ETHNIC DIFFERENCES IN UTILIZATION OF AN OUTPATIENT CLINIC IN THE NETHERLANDS

A study of diabetes patients and patients with gastrointestinal symptoms

Loes Lanting

Acknowledgements
The work presented in this thesis was conducted at the Erasmus MC, in a collaboration between the Department of Public Health and the Department of Internal Medicine. The project was funded by Erasmus MC 'Doelmatigheid Zorg' (internal fund for efficiency of care). The publication of this thesis is financially supported by Novo Nordisk, Sanofi Aventis, the Department of Internal Medicine and the Department of Public Health, Erasmus MC.

Cover illustration: Kim Freitas @ istockphoto.com
Cover and interior design: Anna Bosselaar | www.zoiets.com
Printed by Print Partners Ipskamp, Enschede

ISBN-10: 90-9021332-5
ISBN-13: 978-90-9021332-3

Ethnic differences in utilization of an outpatient clinic in the Netherlands

- a study of diabetes patients and patients with gastrointestinal symptoms -

Etnische verschillen in zorggebruik van een polikliniek in Nederland

- een studie bij diabetes patiënten en bij patiënten met buikklachten -

Proefschrift

ter verkrijging van de graad van doctor aan de
Erasmus Universiteit Rotterdam
op gezag van de
rector magnificus
Prof. dr. S.W.J. Lamberts
en volgens besluit van het College voor Promoties.

De openbare verdediging zal plaatsvinden op
vrijdag 9 februari 2007
om 13.30 uur

door

Louisa Carolina Lanting

geboren te Groningen

Promotiecommissie

Promotoren: Prof. dr. J.P. Mackenbach
Prof. dr. S.W.J. Lamberts

Overige leden: Prof. dr. E.J. Kuipers
Prof. dr. M. Berg
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Copromotoren: Dr. I.M.A. Joung
Dr. A.H. Bootsma

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Submitted 2006

1

General introduction

BACKGROUND

The number of immigrants in the Netherlands is growing rapidly, as in other Western countries. In 1980 non-western immigrants constituted about 3% of the population, and in 1990 it reached 6%. In 2005 10% of the population that lived in the Netherlands was of non-western origin. Another 9% of the population consisted of people originating from western countries (i.e. Europe, Northern America and Japan). In general, non-western immigrants differ from native Dutch people in several demographic, cultural and social respects. Non-western immigrants in the Netherlands are on average younger in age, they are more likely to be married, have lower education, lower incomes and stronger religious affiliations [1].

As a result of the increasing numbers of immigrant groups, the Netherlands is facing numerous new challenges related to this development. One issue of special interest is the consequence for population health. For that reason, a considerable number of studies on ethnic differences in health have been performed during the last few decades. It is of importance, because studies on the health of ethnic minority populations can shed light on health differences that exist within one country and may therefore be informative for people responsible for the provision and planning of health care [2]. Current knowledge about the general health status showed ethnic differences in perceived health, often demonstrated a worse self-reported health among ethnic minorities [3-5]. Besides ethnic differences in perceived health, differences in general morbidity and mortality are reported. Information about health showed that immigrants not only have health problems that are rare among the native Dutch population, e.g. sickle cell disease and thalassaemia, but also the epidemiology of several common diseases differs. For instance, studies have shown ethnic differences in the prevalence of diabetes, cardiovascular diseases, and infectious diseases, with a higher prevalence among immigrants [6-8]. Cause-specific mortality examination showed higher risks of death for ethnic minorities from almost all infectious and several chronic conditions including asthma, diabetes, and cerebrovascular disorders. Ethnic minority women experienced a higher risk of death from maternity-related conditions. However, contrary to this, ethnic minority groups have a relatively low mortality from neoplasms, lung cancer and respiratory diseases [9] [10].

Explanatory factors for the observed differences in health, morbidity and mortality that have been mentioned are genetic factors, cultural behavior, effects of migration, effects of racism, exposure to health promoting and health damaging factors in the country of origin and in the Netherlands [9-11-15] and differences are also attributed to environmental and economic factors [16-18]. Certainly, low socio-economic status and poor health are powerfully correlated. However, these factors do not fully explain the ethnic differences. From this perception it is interesting to investigate the role of health care. Health care itself could be of importance in explaining the ethnic differences, mainly the access and the quality of care. Studies investigating ethnic differences in the use of health care have reported over-consumption by various immigrant groups compared to 'native' populations with respect to general practitioners, while these studies showed under-consumption in outpatient services [19] [20]. Both under – or over-consumption relative to need may be indicative of poorer service (lack of information or lack of appropriate care necessitating further consultation) or of demand side differences. Especially in the United States of America there is evidence that health care processes have an adverse effect on the health status of immigrants [21]. International and national literature did not provide information on the basis of which we could examine ethnic differences in relation to health care processes in the Netherlands. This led to the formulation of a research project about analysing ethnic differences in health care processes. More specific, in this thesis we compare health care processes and outcomes among immigrant patients and native Dutch patients.

ETHNIC MINORITY GROUPS IN THIS THESIS

In this thesis we restricted ourselves to non-western immigrants from Turkish, Moroccan, Surinamese, Cape Verdean and Antillean and Aruban descent. In the 1960s and 1970s, Turkish and Moroccan men came, initially on a temporary basis, to the Netherlands as labor immigrants. Only one third of the Turkish men and one fifth of the Moroccan men returned to their country of origin. The majority of those who decided to stay permanently had their wives and children relocated to the Netherlands from the mid 1970's onwards. In 1975 after Surinam had gained independence,

Table 1
Number of inhabitants of the Netherlands according to country of origin (restricted to the immigrants that are studied in this thesis).

Country of origin	Number of inhabitants in the municipality of Rotterdam (*1000)	Number of inhabitants in the Netherlands (*1000)
The Netherlands	328	13.183
Turkey	45	358
Morocco	36	315
Surinam	52	329
Dutch Antilles and Aruba	20	131
Cape Verdean Islands	15	20

there was a large migration wave from Surinam to the Netherlands. A second wave in 1979/1980 was related to a military coup and to perceived restrictions in obtaining residency permits to the Netherlands. Immigrants of Surinamese descent are ethnically diverse and consist of persons who originate from West Africa (30%), India (37%), Java (15%), and China (15%), and persons of mixed origin. In the 1960s and 1970s Cape Verdean immigrants came to the Netherlands, stimulated by their own government to leave the Cape Verdean Islands. Most of the Cape Verdean immigrants are inhabitants of Rotterdam-city or live in the municipality of Rotterdam, because of their main duties in the harbors or as seamen. The Dutch Antilles and Aruba are still part of the Netherlands. Between 1955 and 1985 there has been a relatively constant and mainly work-related migration of people from these isles to the Netherlands. Due to an economic recession in the isles, migration from the Dutch Antilles and Aruba increased after 1985.

