Type 2 diabetes in migrants: register-based analyses

PhD dissertation

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Preface

Motivation

During my work as a junior doctor in a general practice in Gellerup, a deprived suburb of Aarhus with a large migrant population, I was immediately struck by the high frequency of type 2 diabetes (T2D) and other chronic diseases among day-to-day consultations. I would quickly learn that T2D held more surprises for me than just a high prevalence, and after just a few weeks it seemed that much of what I had learned about the disease in medical school and studied in clinical guidelines did not apply in my new setting. Patients were not only more prevalent, they were also much younger, and hemoglobin-A1c (HbA1c) levels rarely came close to guideline targets despite our best efforts to intensify treatment. Sadly, these experiences would repeat themselves in my subsequent work with migrants as a general practitioner (GP) in health clinics of the Danish Red Cross at asylum residence centers and pre-removal detention centers.

As I reviewed the literature, I understood why medical school and guidelines had failed to prepare me for the challenges I faced as a clinician with T2D in migrants: the existing literature was inadequate. While increased prevalence of T2D appeared well-established, and migrants with T2D were also ascribed a higher mortality than their native counterparts, this provided little guidance for my day-to-day work. Contrarily, there was hardly any evidence on disparities in the time between diagnosis and death - the time when care from the GP is needed the most. So I was left to wonder what might cause this discordance between what I knew about T2D from books and guidelines, and what I encountered in migrants in the clinic.
Are migrants with T2D more prone to under-treatment, and in which areas of care?
Are some migrant groups more prone to under-treatment than others?
Are their needs for T2D care simply greater?
Knowledge on these clinical questions would enable GPs and healthcare planners to address disparities and improve care in migrants by prioritizing and focusing care accordingly. Migrants are currently a younger demographic than the rest of the population, but as time causes the migrant demographic to age, it is likely that migrants will constitute an increasing proportion of the T2D population in the coming years. Therefore, I was excited to explore these urgent clinical questions as a researcher, hoping I could provide

answers to myself and fellow GPs that could lead to better care - and, ultimately, better health - in a vulnerable and challenging group of patients.

During my time as a PhD student, I quickly encountered the first of many challenges on the way to studying migrants with T2D in the Danish registers: there was no validated definition of T2D, nor a common consensus among researchers. This led to the PhD project expanding its scope to develop and validate a tool to define T2D in the Danish registers, which allowed me to answer my research questions based on robust findings. This PhD project benefited greatly from open-source tools, and in the spirit of open science, the source code of the validated diabetes classifier was made available to other researchers in the *osdc* package for the *R* statistical programming language. As a final commitment to openness, this dissertation was made available to a global audience in website format at aastedet.github.io/dissertation/.

Outline of the dissertation

Chapter 1 introduces type 2 diabetes (T2D) and the special risk it poses to migrants. It then describes the context of T2D care in Denmark and summarizes clinical guideline recommendations and how they relate migrants with T2D. Finally, it introduces the reader to identification of diabetes patients in Danish healthcare registers.

Chapter 2 states the overall aims of this PhD project and each individual study.

Chapter 3 describes the setting, data sources, methods and study designs used in the studies of this PhD project.

Chapter 4 presents the main results of the studies.

Chapter 5 contains a discussion of the methods used and their potential impact on results.

Chapter 6 discusses the findings in light of the methods used.

Chapter 7 presents the main conclusions and their clinical implications.

Chapter 8 draws up future perspectives of the PhD study and research field.

Papers associated with the dissertation

Coming soon

Table of contents

Abbreviations

ACEI: Angiotensin-converting enzyme-inhibitors
ARB: Angiotensin receptor blockers
CVD: Cardiovascular disease
DKD: Diabetic kidney disease
GP: General practitioner
GDM: Gestational diabetes mellitus
GLD: Glucose-lowering drugs
HbA1c: Hemoglobin-A1c
LDL-C: low-density lipoprotein cholesterol
LLD: Lipid-lowering drugs
T1D: Type 1 diabetes mellitus
T2D: Type 2 diabetes mellitus
UACR: Urine albumin-to-creatinine ratio

1. Introduction

[This paragraph should introduce the overall context, and very briefly introduce the aims/niche of the project: Why did I do this?]

