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Session 14
Bridging the gap between health care research & policy: Integrated care

Talk 4: 14.15 – 14:30 PM, April 2018
Chair: Ulrich Wagner

Point-of-care testing of HbA1c in diabetes care in general practice and the effect on outpatient and inpatient diabetes related hospital care:

Evidence from a natural experiment in general practice in Denmark

(work in progress – do not refer to or cite without the permission of the autors)

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SDU

1. Introduction - setting and background:

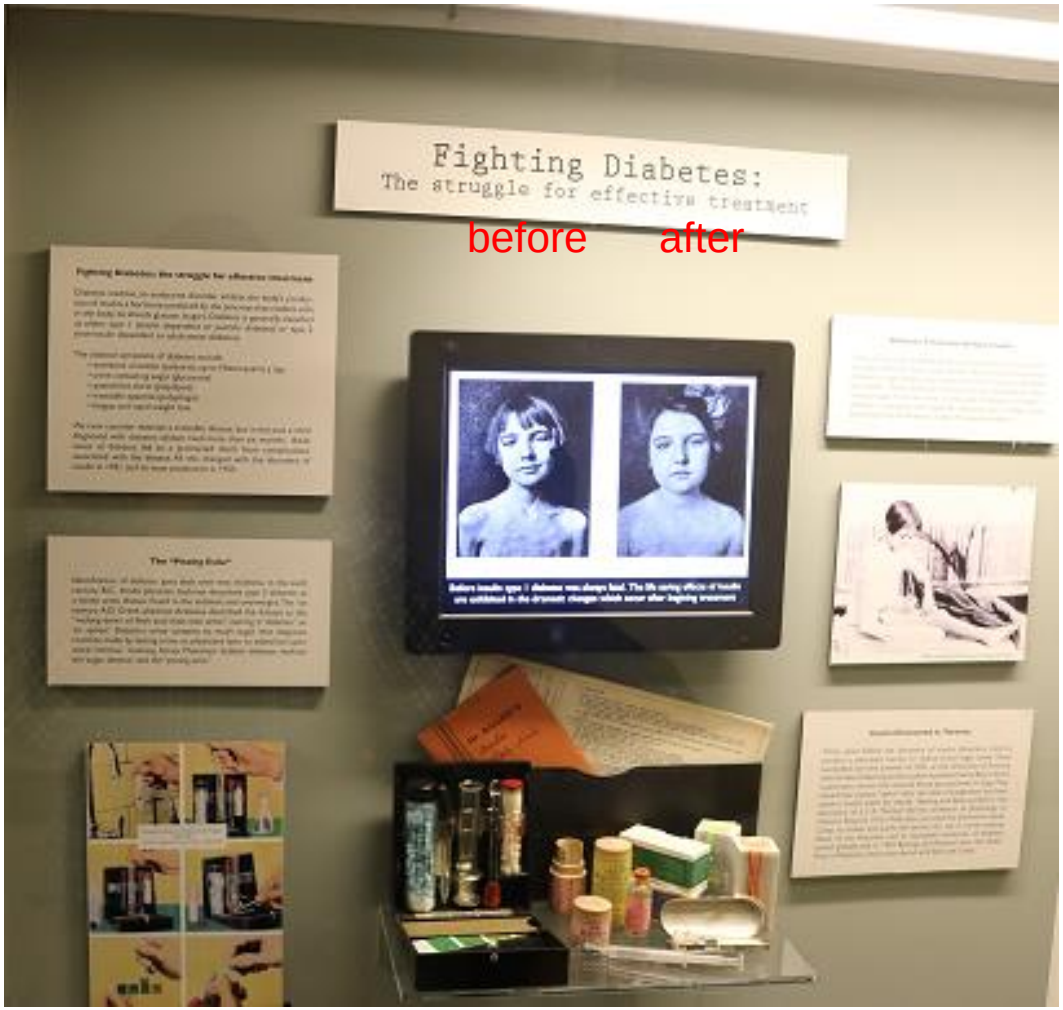
Fighting Diabetes : The struggle for effective treatment (historical perspective)

There is no cure for diabetes.

in the past a child diagnosed with diabetes seldom lived more than six months.