THIS THESIS

This thesis encompasses studies of ethnic differences in the processes and outcomes of health care.

OBJECTIVE

Aim of the study is to analyze the ethnic differences in processes and outcomes of outpatient hospital care, with special attention to diabetes mellitus and gastrointestinal complaints.

APPROACH

In this study ethnic differences in process of care is the central objective. It is necessary to distinguish between the structure of health care, actual care given (the process of care) and the consequences of the interaction between individuals and the health care system (outcomes). The actual care given in health care can be divided in subtopics: use of health care, referral patterns, diagnostic procedures and the quality of care.

To assess the process of care, part of the research questions were restricted to patients with specific diseases with a high prevalence among immigrants: namely diabetes mellitus and gastrointestinal complaints.

RESEARCH QUESTIONS

The research questions addressed in this thesis are:

Q1. Are there ethnic differences in the use of outpatient hospital care?
Q2. Are there ethnic differences in the diagnostic process of gastrointestinal complaints?
Q3. Are there ethnic differences in the quality of diabetes care?

STUDY POPULATION

To answer these research questions, we started to register all *new* patients, aged 15 years and over that visited the outpatient clinic of the department of Internal Medicine, Erasmus Medical Center (Erasmus MC), a university hospital in Rotterdam, the Netherlands. During the period March 2002 to March 2003, all new patients were asked for their and their parents' country of birth. The database derived from this registration was used for the studies in Chapters 2 and 3 (Q1 and Q2). Chapter 4 describes the outcomes of a systematic literature review. Additionally, we selected all patients that were clinically diagnosed with Diabetes Mellitus (type 1 or 2) and were under treatment of a diabetes specialist for at least one year. The selection was based on hospital data registration and after authorisation by the research ethics committee, patients of Dutch origin or immigrants from Turkey or Morocco were asked to participate. This group constituted the study population described in Chapters 5 and 6 (Q3). Besides hospital registration data, data from medical records and face-to-face interviews with patients were used.

Different descriptive and analytical techniques were applied to these data. In Chapter 2 we used Poisson regression analyses to examine whether ethnic minority groups had a higher or lower use of the outpatient clinic than could be expected from their relative distribution among the population. For most research questions we performed multiple regression analyses. These analyses were generally done with and without adjustment for differences in socioeconomic status. In Chapters 5 and 6 paired-sample t-tests were performed, in order to take the design of the diabetes-study (matching on age, gender and SES) and type and duration of diabetes mellitus into account.

STRUCTURE OF THE THESIS

Part I of the thesis (i.e. Chapters 2 to 3), is about the description of ethnic differences in the use of health care and about ethnic differences in referral reasons, diagnosis and diagnostic procedures. In Chapter 2 ethnic differences in patients referred by the general practitioner to the outpatient care are studied. In Chapter 3 ethnic differences in the diagnostic procedures in patients with gastrointestinal complaints are studied.

In Part II of the thesis, ethnic differences in the quality of care (outcomes and process) are analysed. The role of acculturation and behavioral factors in explaining ethnic differences are described. In this part the population is restricted to patients with Diabetes Mellitus. Chapter 4 provides a review of the literature on ethnic differences in the prevalence of complications and mortality among diabetic patients and in the quality of diabetic care. Chapter 5 explores the role of quality of care and acculturation in ethnic differences in outcomes of diabetes for Turkish and Moroccan compared to native Dutch patients. Chapter 6 focuses on the role of self-management behavior and its determinants for explaining ethnic differences in the outcomes of diabetes care.

The final chapter, Chapter 7, summarizes the main results, and evaluates the usefulness and possible limitations of our methodological approach in obtaining these results. Additionally, conclusions and recommendations for further research and policy are presented in this section.

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PART I

2

Ethnic differences in use of, reasons for referrals to and diagnosis in an internal medicine outpatient clinic

Lanting LC, Bootsma AH, Lamberts SWJ, Mackenbach JP, Joung IMA.

Submitted 2006.

Abstract

Study objective – To determine ethnic differences in the use of internal medicine outpatient care, specifically to examine ethnic differences in the reason for referral and diagnosis.

Design – Open cohort design.

Setting and patients – The ethnicity, sex, age, referral reasons, diagnosis and living area of all new patients that visited the internal medicine outpatient clinic of the Erasmus Medical Centre in Rotterdam (Erasmus MC) were registered for one year (March 2002-March 2003). Referrals were coded according to the International Classification of Primary Care (ICPC) and diagnosis categorised according to the Diagnosis Treatment Combination (DTC). Data were analysed using Poisson regression and logistic regression.

Main results – All ethnic minority groups (Surinam, Turkish, Moroccan, Antillean/Aruban and Cape Verdean immigrants) living in Rotterdam municipality, make significantly more use of the outpatient clinic than native Dutch people (relative risk versus native Dutch people was 1.83, 1.97, 1.79, 1.65 and 1.88, respectively).
Immigrant patients are more likely to be referred for analysis and treatment of 'gastro-intestinal signs & symptoms' and were less often referred for 'indefinite, ambiguous signs'. Ethnic minorities were more frequently diagnosed with 'Liver diseases', and less often with 'Analysis without diagnosis'. The increased use of the outpatient facilities seems to be restricted to first-generation immigrants, and is mainly based on a higher risk of being referred with 'gastro-intestinal signs & symptoms'.

Conclusions – These findings demonstrate substantial ethnic differences in the use of the outpatient care facilities. Ethnic differences may decrease in the future when the proportion of first-generation immigrants decreases.

INTRODUCTION

Health policy is based on the ideal that all inhabitants should have equal access to health care. US studies have found ethnic differences in the use of health care with lower consumption rates for people from ethnic minorities [1-2]. European studies on ethnic differences in the use of health care have reported mixed outcomes. Some studies reported higher consumption rates by various ethnic minority groups in comparison with the majority populations with respect to the general practitioner (GP) services in combination with lower consumption rates for outpatient services [3-5]. Other studies reported either no differences in outpatient care use [6-7] or higher consumption rates among ethnic minorities or immigrant populations [8-12].

Differences in consumption rates could be based upon differences in the incidence of diseases. For some diseases, like diabetes, it has indeed been shown that there are ethnic differences in incidence [13-15]. However, ethnic differences in consumption rates could also have other reasons. For instance, in case of referral of patients by a GP to an outpatient clinic, patients ethnicity might influence the physicians' beliefs about and expectations of patients, and consequently the physicians' actions [16]. There are also indications that, as a result of less effective and satisfying doctor-patient relationship [17], physicians that treat ethnic minority patients are more uncertain in the process of care [18]. Especially in case of language problems, which are common among immigrant populations, the latter might be the case. This could clearly have implications for the referral pattern and the care physicians give. A possible result could be that people from ethnic minorities are more often referred on the basis of vague symptoms, and might therefore less often receive a medical diagnosis.