This chapter describes type 2 diabetes (T2D) and how migrants are at particular risk. It also describes the context of care in Denmark and summarizes clinical guideline recommendations and how they relate to the needs of migrants with T2D. Finally, it introduces the reader to identification of diabetes patients in Danish healthcare registers as a means to provide much-needed knowledge on potential disparities in T2D care between migrants and native Danes.

1.1. Migrants and type 2 diabetes

T2D constitutes the vast majority of all diabetes cases, and disproportionally affects the socially deprived demographics in societies across the globe[manglerref]. The prevalence of type 2 diabetes (T2D) today exceeds half a *billion* people globally and is on the rise due to several factors, including population aging, urbanization, adoption of energy-dense diets, and sedentary lifestyles. These transitions are occurring at a rapid pace in developing countries, where they affect the largest number of people[1]. Many developing countries have populations with a genetic predisposition to developing T2D, which exacerbates the impact of these transitions.

Migrants are particularly vulnerable to T2D, as they are positioned at the point of convergence of these exposures: genetic predisposition, rapid lifestyle transitions, and the disparate social impact of T2D. After being granted residence permit in Denmark and other developed nations, migrants are often housed in densely-populated urban areas and exposed to drastic lifestyle transitions. Migrants may also suffer from previous mental and physical trauma, which - in addition to cultural and language barriers - can limit their ability to gain higher-income employment and escape their disadvantageous socioeconomic position.

In Denmark and many other developed nations, healthcare systems are facing a challenge to sustain the expected high quality of care in an aging population with a growing burden of chronic diseases and comorbidities. Prioritization of limited resources is crucial to

ensure that those with the highest need for (and potential benefit from) healthcare receive adequate care. Migrant origin is a well-established risk factor of T2D, and migrants have a higher prevalence of T2D compared to native populations today[manglerref], but the increased risk of developing T2D is partially mitigated by their younger age. However, this only delays the impact of their increased T2D risk, and as these migrant populations age in the coming years, they will make up a growing proportion of T2D patients in the country. Therefore, understanding potential disparities in care and the specific healthcare needs of migrant populations with T2D can inform the prioritization of healthcare resources, ultimately ensuring that all individuals with T2D can continue to receive appropriate care.

Currently, there is a lack of evidence on T2D care in migrants, and research in this area faces several challenges that may explain the scarsity of evidence. Not only are migrants a minority, which limits the size of potential study populations, they are often a hard-to-reach group in studies that require patient engagement for inclusion, which exacerbates sample size problems and can induce selection bias in such study designs. Furthermore, migrants have historically been defined by their racial appearance and ethnic minorities categorized accordingly, particularly in Europe and the United States. While these categories allow researchers to identify racial minorities, they obscure the role of migrants in the modern era, and provide only indirect evidence on migrant minority groups[2].

1.2. Type 2 diabetes care

1.2.1. Complications and risk factors

1.2.1.1. Overall

Complications of diabetes are traditionally divided into macrovascular (e.g. *cardiovascular disease* (CVD)) and microvascular complications (e.g. kidney disease, retinopathy, neuropathy), all of which contribute to morbidity and mortality in T2D. Several lifestyle and physiological factors influence the risk of developing complications, and clinical care revolves around management of these. In addition to being key risk factors of complications, blood pressure and levels of *hemoglobin-A1C* (HbA1c) and *low-density lipoprotein cholesterol* (LDL-C) drive indications for treatment and clinical decision-making in T2D[manglerref].

