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Developing an Agent Based Model (ABM) of Initiating Insulin Therapy in Poorly Controlled Type 2 Diabetes

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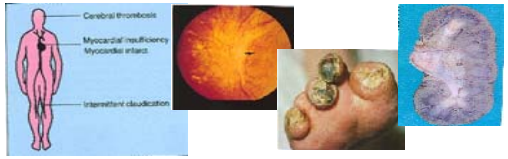
1. Complications of poorly controlled type 2 Diabetes Mellitus



2. Does good control of blood glucose in type 2 diabetes matter ?

UKPDS study shows a good control of blood glucose led to 25% overall reduction in microvascular disease end points , 33% reduction in albuminuria and 30% reduction in need for laser treatment for retinopathy [1]

Target goals of risk factors for diabetic patients

Parameter	Ideal	Reasonable but not ideal
HbA_{1c}	< 7%	< 8,5%

Standards from American Diabetes Association (2003)
* In women > 1.3 mmol/L

3. What do current data suggest ?

A major cause of poor glucose control in patients with type 2 diabetes who are followed in primary care clinics is the failure to initiate insulin early in the course of management either due to clinical inertia or competing interests with diabetes care during the consultation [2]

Among patients with poor glucose control, initiation of insulin has been associated with a significant increase in adequate glucose control. Even so, few patients with poorly controlled glucose are started on insulin therapy.

4. About the study –what it is and rationale

A quantitative and qualitative **pilot study** to model the dynamics of the **longitudinal care** of patients with **type 2 diabetes and to develop dynamic models of clinical inertia.**

In order to expand our understanding of why a decision to start insulin is often delayed for months, if not year beyond when it is indicated

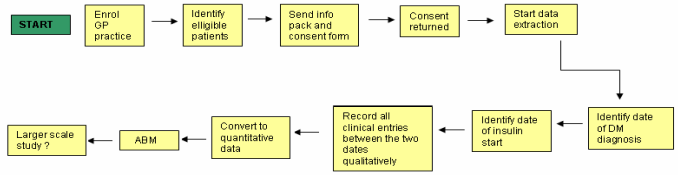
knowledge is needed of the 'anatomy' of all clinic encounters leading up to initiation of insulin in order to observe common patterns in visits that result in clinical inertia before insulin is started.

5. Where is the study being carried out and who is eligible ?

Study is being carried out in 4 GP surgeries in the UK with the aim of enrolling 40 patients.

Eligibility criteria: Type 2 diabetes mellitus patients, started on insulin therapy in the past 5 years who are able to give informed consent for participation in the study.

6. Process flowchart



7. Example of qualitative data extracted

diagnosed with type 2 DM

started on insulin

Visit number	Month	Hba1c (%)	fasting glucose (mmol/l)	blood glucose tested by doctor since last visit	patient self testing BM worse, same or better	was medication intensified by doctor ?	was self care discussed with patient ?	Competing interests with diabetes care (i.e: other illness discussed)
1	March	15.6	19.5	Yes	Worse	No	Yes	No
2				No	Same	No	Yes	No
3				No	Same	Yes	Yes	No
4				No	Same	No	Yes	No
5				No	Worse	No	Yes	Yes
6				No	Same	Yes	Yes	Yes
7				No	Same	Yes	No	Yes
8				No	Worse	Yes	Yes	Yes
9				No	Worse	No	No	Yes
10				No	Same	No	No	Yes
11			11.2	Yes	Same	No	Yes	No
12	Sept	9.5		Yes	Worse	Yes	Yes	No

8. How will the data extracted be used ?

The key to developing an ABM is to observe and record identifiable patterns in clinical inertia that one could then use to develop a set of simple rules.

These rules will then be applied to different patient-physician dyads and run in a dynamic model over a series of patient physician encounters to see if the pattern of clinical inertia observed in the real world is faithfully reproduced in our ABM.

References:1 **Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). UK Prospective Diabetes Study (UKPDS) Group. Lancet,1998 Sep 12;352(9131):837-53** 2 Michael L. Parchman et al , **Competing Demands or Clinical Inertia: The Case of Elevated Glycosylated Hemoglobin** Ann Fam Med 2007; 5: 196-201