Since the number of immigrants in the industrialized countries is growing, it is also of growing importance to obtain data on ethnic differences in the use of health care, referral patterns en diagnoses. E.g., in the Netherlands the proportion of non-western immigrants increased from about 3% in 1980, to 6% in 1990 and more than 10% in 2005. A limitation of previous studies is their reliance on self-reports of health care utilization. Although self-reports have been shown to be a valid estimate of health care utilization across socio-economic strata [19], there is less evidence for cross-cultural validity, especially among some of the larger immigrant groups in the western European countries, Turkish and Moroccan people [20]. Ethnic differences in recall bias, non-response and tendency for giving socially desirable answers, could undermine the validity of self-reported measures [21]. For instance, illiteracy and limited proficiency in the native language, both more prevalent among immigrants, will increase non-response rates. Therefore we have chosen for the use of hospital registration data in order to examine ethnic differences in the use of health care.

The ethnic minority populations in the western European countries mainly exist of immigrants who entered the country in the period between 1955-1985 when there was a severe shortage of people to do the unschooled jobs in these countries (first-generation immigrants). In the case that ethnic differences are found, it would also be worthwhile to know whether these differences also persist in the younger generations or whether the consumption rates in younger generations will be more alike those in the majority population.

Using hospital registration data for an outpatient clinic for internal medicine we investigated the following research questions:

(1) Are there differences between ethnic groups in the use of outpatient health services?

(2) Are there differences in reasons for referral and diagnosis between ethnic groups?

METHODS

Population

From March 2002 to March 2003 the ethnicity of all *new* patients, aged 15 years and over that visited the outpatient clinic of the department of Internal Medicine, Erasmus Medical Center (Erasmus MC), a university hospital in Rotterdam, the Netherlands, was registered.

In total, 4438 new patients visited the outpatient clinic. From these 4438 patients, ethnicity was registered for 3985 patients (90%). Eligibility criteria for these 3985 patients for inclusion in the study were firstly their living area and secondly their

Table 1

Population by living area, ethnicity, mean age, sex, generation and socio-economic status. N=1332

Referral area Erasmus MC	Dutch	Surinamese	Turkish	Moroccan	Antillean / Aruban	Cape Verdean	S, T, M, A/A, C together
N=320	124	62	57	36	11	30	196
Mean age	55.0	46.5	41.8	41.4	39.6	50.4	44.4
% men	43.5	32.3	31.6	38.9	63.6	53.3	38.3
% 2nd generation	-	6.5	5.3	5.6	-	-	4.6
Municipality Rotterdam	**Dutch**	**Surinamese**	**Turkish**	**Moroccan**	**Antillean / Aruban**	**Cape Verdean**	**S, T, M, A/A, C together**
N=1332	852	174	126	79	50	51	480
Mean age	56.1	45.0	41.4	42.1	41.3	47.3	43.4
% men	40.1	33.9	38.1	44.3	44.0	51.0	39.6
% 2nd generation	-	7.5	8.7	5.1	2.0	3.9	6.5
% lowest SES level	33	62.1	80.2	83.5	54.0	76.5	71.0

ethnicity. Only residents of the municipality of Rotterdam were included (40%). Six ethnicities were included: Surinamese, Turkish, Moroccan, Aruban/Antillean, Cape Verdean and Dutch (33%). Among the ethnic minorities Surinamese was the largest, and Antillean/Aruban accounted for the smallest group patients. In table 1 characteristics of the research population are presented. In total 1332 patients remained.

Data

The research proposal, including the plan of data collection, was authorised by the research ethics committee of the Erasmus MC. We used the country of birth of the patient and both parents to assign ethnicity. We applied the standard definition of ethnicity of Statistics Netherlands and considered a person to be Non-Dutch if at least one parent was born abroad [22]. During the year all new patients were asked for their and their parents' country of birth. Immigrants who were born in the Netherlands and had at least one parent that was born abroad, were considered second-generation immigrants. If a person was born abroad and at least one of the parents did, we defined the person as first-generation immigrant. A six-digit zip code was used for ascribing socio-economic status (based on standardized household income) and based on quintiles determined for Rotterdam. Information about the composition of the population of Rotterdam was obtained from Statistics Rotterdam. A data file was created for the observation period. Persons were allowed to enter the study throughout the study period (open cohort design).

The patient population was divided into two groups: residents from the referral area of the Erasmus MC and patients living in the municipality of Rotterdam. The inhabitants of the referral area constituted about 12% of all inhabitants living in the municipality of Rotterdam. The referral area consists of the neighborhoods surrounding the Erasmus MC, which is for the greater part a deprived area, for which the hospital has a local community service.

Medical reports sent to the general practitioners, when the diagnostic analysis was completed, were scrutinized in order to collect the reason for referral and diagnosis. Complete data were available for 1070 of 1332 patients. Absence of reports was equally distributed over all ethnic groups. After looking into more detail, 82 patients were not new patients. In total, referral reasons and diagnosis were collected for 988 new patients. Referral reasons were coded according to the International Classification of Primary Care (ICPC) and diagnosis according to the Diagnosis Treatment Combination (DTC). The latter is a system used to finance hospitals in the Netherlands. It is based on formation of groups of patients that have a homogeneous health care use profile. We designed meaningful categories by aggregating ICPC and DTC codes, in order to obtain groups of sufficient size for the analyses. In the appendix the original codes and structure as well as the aggregated categories for ICPC and DTC are presented.

Analysis

With regard to research question 1 it was examined whether ethnic minority groups had a higher or lower use of the outpatient clinic than could be expected *from their relative distribution in the population*. In order to estimate rate ratios (Relative Risks) and 95% confidence intervals (CI) of health care use by ethnicity, in research question 1, Poisson regression analyses were carried out. For the Poisson distribution, the patients constituted the numbers of observed events. A base group represents the rate (denominator) at which these events occur. The population of the municipality of Rotterdam, including the ethnic distribution of it, constituted this group. For analyses restricted to the referral area, the population of the referral area was the base group. Both base groups were exactly defined grounded on six-digit zip codes. The composition (concerning age, sex and socio-economic status) of the base groups was obtained from Statistics Rotterdam. We used the multiplicative (relative) risk, which is the standard Poisson regression model. The statistical package used was EGRET (version 2.0.1).

With regard to research question 2, we examined whether there were ethnic differences in reasons for referral and diagnosis w*ithin the study population of patients*. For the research questions about ethnic differences in referrals and diagnosis, the reference consisted of the patient group. We did not have the data to estimate odds ratios for the population of Rotterdam, that is why we restricted these analyses to the patient population. For these questions logistic regression was used in SPSS (version 11).