1.2.1.2. In migrants

In European countries, HbA1c-levels are higher in migrants than in native populations[manglerref], but LDL-C levels have only been sparsely described. The evidence on complication risk is inconsistent, but indicates a higher risk compared to native populations, although risks differ between complication types, migrant groups and countries. Similarly, higher mortality among migrants with T2D has been reported in some studies *[refs]*, while other studies have found similar or lower risk [manglerrefs]

1.2.2. Pharmacological treatment

1.2.2.1. Overall

Due to their effects on HbA1c, LDL-C, and blood pressure, *glucose-lowering drugs* (GLD), *lipid-lowering drugs* (LLD), and antihypertensive drugs are critical parts of T2D care. In T2D patients with particularly high risk of complications, pharmacological treatment also includes *antiplatelet therapy* (APT), as the complication risk-lowering effect outweighs the risk of adverse events in these patients[3,4]. In addition to their effect on biomarker levels, certain drug types within the above classes of drugs have other positive effects. In particular, the GLD types *sodium glucose co-transporter type 2 inhibitors* (SGLT2i) and *glucagon-like peptide-1 receptor agonists* (GLP1RA) substantially reduce the risk of adverse cardiovascular and renal events beyond their effect on HbA1c. Similarly, the antihypertensive drugs types *angiotensin-converting enzyme-inhibitors* (ACEI) and *angiotensin receptor blockers* (ARB) reduce the risk and improve the prognosis of *diabetic kidney disease* (DKD) beyond their effect on blood pressure. [manglerref]

Combination therapy - the use of multiple drug types with differing mechanisms of action - is a way to increase treatment intensity and achieve treatment goals with fewer side-effects. Combination therapy is particularly important in T2D, as GLD monotherapy fails to achieve target levels of HbA1c in many patients, even at maximal dosage. [manglerref]

1.2.2.2. In migrants

Evidence from several European countries shows that GLDs are prescribed earlier and/or to a larger proportion of migrants compared to native populations[manglerref]. However, disparities in the quality of the prescribed GLD treatment, such as the use of combination therapy or the types of GLD prescribed, has not been studied. Indirect evidence suggests that such disparities are likely, as non-white minorities in the UK were slower and less likely to intensify to combination therapy than white groups[manglerref9], and

migrants in Italy with T2D purchased fewer packages of non-insulin GLD per person-year than their native counterparts[manglerref10], and socioeconomic[manglerref21-25] and racial[manglerref22, 24, 27] disparities in prescribing of SGLT2i and GLP1RA have been reported in several countries.

In contrast, studies from European countries have reported lower rates of prescribing of LLD in migrants with T2D *[care_qual_migrants refs 40, 5, Eastwood]*. Treatment with LLD is not indicated in all patients with T2D, however, and only a few of these studies accounted for treatment indication.

Evidence on ACEI/ARB use and APT in migrants with T2D is very limited, but a study from Italy found lower odds of treatment in most migrant groups [42], indicating a potential for disparities in these areas of care.

1.2.3. Monitoring

1.2.3.1. Overall

In T2D, timely monitoring of risk factors and complications allows faster adjustment of treatment, and monitoring has previously been used as a process indicator of care quality, although the direct evidence on its influence on outcomes is sparse. *[see refs* [7-12, e.g. https://doi.org/10.1093/intqhc/mzl023, , evt. DVDD rapport]*

1.2.3.2. In migrants

The evidence on monitoring of T2D in migrants is inconsistent between countries and different aspects of monitoring. In Norway, migrants with T2D received similar or more monitoring than native Norwegians[manglerrefTran2010], while migrants with T2D in Italy received fewer referrals for consultations than native Italians[manglerrefMarchesini2014].

