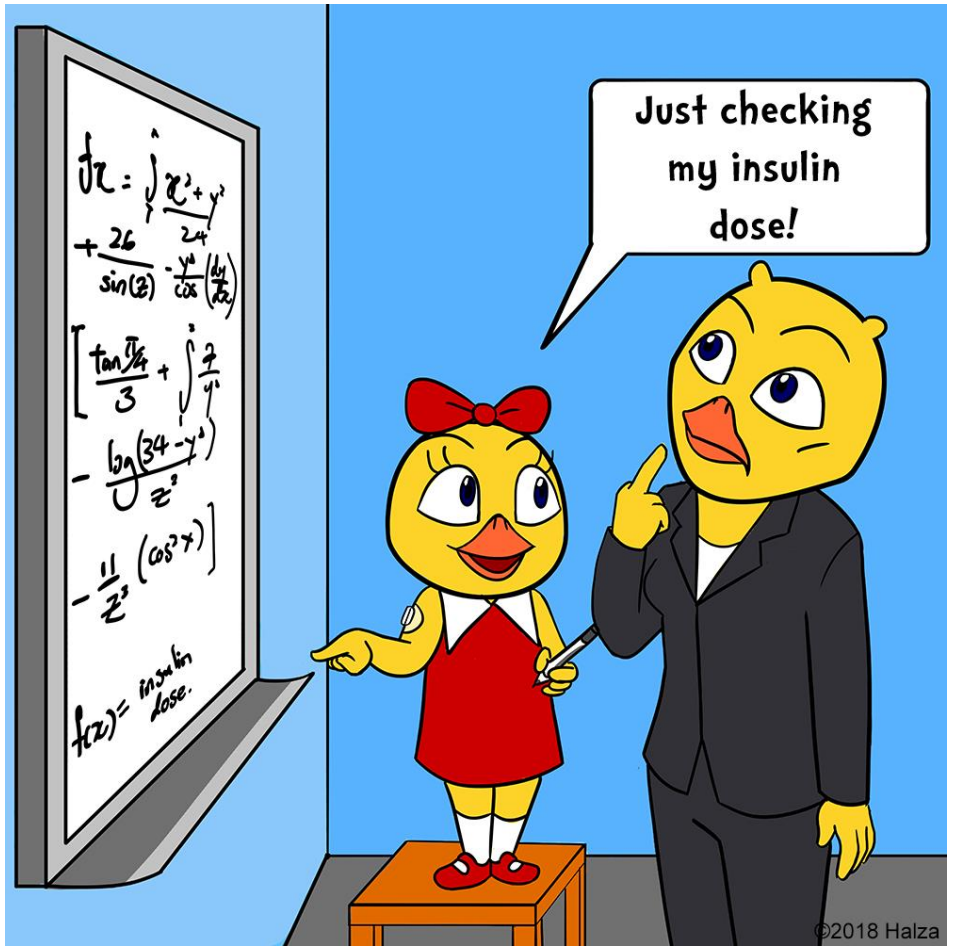
- Detection of derangements in glucose and adverse glycaemic events
- Insulin bolus calculation and advisory
- Retinal screening

Working with care systems

- Prediction and clinical decision making



Thank you!



Courtesy of Dr Rayhan Lal

NHS
Guy's and St Thomas'
NHS Foundation Trust

KING'S College LONDON

KING'S HEALTH PARTNERS

DTN UK
collaborate · evolve · support