The analyses of research question 1, concerning the population of Rotterdam, were restricted to people aged 15-70, as the older age groups contained very few immigrants. In the models we adjusted for sex, age (10-year age categories), and socio-economic status (SES; quintiles). The analyses concerning differences in generation were restricted to people 15-45, as the second-generation immigrants contained very few people above 45 years.

RESULTS

For the referral area of the Erasmus MC, immigrant people have an increased use of the outpatient clinic compared to Dutch people, adjusted for sex and age. The increased use was expressed by relative risks of consultations, which ranged from 1.29 in the Cape Verdean group to 1.82 in the Turkish group. The difference was statistically significant only for Surinamese, Turkish and Moroccan people.

For the municipality of Rotterdam, all immigrant groups included in this study, had a significantly increased use of outpatient care, adjusted for sex and age. Again Turkish immigrants had the highest rates; relative risks ranged from 1.65 in the An-

Table 2A
Relative risks (CI 95%) for the use of outpatient care (Dutch as reference)
Age 15-70.

	Surinamese	Turkish	Moroccan	Antillean / Aruban	Cape Verdean	p-value*
Referral area Erasmus MC N= 282						
Adjusted for sex and age	1.47 (1.05-2.06)	1.82 (1.29-2.56)	1.49 (1.00-2.21)	1.46 (0.78-2.75)	1.29 (0.85-1.97)	0.02
Additional adjustment for socio-economic status	1.49 (1.06-2.07)	1.84 (1.31-2.59)	1.50 (1.01-2.24)	1.49 (0.79-2.80)	1.30 (0.86-1.99)	0.02
Municipality of Rotterdam N= 819						
Adjusted for sex and age	1.88 (1.58-2.24)	2.05 (1.68-2.50)	1.88 (1.48-2.39)	1.67 (1.24-2.26)	1.99 (1.49-2.67)	<0.001
Additional adjustment for socio-economic status	1.83 (1.53-2.19)	1.97 (1.59-2.42)	1.79 (1.40-2.29)	1.65 (1.22-2.24)	1.88 (1.40-2.54)	<0.001

*p-value of the overall ethnic differences (Wald test)

tillean/Aruban group to 1.97 in the Turkish group. In table 2A relative risks are presented for all ethnic minorities compared to the native Dutch.

Additional adjustment for socio-economic status hardly changed the estimates (table 2A). The largest decrease in relative risk was observed among Cape Verdeans in the analyses for the municipality of Rotterdam, from 1.99 to 1.88. In analyses in which the first and second immigrant generations were distinguished (table 2B), no difference in the use of health care were observed between the second-generation and the native Dutch citizens. In both areas the increased use can be predominantly ascribed to the first-generation immigrants.

In table 3 odds ratios are represented for ethnic differences in referral reasons. Compared to Dutch patients, immigrant patients are less likely to be referred to the outpatient care of the Erasmus MC because of reasons in the category ‘indefinite, ambiguous signs’. Further analysis showed that the difference in this referral reason is mainly based on two underlying categories; general weakness/tiredness and memory disorder, which both occurred more frequently among Dutch patients (data not

Table 2B
Relative risks (CI 95%) for the use of outpatient care
N=385

Comparison	Relative risk[a]
1st generation immigrants versus Dutch	1.85 (1.51-2.25)
2nd generation immigrants versus Dutch	1.08 (0.72-1.63)
2nd generation versus 1st generation immigrants	0.59 (0.39-0.88)

[a] age 15-45, adjusted for sex, age and socio-economic status

Table 3
Ethnic differences in referral reasons (immigrants versus Dutch as reference). N=988

	N total	Dutch	Immigrants	Odds ratios [a b]
Indefinite, ambiguous signs	144	119	25	0.46* (0.27-0.77)
Signs & symptoms gastro-intestinal	298	160	138	1.45* (1.05-2.00)
Risk for vascular diseases	139	88	51	1.11 (0.71-1.71)
Remaining category	407	257	150	0.90 (0.66-1.23)

[a] Adjusted for sex, age and SES
[b] Confidence Interval 95%
*p<0.05

shown). Immigrant patients are more likely to be referred because of reasons in the category 'signs & symptoms gastro-intestinal'. Underlying codes in these are generalized/diffuse abdominal pain/ cramps, localized abdominal pain and viral hepatitis, of which all three conditions had a higher incidence among immigrant patients. The only exception in this category is rectal bleeding which had a lower incidence among immigrant patients (data not shown). In the patient population were no ethnic differences in the likelihood to be referred because of reasons in the category 'risk for vascular diseases' or the category with remaining referral reasons.

After adjusting for socio-economic status ethnic differences only decreased slightly, indicating that ethnic differences in socio-economic status hardly explained the differences in referral reasons for patients that were referred to the Erasmus MC.

In table 4 odds ratios are represented for the categories of the diagnosis, as made by the internist. With regard to diagnosis, immigrant patients have an increased risk to be diagnosed with 'liver' diseases and they have a lower risk for the category 'analysis without diagnosis'. The dominant code in the category liver is hepatitis B/C. The category 'analysis without diagnosis' constituted a set of underlying codes which all

Table 4
Ethnic differences in diagnosis (immigrants versus Dutch as reference). N=988

	N total	Dutch	Immigrants	Odds ratios [a]
Diagnose category 'risk vascular diseases, including diabetes mellitus'	143	93	52	1.12 (0.72-1.72)
Diagnose category 'Liver diseases'	75	32	43	1.75* (1.00-3.07)
Diagnose category 'Gastro-intestinal'	200	118	82	1.07 (0.74-1.55)
Diagnose category 'Analysis without diagnosis'	278	194	84	0.68* (0.48-0.95)
Diagnose category 'Endocrinology without diabetes mellitus'	108	60	48	0.90 (0.56-1.44)
Remaining category	184	127	55	1.17 (0.76-1.81)

[a] Adjusted for sex, age and SES
[b] Confidence Interval 95%
*p<0.05

have in common that extensive medical examination took place without giving a pathological diagnosis. The underlying codes discriminate between different complaints, from which general weakness/tiredness and a collection of residue complaints (e.g. impairment of visual acuity, sickness, amnesia) occurred more often among Dutch patients. Analysis of abdominal pain without resulting in a pathological diagnosis on the contrary, occurred more often among immigrant patients.

Ethnic differences in risk for 'liver diseases' are partly explained by differences in socio-economic status; after adjusting for socio-economic status the differences in risk became smaller. For 'liver diseases' the risk decreased from 1.96 to 1.75, but retained a borderline significance. For 'analysis without diagnosis' the risk decreased slightly after adjustment for socio-economic status (from 0.62 to 0.67), it retained statistical significance.

Finally, we also analysed ethnic differences in the risk of getting a certain diagnosis given the referral reason and looked for ethnic differences in this relationship. There appeared to be no differences between the ethnic groups under study, except for the category 'gastro-intestinal signs & symptoms', in which immigrant patients were more likely to receive a diagnosis in the category 'liver' (data not shown).