1.3. Clinical guidelines for type 2 diabetes care

In Denmark, T2D care is most often provided by *general practitioners* (GPs) and other actors in the primary care sector, although some patients are treated in the outpatient hospital setting. The Danish College of General Practitioners publishes national clinical guidelines for T2D in cooperation with the Danish Endocrine Society. The guidelines are continuously updated as new evidence emerges. In this PhD project, T2D care was studied in the time period covered by the 2012[5] and 2019[6] revisions (only minor changes

were made between the two revisions). These guidelines advise that monitoring intervals, biomarker goals and treatment intensity are adapted to fit the individual patient, but specify recommendations that may be used as indicators of care quality.

Danish guidelines provide virtually no specific recommendations on T2D care in migrants, and migrants are not addressed in the appendix on pharmacological treatment of special groups. Guideline recommendations relevant to this PhD study are described below.

1.3.1. Diagnosis

1.3.1.1. Overall

HbA1c values $\geq 48 mmol/mol$ are diagnostic of diabetes, but diagnosis must be confirmed with a repeated sample on a different day. Once diagnosed, patients with T2D should be considered permanently affected by the disease, and the associated risk factors for complications should be treated regardless of subsequent normalization of HbA1c.

1.3.1.2. In migrants

Migrant origin is mentioned as a risk factor of T2D, and guidelines recommend increased HbA1c screening in certain migrant groups.

1.3.2. Monitoring

1.3.2.1. Overall

The risk biomarkers HbA1c and LDL-C should be measured yearly, as well as urine albumin-to-creatinine ratio (UACR) to screen for DKD. Repeated samples of UACR $\geq 300 mg/g$ is considering diagnostic of diabetic kidney disease (DKD). Diabetic retinopathy should be screened by an ophthalmologist every second year and screening for diabetic foot disease by a podiatrist every year. At the initial diagnosis of T2D, a baseline-screening of all five types of monitoring is recommended.

1.3.2.2. In migrants

Guidelines provide no specific recommendations on monitoring in migrants.

1.3.3. Biomarker levels

1.3.3.1. Overall

For HbA1c, the goal should be the lowest possible level without hypoglycemia or inappropriate polypharmacy. Specific targets at $48 mmol/mol$, $53 mmol/mol$, $58 mmol/mol$, and $70 mmol/mol$ are provided depending on diabetes duration and severity, complications, age and comorbidities.

For LDL-C, the level should be as low as possible. A general target below $2.6 mmol/L$ is provided, while the target in patients with complications should be below $1.8 mmol/L$.

1.3.3.2. In migrants

Guidelines provide no specific recommendations on HbA1c or LDL-C targets in migrants.

1.3.4. Pharmacological treatment

1.3.4.1. Overall

1.3.4.2. Glucose-lowering drugs

Combination therapy: GLD therapy is recommended in patients with HbA1c 48 mmol/mol, and metformin is the recommended first-line treatment. There is no overall recommendation of second- or third-line drugs, although SGLT2i or GLP1RA should be considered in patients with CVD when metformin or other treatment is insufficient to reach the patient's HbA1c target (note that, although not in effect during the time period studied in this PhD project, the recommendations for SGLT2i and GLP1RA were expanded in the 2022 revision to include all T2D patients with CVD, multiple risk factors for CVD, or chronic kidney disease, irrespective of HbA1c level).

Individual drug types: Guidelines recommend factoring in all effects - positive and negative - as well as cost when choosing between individual drug types, and do not present a fixed hierarchy between GLD drug type. [*maybe summarise guideline considerations on second- and third-line drugs, similar to* https://vejledninger.dsam.dk/media/238.png]

1.3.4.3. Lipid-lowering drugs

Treatment with LLD is recommended to all individuals with prevalent CVD, diabetic nephropathy, or LDL-C above 2.5 mmol/L.

1.3.4.4. Antihypertensive drugs

In addition to treatment of hypertension, use of either ACEI or ARB is recommended in individuals with prevalent CVD, microalbuminuria, or diabetic kidney disease.

1.3.4.5. Antiplatelet therapy

APT is recommended in individuals with prevalent CVD, diabetic kidney disease or very high risk of CVD due to other risk factors (this recommendation was expanded in the 2022 revision to also include individuals with kidney failure and concurrent microalbuminuria).

