The Danish national type 2 diabetes cohort – the DD2 study

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Editorial

Type 2 diabetes is a pandemic and an enormous public health problem. This supplemental issue of Clinical Epidemiology describes the rationale, design, and implementation of the establishment of a large cohort of all Danes with type 2 diabetes (the DD2 study) and of a biobank to bridge the scientific disciplines of epidemiology, clinical medicine, genetics, epigenetics, and pharmacology. This will most likely result in great benefits for the application of evidence-based medicine to the care of, and improved outcomes for, Danish type 2 diabetes patients.

This real-life clinical scientific investment will be an international resource for diabetes research for many years to come. Type 2 diabetes is a rapidly growing disease affecting around 205 million people worldwide and, in a “worst case scenario”, 439 million will be diagnosed with type 2 diabetes by the year 2025. The disease is associated with a two-fold increased mortality rate compared with the general population, due to complications such as myocardial infarction, stroke, gangrene in the lower extremities, end-stage renal failure, and blindness. The excess global mortality in 2000 attributable to diabetes overall, most of which was attributable to type 2 diabetes, was 2.9 million deaths. These complications are very troublesome for the individual diabetic patient and major public health problem.

Therefore, cost-effective national organization and intervention are strongly needed, both in order to prevent the disease, but also in an attempt to improve treatment of the metabolic abnormalities behind the disease with the aim of preventing the devastating complications.

Recent clinical trials2,3 have emphasized the importance of early intensive treatment of type 2 diabetes patients in order to prevent complications and improve quality of life. Therefore, evidence for new national guidelines for treatment and organisation for newly diagnosed type 2 diabetes patients is needed. In this case – if the guidelines are effective – the prognosis of newly diagnosed patients may be expected to improve significantly.

The overall aim of the DD2 study is to near-normalize metabolic control in newly diagnosed type 2 diabetes patients in order to prevent diabetic complications and improve quality of life. The DD2 study thus has two specific aims:
1. To investigate whether or not it is possible through treatment guidelines and structured organization to near-normalize the risk profile and to avoid/reduce diabetic complications by continuous monitoring through Danish health registries, thereby...
obtaining knowledge about predictors for the long-term outcome and thus objectives for new interventions.

2. To establish a biobank of DNA and plasma, urine, and tissue samples for individual characterization of type 2 diabetes patients that will improve the prognosis and build a platform for individualized treatment.

In Denmark the outcome of treatment and clinical course can be followed through comprehensive health registries with complete follow-up. Therefore the DD2 study will be able to evaluate treatment and intervene if the current treatment fails. Based on the data obtained, outcome will be evaluated prospectively, independently of the specific phenotypes and genotypes, and will thus be unbiased.

The identification of new genes and pathways involved in type 2 diabetes predisposition and increased risk of diabetic complications offers opportunities for developing novel therapeutic and preventative approaches. Furthermore, the identification of additional genetic variants – both protective and risk variants – may render it possible to use patterns of predisposition to tailor individual management of these conditions.

Denmark holds an internationally leading position within many aspects of clinical care and diabetes research, but such Danish research has been carried out in many institutions focusing on different aspects such as physiology, clinical medicine, health services research, biotechnology, clinical epidemiology, and biostatistics.

The pandemic of type 2 diabetes is showing no signs of abatement and therefore progress is urgently needed to slow progression and reduce the consequences. The establishment of a large cohort of all Danes with type 2 diabetes and of a biobank to bridge all scientific disciplines will be an important international resource for diabetes research for many years.

**Disclosure**

The authors report no conflicts of interest in this work.

**Acknowledgement**

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**References**

**Supplementary data**

**DD2 organization**

**Members of the executive committee**

- Professor Henning Beck-Nielsen, DMSc, Odense University Hospital
- Professor Jørgen Rungby, DMSc, Aarhus University
- Professor Henrik Toft Sørensen, DMSc, Aarhus University Hospital
- Professor Jens Sandahl Christiansen, DMSc, FRCPI, Aarhus University Hospital
- Professor Allan Vaag, DMSc, Copenhagen University
- General practitioner Søren Friborg, Odense University Hospital

**Members of the board**

- Professor Henning Beck-Nielsen, DMSc, Odense University Hospital, Denmark (Chairman)
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- Professor Jens Sandahl Christiansen, DMSc, FRCPI, Aarhus University Hospital, Denmark
- Professor Allan Vaag, DMSc, Copenhagen University, Denmark
- Professor Bente Klarlund Pedersen, DMSc, Copenhagen University, Denmark
- Professor Oluf Borbye Pedersen, DMSc, Hagedorn Research Institute, Gentofte, Denmark
- Head of research, knowledge and courses Malene Bagger, MSc, PhD, The Danish Diabetes Association
- Professor Ulf Smith, DMSc, Sahlgrenska University Hospital, Sweden, President EASD
- Professor Philip Home, MA, PhD, DMSc, FRCP, Newcastle University, England
- Professor Leif Groop, MD, PhD, Lund University, Sweden
- Professor John Nolan, FRCP, FRCP(Ed), CEO of Steno Diabetes Center, Gentofte, Denmark
- Staff specialist Ole Andersen, DMSc, the Danish National Board of Health, Copenhagen, Denmark (observer)
- Chief consultant Hanne Agerbak, the Danish Ministry of Health, Copenhagen, Denmark (observer)
- Consultant Maj-Britt Laursen, Danish Regions, Copenhagen, Denmark (observer)
- General practitioner Thomas Drivsholm, DMSc, PhD, The research unit for general practice, Copenhagen, Denmark
- General practice coordinator Søren Friborg, MD, Odense University Hospital, Denmark
- Chief medical officer Anders Dejgaard, MD, DMSc, Novo Nordisk A/S, Denmark

**Project management**

- Project leader Jens Steen Nielsen, MSc, PhD, Odense University Hospital, Denmark
- Communications consultant and coordinator Jane Jærndal, Odense University Hospital, Denmark
- General practice coordinator Søren Friborg, MD, Odense University Hospital, Denmark
### Table S1 Hospitals participating in DD2 (June 2012)

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<th>Hospital</th>
<th>Department</th>
<th>Responsible consultant</th>
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### Table S2 Departments/outpatient clinics that have consented to participate in DD2, but have not yet referred any patients

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