DISCUSSION

Surinamese, Turkish and Moroccan immigrants, living in the referral area of the Erasmus MC, made more use of outpatient care than native Dutch people. In Rotterdam municipality the five largest ethnic minority groups all demonstrate a higher use of the outpatient care facilities. This increased use can be predominantly ascribed to the first-generation immigrants; second-generation immigrants do not appear to have an increased use of health care services. Immigrant patients who visited the outpatient clinic were more likely to be referred because of 'gastro-intestinal signs & symptoms' and less likely to be referred because of 'diffuse and ambiguous signs'. Regarding ethnic differences in diagnosis, we noted an increased risk of 'liver related diagnosis' and a decreased risk of 'analysis without diagnosis' for immigrant patients.

We have to consider a few limitations of the current study. Although over 4000 new patients were registered in the hospital, numbers for those eligible for the study were small for some ethnic groups, and especially for second-generation immigrants. Therefore, not all research questions could be examined for the ethnic groups separately, nor could the first-generation be distinguished from second-generation immigrant for all research questions. For our second research question it was necessary to aggregate all ethnic groups to one 'immigrant' group. The aggregation was justified by the outcomes of table 2, in which all ethnic groups show a deviated use of health care in the same range and direction. A similar limitation concerns the aggregating of codes of *referral reasons* and *diagnosis*. In the results of research question 2 no ethnic differences were found for the *referral reason* ‘risk factor vascular disease’. However, looking in more detail shows large differences between the ethnic minority groups for more specific referral reasons. Surinamese and Cape Verdean patients often are referred with the most prevalent underlying risk of vascular diseases, namely hypertension. The same holds with regard to ethnic differences in *diagnosis:* we found no different risk of *diagnosis* ‘risk factor vascular diseases’ regarding ethnicity. But the underlying codes showed that diabetes mellitus was significantly more prevalent among referred immigrant patients and dyslipidemia more common among Dutch patients. Odds ratios have to be interpreted in a relative sense, because they were calculated for the closed group of patients that visit the outpatient clinic of Erasmus MC. An apparent lower odds ratio might be the result of higher rates in other groups of diagnosis.

In the second place ethnicity is based on countries of birth. Although this is a well-accepted definition [6-23-25] we were unable to address ethnic variations within immigrant groups. Differences in the use of health care may have been more differentiated within certain ethnic minority groups, especially for the ethnically diverse Surinamese and Antillean/Aruban population.

Besides Erasmus MC, there are four more hospitals in Rotterdam that offer health care services. Differences in preference for Erasmus MC could have introduced the differences in health care use. For at least the referral area, this seems hardly the case. A survey among general practitioners in the referral area reported a slightly different referral pattern among different ethnic groups to Erasmus MC and other hospitals in Rotterdam (unpublished data). General practitioners send immigrant patients more often than Dutch patients to the internal medicine outpatient’s care of Erasmus MC. The difference is (at most) 5% and cannot explain the increased use of 80% by immigrant patients. Additional support for our assumption that potential differences in referral patterns (due to preferences or the reputation of the Erasmus MC) between ethnic groups in Rotterdam municipality, have had little influence on the outcomes of our study comes from the analysis of the ethnic differences in *referral reasons* for both areas separately (data not shown). The findings at least indicate that there are no ethnic differences in referral reasons between the referral area and Rotterdam as a whole. Herewith a correct inference for the population of Rotterdam municipality is deduced, since the assumption for representative ness of the patient sample seems to be supported.

Remarkable is that the ethnic differences in likelihood of being referred are higher when focussing on Rotterdam municipality than when focussing on the referral area. It is uncertain whether this can be attributed to the prevalence of certain diseases, which require special care. Erasmus MC is also a university hospital and delivers tertiary medical care.

The results of this study regarding the *use of health care* differ from the results of Stronks et al., who reported no differences in the use of outpatient care [6], likewise using registration data. An explanation could be that they addressed outpatient care clinics comprising of several types of specialists, while we made a restriction to internal medicine. Immigrant patients are known to have a higher incidence of several diseases and syndromes, which are referred to the internal medicine clinic (i.e., diabetes, liver diseases and gastro-intestinal complaints). Diseases referred to other outpatient care clinics probably are more equally distributed among different ethnic groups.[8]

The results of our study are in agreement with the results of some other studies. Both Manna [26] and Weide and Foets [27] reported an increased risk for immigrant patients for referral with 'signs & symptoms gastro-intestinal'. Some of our results however, differ from the results of other studies. Other studies have reported that reasons for medical consultation among immigrants patient's are more often misunderstood or perceived as not being appropriate by the physician, and that the diagnostic process among immigrant patients might be more complicated because of language barriers, other concepts of disease, and other expressions of pain or other symptoms.[28-31] Possibly this could lead to more referrals for indefinite or ambiguous signs and immigrant patients would be more likely to end up in the category 'analyses without diagnosis', but we found the opposite: less immigrant patients came to the outpatient clinic with 'indefinite ambiguous signs' and compared to Dutch patients they have a lower risk for the category 'analysis without diagnosis'. Differences in domains of health care under study may explain the dissimilarity of their results with ours, as these other investigations mainly focussed on general practitioners or on health care in general. Given the Dutch system, where general practitioners are the gatekeepers to most other health services, including the outpatient services, health complaints perceived as inappropriate might have been filtered out by the general practitioner effectively.

A possible explanation for the higher use of outpatient care among immigrants might be a direct reflection of a higher incidence and prevalence of certain diseases. We did not have information about health status, but previous studies have reported a higher incidence of infectious diseases [32], hypertension [33-34], circulatory diseases [35] [36-37], diabetes [38-40], and worse health status in general [8] [41] among immigrant groups. Another explanation could be different styles/patterns in referring immigrant patients and Dutch patients to the outpatient care. Uitewaal [42] reported that more diabetes patients from Turkish descent than native Dutch diabetes patients were referred to the outpatient care. Moreover, immigrant patients asked more for referrals to outpatient clinics, instead of analysis or treatment by the general practitioner.[43] It is known that immigrant patients seek professional medical help more often, not only because they actually do have more health problems, but they also tend to report physical symptoms more often. It is suggested that this might be due to the fact that they have a more positive attitude towards care-seeking [44] [27] and they have different beliefs concerning health and illness. [45] However we did not find evidence for ethnic differences in mismatch between referral and diagnosis, general practitioners can cause differences in referrals between immigrant and Dutch patients, when communication with immigrant patients is less effective than in consultations with Dutch patients, there is more misunderstanding and also more noncompliance. [46] These explanations could also contribute to the interpretation of the finding that the increased use of health care services predominantly can be ascribed to the first-generation immigrants. Compared to the first-generation, immigrants of the second-generation generally have a higher education, better language skills and have better control of their lives [44]. Thus, second-generation immigrants could become more alike to Dutch patients and their health care use will become more similar. While first-generation immigrants directly benefited from the more favourable socio-economic, public health and health-care conditions in the Netherlands compared with their country of origin, they are not yet affected by the higher risks of diseases associated with prosperity. [47] In the future, next generations immigrants, will be exposed to new risks similar to the risks of the native Dutch. Old risks, like higher risk for infections, will be substituted for risks more comparable to the native Dutch.