1.3.4.6. In migrants

Guidelines provide no specific recommendations on any aspect of pharmacological treatment in migrants.

1.4. Identification of type 2 diabetes cases in healthcare registers

1.4.1. Benefits

Healthcare registers provide a powerful data source for population-wide studies without the need to engage the patient for inclusion. The ability to include all individuals in the population makes them particularly suited for studies of migrants with T2D, where sample size is a limiting factor and other data sources may be vulnerable to selection bias in these groups.

1.4.2. Challenges

General-purpose registers and other administrative databases often provide the basis of diabetes epidemiology, but rarely contain validated diabetes-specific data. If the diabetes-specific data is not accurate, bias may be induced into studies. Thus, it is important to have an accurate tool to identify individuals with diabetes in the registers, as findings may differ with various diabetes definitions. Considerable efforts have been made towards establishing such a tool for diabetes research in several countries, including Denmark.

Internationally, some algorithms classifying T1D and T2D have been validated in cohorts of individuals with diabetes, but none have been validated in a general population. In a general population, classification algorithms (classifiers) must not only discern type 1 diabetes (T1D) from T2D, but also identify diabetes while accounting for events that might lead to inclusion of non-cases, such as use of GLD in the treatment of other conditions. Currently, no type-specific diabetes classifier has been validated in a general population, which leaves register-based studies in this area vulnerable to biases.

1.4.3. Register-based diabetes classifiers

In Denmark, the first resource readily available to researchers to identify diabetes cases using register data was the National Diabetes Register, established in 2006. The National Diabetes Register was discontinued in 2012, and a later validation study questioned its validity and called for future registers to adopt inclusion based on elevated HbA1c levels.

Currently, the Register of Selected Chronic Diseases (RSCD) is the only publicly available resource to identify diabetes cases in Danish register data (by application to the Danish Health Data Authority), but it has not been publicly validated nor is the source code behind the algorithm publicly available. Notably, the algorithm lacks inclusion based on elevated HbA1c levels.

1.5. Introduction at a glance

T2D is a disease that carries serious risks, but several treatment options are available to control the risk factors in T2D and reduce the risk of complications and death. In an aging population, the burden of T2D on healthcare services is rising, and resources must be prioritized to those with higher needs to ensure adequate care.

Migrants are particularly vulnerable to T2D, having an increased prevalence of the disease compared to native Danes. Despite having higher HbA1c levels than their native counterparts, evidence on complication risk and mortality in migrants is inconsistent, but some evidence suggests a higher risk. Evidence on disparities in care that may contribute excess risk in migrants with T2D is limited, and research in this area faces several challenges that may explain this, such as limited sample sizes and migrants being hard-to-reach for intervention and survey studies. Register-based studies are well-suited to handle these limitations, but currently there is no validated method to identify T2D cases in a general population, which leaves register-based studies in this area vulnerable to biases.

In Denmark, guidelines are available to direct clinicians and patients towards the best possible outcomes while prioritizing resources. Despite the special challenges facing migrants, current guidelines do not contain specific recommendations for T2D care in migrants, perhaps due to the limited evidence on specific areas of T2D care where disparities between migrant groups and native Danes may be present.

2. Aims

2.1. Overall aims

The overall aim of this PhD dissertation is to provide robust knowledge on specific areas of T2D care where disparities between migrant groups and native Danes may be present.

2.2. Specific aims

I. Develop a register-based classification of type 1 and type 2 diabetes and make it available to other researchers.

II. Validate register-based diabetes classifiers available to researchers in Denmark.

III. Assess prevalence of T2D in migrant minorities of Denmark, and explore disparities between migrant groups and native Danes in indicators of guideline-recommendations on monitoring, biomarker control, and pharmacological treatment.