Adult onset of diabetes led to death from complications associated with the disease.

All this **changed with the discovery of insulin in 1921**, and its mass production in 1923.



Source: Dittrick Museum of Medical history, Cleveland, Ohio
Case Western Reserve University.

1. Introduction - setting and background:

HbA1c: a measure of average **blood sugar the past 3 months** used to control diabetes

Today, management of type 2 diabetes e.g., includes **monitoring of HbA1c 2-4 times per year - usually - in general practice.**.

Point-of-care testing (POCT) of HbA1c in general practice means instant test results and more coherent counselling which **may** lead to **improved diabetes control, better patients outcomes, enhanced clinical efficiency (e.g., fewer GP visit), reduce outpatient hospital activity and hospitalizations and related costs**.

1. Introduction - setting and background:

Previous research:

International Journal of *Environmental Research and Public Health*

MDPI

Article

Variation in Point-of-Care Testing of HbA1c in Diabetes Care in General Practice

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1. Introduction - setting and background:

Previous research:

Aim: To use patient data to characterize patients with diabetes who have received POCT of HbA1c and analyze **the variation in the use of POCT** of HbA1c among patients with diabetes in Danish general practice.

Method: Cross sectional analysis 2011, Multilevel logistic regression

Results: There were variation in use of POCT across clinics and patients. Male gender, age differences (older age), short education and other ethnicity means *lower odds* for POCT.

High patient cost for drugs and/or morbidity in terms of the Charlson Comorbidity index mean *lower odds* for POCT.

High patient cost in general practice and other parts of primary care imply *higher odds* for POCT.

Conclusion: The study demonstrated variation in use of POCT which can be explained by patient characteristics such as demographic, socioeconomic and casemix markers. Further studies: Impact on health care outcomes?

1. Introduction - setting and background:

In 2008, Danish regulators created a national fee framework for the reimbursement of POCT of HbA1c in general practice. This incentive represents a **natural experiment** where one of the five Danish regions implemented the fee (allowed the GPs to use the fee).

We exploit this experiment and assess whether the introduction of POCT of HbA1c in general practice has **decreased hospital outpatient visits and hospital admissions.**

Purpose:

The purpose is to assess whether the introduction of POCT of HbA1c among T2 diabetes patients in general practice has led to better outcomes (an effect) in terms of reduced outpatient ambulatory hospital care and fewer hospitalizations.

Hypothesis: There is an effect on outcomes (less outpatient hospital care and fewer hospitalizations).

2. Context: diabetes management and a natural experiment

GPs are contracting with regions and are remunerated via capitation + FFS

The **majority** of Danish **T2 diabetes patients** are diagnosed and **treated in general practice**. But some patients are also so-called shared care patients between general practice and hospitals.

Comorbidities (eyes, kidney, food wounds) or elements of multi-morbidity are **addressed** through **outpatient ambulatory or inpatient hospital care.**

Four alternative ways of testing HbA1c (management in general practice):
a) Standard laboratory testing (blood test forwarded to hospital laboratories)
b) Special walk-in labs in the Capital Region (blood test)
c) **Point-of-care-testing (POCT) of HbA1c**
d) Elsewhere(hospital sector)

3. Design and methods:

The POCT fee is used as a proxy for POCT of HbA1c among diabetes patients in the Capital Region.

Only a part of the GPs in the Capital Region have decided to apply this incentive.

We use the described natural experiment in primary care clinics in the Capital region of Denmark.

Partial implementation allows us to use **a difference-in-difference model framework.**

Treatment definition: The clinic used the fee **more than 5 times** in all year during 2009-2012 (definition A). **Control definition**: GPs who did not use POCT.

Advantage: treatment and control are exposed to the same ”competing” explanation for change in outcomes.

Disadvantage: there is a **risk of selection bias** if certain types of GPs choose to implement POCT.