Besides the differences in health care use between native Dutch and ethnic minority groups, there also appear to be differences among the ethnic minority groups themselves. Additional analyses showed that Cape Verdean immigrants have a statistically significant lower use of health care than Surinam, Turkish and Moroccan immigrants. Further research is needed to explore why Cape Verdean immigrants are more similar to the native Dutch population regarding health care use.

Because our data are limited to one particular outpatient care unit and moreover to a university hospital, we must be cautious in generalizing the results. Nevertheless we can conclude that especially first-generation immigrants make significantly more use of the outpatients' care in internal medicine. Ethnic differences might decrease as the share of first-generation immigrants decreases. Concerning this point, it is warranted to monitor the risks of diseases associated with prosperity in the future among immigrant groups. Ethnic differences in referral reasons and diagnosis might be based on a higher prevalence of diseases. It is certainly not demonstrated that the increased use is based on referrals for non-medical reasons. As long as the increased use of outpatient health care is related to ethnic background and the generation of the immigrants rather than to socio-economic status, health professionals have to take ethnicity into account in their daily medical practice. Moreover, they should take the main differences in prevalence of diseases among immigrants into account during the consultations.

Acknowledgement: This project was funded by Erasmus MC 'Doelmatigheid Zorg' (internal fund for efficiency of care.) The authors would like to thank P. Burger of the Centre for Research and Statistics (COS) Rotterdam for his assistance in obtaining the necessary data. We thank Katrina Giskes for her helpful comments on a former version of this paper.

What this paper adds: The paper is of importance to health care as it adds valuable knowledge on ethnic differences in the use of health care. Ethnic minorities were almost twice as often referred to the outpatient clinic as native Dutch people. However, ethnic minorities also received a diagnosis more frequently than native Dutch people. The increased use of the outpatient facilities was restricted to first-generation immigrants.

Appendix

Aggregated categories of ICPC and DTC with underlying codes

Aggregated category ICPC	Underlying codes
Referral indefinite, ambiguous signs	Weakness, tiredness general, feeling ill, pain general / multiple sites, nausea, feeling anxious/nerves/tense, feeling depressed, feeling / behaving irritable / angry, sleep disturbance, memory disorder
Referral signs & symptoms gastro-enterology	Abdominal pain/ cramps general, abdominal pain epigastric, heartburn, rectal / anal pain, perianal itching, abdominal pain localized other, dyspepsia / indigestion, flatulence / gas / belching, vomiting, diarrhoea, constipation, haematemesis / vomiting blood, maelena, rectal bleeding, incontinence of bowel, change in faeces / bowel movements, abdominal mass nos, abdominal distension, viral hepatitis, injury digestive system other, congenital anomaly digestive system, oesophagus disease, duodenal ulcer, peptic ulcer other, stomach function disorder, appendicitis, hiatus hernia, abdominal hernia other, diverticular disease, irritable bowel syndrome, chronic enteritis / ulcerative colitis, anal fissure / perianal abscess, liver disease nos, cholecystisis / cholelithiasis, disease digestive system other.
Referral risk factor vascular disease	Elevated blood pressure, hypertension uncomplicated, hypertension complicated, lipid disorder, diabetes insulin dependent, diabetes non-insulin dependent, ischaemic heart disease with angina, acute myocardial infarction, ischaemic heart disease without angina, stroke / cerebrovascular accident, cerebrovascular disease, artherosclerosis / peripheral vascular disease, pulmonary embolism, heart failure.
Remaining referrals	All rest codes occurring at the outpatient department of internal medicine.
Aggregated category DTC	
Diagnosis cardiovascular diseases and risk factor cardiovascular disease, including diabetes	Hypertension, stroke (not specified as haemorrhage or infarction), embolism and thrombosis of arteries, aneurysmas, atherosclerosis peripheral, other arterial disorders, post thrombosis syndrome, ischaemic heart diseases, unstable angina, myocardial infarction, heart failure, dyslipidaemia, riskfactors vascular disease, thrombophilia, diabetes.
Diagnosis liver	Diseases of liver: Hepatitis B/C, alcoholic hepatitis, livercirrhosis, liver tumours.
Diagnosis gastro-enterology	Gastroenterology
Signs and symptoms without diagnosis.	Diagnostic procedures generated no diagnosis. All diagnostic procedures in the beginning were based on signs (i.e. pain) or symptoms (e.g. Fever, deviant laboratory results)
Diagnosis endocrinology without diabetes mellitus	Endocrine System Diseases, without diabetes mellitus.
Remaining diagnosis	Remaining diagnosis

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3

Ethnic differences in gastrointestinal complaints, diagnostic procedures and diagnosis

Lanting LC, Joung IMA, Mackenbach JP, Lamberts SWJ, Bootsma AH.
Submitted 2006.

Abstract

Introduction – The changing ethnic composition of patients affects the diagnostic process, namely by a greater variety of disorders and symptoms. The diagnostic process among immigrant patients is thought to be more complicated. Immigrant patients are more likely to be referred to an outpatient clinic with gastrointestinal signs and symptoms. Little is known about ethnic differences in diagnosis and diagnostic processes with regard to gastrointestinal complaints: do gastro-intestinal complaints occur to the same degree among native and immigrant patients, do they present with the same signs and symptoms, and do immigrant patients receive similar diagnostic procedures as native patients?

Objectives – This study examines (1) the ethnic differences in gastrointestinal complaints presented during the first consultation at a Dutch outpatient clinic, (2) whether immigrant patients with gastrointestinal complaints receive similar diagnostic procedures as native Dutch patients and at the same rates, and (3) whether there are ethnic differences in the diagnosis.

Methods – The study population consisted of 71 ethnic minority (Surinamese, Turkish and Moroccan descent) and 134 native Dutch patients who visited the outpatient department of the university hospital in Rotterdam with gastrointestinal complaints. A medical record review was conducted to assess diagnosis and the diagnostic procedures used.

Results – There were ethnic differences in complaints presented during the first consultation. Immigrant patients presented with pain more frequently but presented less with tangible signs (i.e.diarrhea, melaena, rectal bleeding). We also found ethnic differences in the diagnostic process. Among immigrant patients more diagnostic tests were requested during the first consultation and it took more consultations to reach a diagnosis. ‘Helicobacter pylori infection’ was the only diagnosis that occurred more frequently among immigrant patients.