IV. Evaluate disparities in the quality of glucose-lowering pharmacological treatment between migrants and native Danes in terms of combination therapy and drug types.

3. Material and methods

3.1. Setting

3.1.1. The Danish healthcare system

Describe the danish public healthcare system: sectors, actors, reimbursement and patient-incurred costs.

3.1.2. Migrants in Denmark

Describe overall proportion of migrants and migration patterns/groups/causes: Summarise https://www.dst.dk/da/Statistik/nyheder-analyser-publ/bagtal/2022/2022-08-18-fakta-om-indvandrere

3.2. Data sources

Describe the overall CPR number system and acquisition and how it related to civil registration, healthcare contacts and prescription drug use, and how it allows linkage of the data sources.

3.2.1. The Danish Civil Registration System

CRS ref

3.2.2. The Danish National Patient Register

NPR ref Validation refs e.g. for CVD goes in discussion chapter 5.

3.2.3. The Danish National Health Service Register

NHSR ref

3.2.4. The Danish National Prescription Registry

NPrR ref

3.2.5. The Danish Register of Laboratory Results for Research

RLRR ref? RLRR covers all of Denmark…

3.2.6. The Clinical Laboratory Information System of Central Denmark Region

At the time of data acquisition, RLRR did not yet cover the Central Denmark Region, and laboratory results from this part of the the population was extracted from the CLIS/LABKA ref

3.3. Diabetes classification algorithms

[A short intro on why we decided to develop a novel algorithm to classify diabetes instead of just validating the existing classifier]. Introduce OSDC and RSCD abbreviations

As a point of reference in validation, we developed an implementation of the algorithms of the RSCD diabetes classifier (version 1.0, August 2016) according to official documentation.[27]

The following sections describe the algorithms behind each diabetes classifier.

[detailed discussion of choices in OSDC, e.g. on obstetric coding, and pros/cons of RSCD goes in chapter 5]

3.3.1. The Open-Source Diabetes Classifier

[CP from validation paper]

3.3.2. The Register of Selected Chronic Diseases

[CP from validation paper]

3.4. Validation Questionnaire data

3.4.1. The Health In Central Denmark survey

Describe population, inclusion, responses etc. HICD ref

3.4.2. The National Health Survey

Describe population, inclusion, responses etc. NHS ref. This survey was only used for supplementary validation analyses.

3.5. Study design and population

Study I was designed to examine the validity of register-based definitions of T1D and T2D, the latter of which was used to identify the population-wide study populations in studies II and III.

[Overview table of the three studies]

3.5.1. Study populations

3.5.1.1. Study I

From nationwide healthcare registers, data covering the Central Denmark Region was used to identify diabetes populations using the OSDC and RSCD classifiers.

3.5.1.2. Study II

[Describe the different study populations in the analyses of study II, "indication for treatment", and the reason for exclusions]

3.5.1.3. Study III

[Describe the study populations in study III]

3.5.2. Outcomes

3.5.2.1. Study I

The validation outcomes

3.5.2.2. Study II

Prevalence and the indicators of care quality

3.5.2.3. Study III

Combinations therapy and individual drug types

3.5.2.4. Timeline of all outcomes across the three studies

Make a figure.

3.5.3. Primary variable of interest: migrant status

[CP from papers]

3.5.4. Other explanatory variables

[CP from papers]

3.6. Statistical analysis

3.6.0.1. Study I

Validation: Introduce sensitivity, PPV and other validation metrics.

3.6.0.2. Study II & III

Robust poisson regression. Why we chose the models that we did.

3.7. Ethics and approval

4. Results in summary

[Align structure with each individual study? Or split into themes? Kind of doing both for now]

4.1. Study I

In this study, we identified… Number of participants, diabetes cases etc.

4.1.1. Register-based classification of type 1 diabetes

metrics

4.1.2. Register-based classification of type 2 diabetes

metrics

4.2. Study II

[Maybe for each outcome?] In this study, we identified… Number of participants, diabetes cases etc.