3. Design and methods: DID potential outcome framework

Challenge for identification and estimation strategy:

Non-random use of POCT(voluntary) among GPs may lead to potential selection bias.

Applied metods/solution (O´Neil et al. 2016):
We apply a DID panel data framework. This means **the potential outcome framework**, where there are i = 1,…, n clinics, and a number of time periods, where t= 2006;…,T_0 = 2008 are pre-treatment and T_0 + 1=2009,…., T=2012 are post treatment.

Three alternative set of hospital services (outcomes):

1) Average **rate** of diabetes patients receiving **outpatient care** (ambulatory)
2) Average **rate** of diabetes patient with **inpatient diabetes conditions**
3) Average rate of diabetes patients with **inpatient diabetes ACSC conditions**

3. Design and methods: Estimation

We used the commonly used **to-way fixed effect regression** to estimate the average treatment effect (ATT) (O´Neill et al., 2016):

$$y_{it} = \delta D_i I_t + \beta x_{it} + \theta_t + GP_i + \mu_{it} \qquad (1)$$

Where in (1):

y_{it} represents outcomes measures of hospital activity for clinic i in year t

D_i is a dummy indicating whether a $clinic_i$ belongs to the treatment group

x_{it} represents a set of observed time varying clinic characteristics (such as list size, number of diabetes patients and number of consultations in GP clinics)

I_t is an indicator variabel, which turns on after the introduction of POCT

θ_t represents common aggregate shocks in terms of time-varying fixed effect (intercept)

GP_i represents unobserved confounders and there effect are not assumed to vary over time.

δ The average treatment effect on the treated across the post-treatment periods (2009-12)

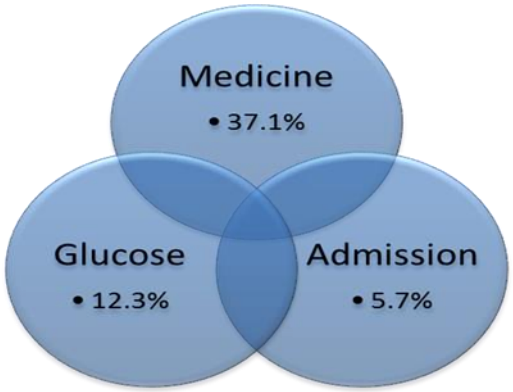
μ_{it} represents the random residual.

4. Data:

We use a **panel data set covering the years 2006-2012** for a cohort of T2 diabetes patients from the Capital Region of Denmark.

The cohort of diabetes patients were defined by an algorithm based on the Danish Drug Register, the **Danish Health Service Register** and the National Patient Register.

Patients were required to be above 18 years, alive in 2013 and comply with at least one out of three criteria regarding prescription, blood sugar test and ICD10 codes in a given year:



The cohort is identified prior to the analysis period. This allows us to understand and explore the difference in the control and treatment group before and after the intervention without the pre-period outcome being influenced by accession and attrition.

5. Sensitivity analysis & robustness

The **robustness** of results are tested in **three ways**:

a) An alternative treatment variable – share of diab patients receiving POCT
A continous variable measuring the proportion of patients per clinic who received POCT (definition B). Allows us to include the intensity of use and inclusion of more clinics (no treshold > 5 yearly).

b) Including – lacked implementation: An alternative treatment definition that include clinics that used POCT in all subsequent years after their introduction in year K rather than only 2009 (65) + (63+46+57= 231

c) Flexible intro approach in the form om event history analysis

$$y_{it} = \alpha + \sum_{k=k_{min}}^{-2} \beta_k^{Before} D_i \mathbf{1}[t - T_i = k] + \sum_{k=0}^{k_{max}} \beta_k^{After} D_i \mathbf{1}[t - T_i = k] + \gamma x_{it} + \theta_t + GP_i + \mu_{it}$$

First part: visualize **the effect in year k before** (Parallel trends assumption)
Second part : visualise **the effect in year K after** (K=0 intro year, K=-1 the year before).

6. Results: Difference-in-difference analysis

Unpublished results and conclusions have been removed from this presentation

Thank you for your attention!

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