Conclusions – This study identified ethnic differences in the diagnostic process among patients with gastrointestinal complaints. Physicians appeared to initiate testing earlier among immigrant patients, suggesting that reaching a diagnosis based on history taking is more difficult among this group. However, on the whole, no large ethnic differences were detected in the diagnostic process among patients with gastrointestinal complaints.

INTRODUCTION

As in other Western countries, immigrants represent a large and rapidly increasing segment of the Dutch population. In 1980 non-western immigrants constituted about 3% of the population, in 1990 it was 6% and currently it is more than 10%. Nearly half of the immigrant population lives in the four major cities. In the municipality of Rotterdam 34% of the inhabitants are immigrants, much more than the national average [1]. The changes in the population, with its increasing variety of genetic, cultural and behavioral characteristics of patients, influence health care. The changing ethnic composition of patients affects the diagnostic process, by many factors including an increasing variety of disorders and symptoms. There is evidence that ethnic minorities are less likely than their white counterparts to receive tests, even when very basic in-hospital diagnostic procedures were examined [2]. This evidence is applicable to the United Stated as well as to Europe and Asia [3].

Regarding diagnostic and therapeutic procedures among patients with cancer and cardiovascular diseases, several U.S. studies indicated ethnic differences. Mostly ethnic minorities were less likely to receive adequate laboratory and other diagnostic tests or therapeutic drugs [4]. Previous studies suggest a number of potential reasons for observed ethnic disparities, such as differences in patients' preferences and differences in physicians' assumptions about the underlying disease processes in ethnic minority patients and their non-immigrant counterparts [5-8]. Although there is evidence of broad patterns of inequity in receiving appropriate health care, little is known about patients with gastrointestinal complaints and the subsequent diagnostic procedures.

Gastroenterology is an interesting area, because several studies in the Netherlands reported that immigrant patients are more likely to present to their general practitioner with 'gastrointestinal signs and symptoms' (relative risk for Surinam, Turkish and Moroccan immigrants versus native Dutch people was 1.93, 1.97 and 2.16, respectively) [9-11]. In the Dutch health care system, general practitioners (GP) are the gatekeepers to most other health services, including outpatient care. The system requires that patients be referred by their GP to attend an outpatient clinic. Referrals by general practitioner are based on complaints and on the conviction that patients will benefit from an advanced diagnostic assessment, regardless of ethnicity. Immigrant patients are more frequently referred to outpatient clinics with 'gastrointestinal signs & symptoms' (relative risk for Surinam, Turkish and Moroccan immigrants versus native Dutch people was 0.82, 4.26 and 4.10, respectively) [11]. Studies have reported that the reasons for medical consultation among immigrant patients are more often misunderstood or perceived as not being appropriate by physicians, and that the diagnostic process among immigrant patients may be more complicated because they are less proficient in the native language. Immigrant patients also seem to be less assertive and affective during the medical encounter, they have other concepts of disease, and other expressions of symptoms [12-14]. This might result in less effective referrals, including to outpatient care.

After referral to the outpatient clinics, there is evidence that gastroenterologists encounter problems in the provision of healthcare to immigrant patients with chronic abdominal complaints [15]. For instance, problems related to indefinite, vague symptoms, somatizing, non-adherence to treatment, and a higher frequency of visits. Although it is assumed that the diagnostic process among immigrant patients is more complicated, it has not been described for gastrointestinal complaints. To our knowledge, there are no studies in which patients with gastrointestinal complaints, referred for a diagnostic procedure, were assessed on as well their complaints as the diagnostic procedures used.

The aim of this study is to determine whether differences in diagnostic procedures occurs by ethnicity, and whether there are ethnic differences in complaints and diagnosis among patients referred to an outpatient clinic with gastrointestinal signs and symptoms.

METHODS

Study population

Participants in this study were all new patients, residents of the municipality of Rotterdam, that were seen at their first consultation with unexplained abdominal complaints between March 2002 and March 2003. Their abdominal complaints constituted of pain, vomiting, nausea, constipation, melaena / rectal bleeding, diarrhea or dyspepsia.

Of all 1883 *new* patients who visited the outpatient clinic of the department of Internal Medicine, Erasmus Medical Center (Erasmus MC), the university hospital in Rotterdam, reason for referral was collected and coded according to the International Classification of Primary Care (ICPC). We included only those patients who were referred for abdominal complaints (see appendix) and on condition that complaints were not otherwise specified at the time of referral. Between March 2002 and March 2003 342 patients (18%) were referred with unexplained abdominal complaints. The study was restricted to patients of the four largest ethnic groups: Surinamese, Turkish, Moroccan, and native Dutch (N=273). Patients who came for a second opinion and complaints that were based on a pre-existing disorder were excluded (N=68), leaving a total of 205 patients included in this study (Table 1).

Data

Two trained medical students collected the data from the medical records of all eligi-

Table 1
Characteristics of the study population

	Dutch	Surinam	Turkish	Moroccan	Total
Number of people in the study	134	28	29	14	205
New patients referred with unexplained abdominal complaints as a percentage of all new referrals	12	16	20	17	14
Mean age (Sd)	54.5 (18.0)	43.5 (15.6)	42.2 (12.5)	40.6 (13.8)	50.3 (17.6)
Gender (% males)	36.6	32.1	37.9	28.6	35.6
Socioeconomic status (Sd)[a]	94.5 (13.9)	85.2 (10.8)	78.7 (7.6)	78.5 (7.8)	89.9 (14.0)

[a] Socioeconomic status based on a household income equivalent of the neighborhood (National mean=100).

ble patients. To ensure reliability of coding, the principal investigator and the two students independently coded the first 25 medical records after receiving training for the coding. The level of agreement was shown to be good (interrater reliability > 90%).

During patient history taking, the medical specialists assessed signs and symptoms by asking about complaints. All reported complaints in the medical records were collected separately (pain, vomit, dyspepsia etc.), a distinction was made between tangible signs – which could theoretically be observed by a physician, i.e. diarrhea, melaena, rectal bleeding- and intangible signs (Appendix).

Medical records were examined and data about performed diagnostic tests were collected. First, data about which tests were performed (common laboratory tests like blood analyses and cultures, sonography, endoscopy of the upper and lower intestine, biopsies, CT scan, endoscopic retrograde cholangiopancreatography, the breath test C13-urea). The factor of interest in this study was how efficiently tests were used to reach a diagnosis in the most direct manner. Therefore, data were collected about the tests performed, the number of tests performed and about the time at which these tests were carried out. A distinction was made between early tests (performed after the first and before the second consultation) and tests requested later on (performed after the second consultation).

Diagnoses were recorded verbatim as they appeared on the medical record. Diagnoses were categorised to six groups: (1) no diagnosis, (2) functional disorder (absence of organic disease; e.g. irritable bowel syndrome), (3) gastrointestinal disorder, e.g. colitis ulcerosa, (4) other somatic disorder, e.g. cervical cancer, (5) mental disorder, e.g. depression, and (6) side effects of medication, e.g. use of morphine. The categorisation of diagnoses was performed by the principal investigator under supervision of an experienced physician.