4.2.1. Prevalence

4.2.2. Monitoring

4.2.3. Biomarker control

4.2.4. Pharmacological treatment

4.2.5.

4.3. Study III

In this study, we identified... Number of participants, diabetes cases etc.

4.3.1. Combination therapy

4.3.2. Drug types

5. Discussion of methods

5.1. Study designs

5.2. Internal validity

5.2.1. Selection bias

5.2.2. Information bias

T2D was validated! Diabetes duration Migrant ethnicity based on country of origin is more accurate than race or continent, but does not capture ethnic differences within the countries of origin.

5.2.3. Confounding

Studies II and III mapped risks, not causal associations

5.3. External validity

5.3.1. Generalizability

Population-wide: representative of the Danish healthcare system and migrant populations in their current state. Risks are likely to be representative of other, similar healthcare systems and migrant populations found in other Nordic countries - but not in other contexts.

Migrant group characteristics, such as distribution of other covariables may provide different results between countries, as well as difference outcome prevalence in the native population.

5.4. Analyses

Robust poisson regression provides more intuitive estimates of relative risk than logistic regression in studies where the outcome of interest is not rare.

6. Discussion of results

6.1. Key main findings

Register-based classifiers identified valid populations of T1D and T2D in a general population, but diabetes type in cases with atypical age at onset of diabetes should be interpreted with caution.

Disparities between migrant groups and native Danes, yes, but much can be attributed to differences in clinical characteristics. Largest disparities in podiatrist monitoring, control of HbA1c and LDL-cholesterol and GLP1RA use. Migrants from Somalia received "poorer" care in all outcomes, and poorest care of all groups in most.

In the following sections, the main findings out each study will be discussed separately in light of existing literature.

6.1.1. Study I

[probably mostly CP from paper?]

6.1.2. Study II

[probably mostly CP from paper?]

6.1.3. Study III

[probably mostly CP from paper?]

7. Conclusions and implications

7.1. Main conclusions

[probably mostly CP from papers]

7.2. Implications

Validation: Diabetes researchers can trust OSDC and RSCD, and very likely also classifiers with similar algorithms used on similar source data and populations.

osdc-package

Atypical age at onset of diabetes

Migrants:

[Structure similar to discussion in paper III]

8. Perspectives and future research

8.1. Perspectives

The findings call for bla bla bla updated guidelines, increased awareness….

Action card for physicians: which areas of care to pay particular attention in each migrant group, when delivering care to a migrant with T2D.

8.2. Future research

Validated diabetes classifiers, or similar, should be used. Validation studies on diabetes duration/age at onset of diabetes should be performed.

Qualitative studies? The reasons for the observed disparities should be studied, and intervention studies are needed to address these reasons in migrants in an evidence-based way.

Other vulnerable groups?

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English summary

This is what I spent three years on...

Dansk resumé

Det her brugte jeg tre år på...

A. Supplementary material

Some results that wouldn't fit into the main thesis

A.1. To do/Questions:

- Intro:
- 1.1: Hvorfor?
- 1.1.1: Migrants & type 2 diabetes
  - Prævalens af T2D er stigende: aldrende befolkning. Sundhedsvæsenets resourcer er begrænsede - hvem skal prioriteres for at resourcerne udnyttes bedst?
    - Kort intro: T2D rammer skævt socioøkonomisk: Livsstil, arbejde
      - hvorfor er migranter særligt interessante? (er en sociøkonomisk skæv gruppe. Desuden højere prævalens af T2D, ung demografi -> kommer til at udgøre en stigende andel af T2D i fremtiden),
- 1.1.2: Diabetes
  - prævalens
  - Komplikationer og risikofaktorer
    - Evidens generelt
    - Migranter
  - Medicinsk behandling
    - Evidens generelt
    - Migranter
  - Guidelines

* Evidens generelt
* Migranter