We used the country of birth of the patient and both parents to assign ethnicity. We applied the standard definition of ethnicity of Statistics Netherlands and considered a person to be non-Dutch if at least one parent was born abroad [16]. A six-digit zip code was used for ascribing socioeconomic status (based on the standardized household income of areas) [17].

Analyses

Differences in complaints, diagnostic procedures and diagnosis were estimated using logistic regression analyses in Statistical Package of Social Science (SPSS, version 11). We used multivariate logistic regression models in which adjustment was made for age and sex and additionally for socioeconomic status (SES).

RESULTS

Study population

The study included 205 patients, 65% were of Dutch origin and 35% were immigrants from Turkey, Morocco and Surinam (Table 1). Immigrant patients, from all three ethnic groups, had a lower average income and were younger than the native Dutch patients. There were no gender differences between the four ethnic groups.

Complaints

Table 2 presents ethnic differences in abdominal complaints. A higher proportion of immigrant patients (93%) reported abdominal pain during the first consultation than

Table 2
Ethnic differences in abdominal complaints & signs presented during the history taking

Complaint & signs	Dutch patients^C	Immigrant patients^C	Odds ratio^A	Odds ratio^B
Abdominal pain	63.4	93.0	6.0***	4.8**
Vomit	11.2	15.5	1.1	0.7
Nausea	24.6	35.2	1.4	1.3
Constipation	21.7	23.9	1.0	1.4
Melaena / rectal bleeding	20.1	18.3	0.7	1.3
Diarrhea	38.8	19.7	0.3**	0.3**
Dyspepsia	24.6	36.6	1.3	1.2
Tangible signs (Diarrhea and/or melaena / rectal bleeding)	50.0	32.4	0.4**	0.5*
Intangible signs (Pain and/or vomit and/or nausea and/or constipation and/or dyspepsia)	50.0	67.6	2.6**	2.1*

^{A}= odds ratios (Dutch patients as reference), adjusted for age and sex
^{B}= odds ratios (Dutch patients as reference), adjusted for age, sex and socioeconomic status
^{C}=% within ethnic group
*= $p< 0.05$
**= $p< 0.01$
***= $p< 0.001$

native Dutch patients (63%). This remained after adjustment for sex and age, odds ratios of reporting pain were 6, after subsequent adjustment for SES the odds declined to 4.8. Immigrant patients presented less frequently with complaints of diarrhea (odds ratio 0.3). Analysing the complaints as a categorical variable, distinguishing tangible signs (diarrhea and/or melaena / rectal bleeding) versus non-tangible signs (pain and/or vomit and/or nausea and/or constipation and/or dyspepsia), immigrant patients presented themselves more frequently with non-tangible signs (odds ratio 2.6) and less frequently (odds ratio 0.4) with tangible signs. These associations remained after additional adjustment for socioeconomic status.

Diagnostic procedures

Table 3 presents the ethnic differences in diagnostic procedures and the number of consultations. After the first consultation, almost all ethnic minority patients received one or more diagnostic procedures (97%), but not all native Dutch patients (88%), regardless age, sex and socioeconomic status. Immigrant patients received basic diagnostic tests more frequently, such as laboratory tests of blood. Sophisticated diagnostic tests on the other hand, such as a CT scan, were applied equally to

Table 3
Ethnic differences in diagnostic tests and consultations

	Dutch patients[C]	Immigrant patients[C]	Odds ratio[A]	Odds ratio[B]
Early diagnostic tests (between the 1st and 2nd consultation)	88.1	97.2	5.0*	5.7*
Subsequent diagnostic tests (after the 2nd consultation)	47.8	49.3	1.3	1.2
Sophisticated diagnostic tests, such as CT scan, echography, endoscopy	76.9	73.2	1.0	1.1
More than one *sophisticated* diagnostic test	48.5	25.0	0.3**	0.3**
Basic diagnostic tests, such as laboratory tests of blood, urine, faces	83.6	90.1	1.8a	1.9a
More than one *basic* diagnostic test	60.7	68.8	1.4	1.4
Intensity of tests: more than three diagnostic tests *in total*	53.0	59.2	1.4	1.6
Diagnosis within two months after 1st consultation	63.0	55.8	0.6	0.6
More than 3 *consultations* to reach diagnosis	29.3	42.3	2.5*	2.9*

[A]= odds ratios (Dutch patients as reference), adjusted for age and sex
[B]= odds ratios (Dutch patients as reference), adjusted for age, sex and socioeconomic status
[C]=% within ethnic group
[a]= borderline significant < 0.1
*= p< 0.05
**=p<0.01

immigrant and native Dutch patients. However, immigrant patients received several sophisticated diagnostic tests more frequently. With regard to obtaining a diagnosis, receiving several sophisticated diagnostic test appeared to be negative, since patients that received several sophisticated diagnostic tests were less likely to get a diagnosis (data not shown). Reaching diagnosis was not associated with the administration of sophisticated diagnostic tests (data not shown). No ethnic differences were noted in the intensity of tests or in the required time (within two months after the first consultation) for making a diagnosis. Overall, it took more consultations among immigrant patients for reaching a diagnosis (odds ratio 2.5 for more than 3 consultations till diagnosis).

Ethnic differences in diagnosis

Table 4 presents results for ethnic differences in diagnosis. The proportion of immigrant patients receiving a diagnosis of a gastrointestinal disorder (25%), another somatic disorder (11%), functional disorder (34%), or no diagnosis (30%) were comparable to those among native Dutch patients. Immigrant patients had a higher risk for being diagnosed with a Helicobacter pylori infection.

Table 4
Ethnic differences in diagnosis

	Dutch N=134	Surinamese N=28	Turkish N=29	Moroccan N=14	Immigrants	Total N=205	Odds ratio[A] (CI 95%)	Odds ratio[B] (CI 95%)
No diagnosis	31%	36%	17%	29%	27%	30%	0.9 (0.4-1.7)	1.00 (0.5-2.0)
Functional disorder (absence of organic disease; e.g. irritable bowel syndrome)	28%	21%	41%	43%	34%	30%	0.9 (0.5-1.8)	1.2 (0.6-2.5)
Gastrointestinal disorder	25%	21%	28%	29%	25%	25%	1.1 (0.6-2.4)	0.9 (0.4-2.0)
(Helicobacter pylori infection)	(4%)	(7%)	(28%)	(14%)	(17%)	(8%)	5.7* (1.6-20)	4.6* (1.1-18.4)
Other somatic disorder	9%	14%	14%	-	11%	10%	1.6 (0.6-4.4)	1.2 (0.4-3.8)
Mental disorder	1%	4%	-	-	1%	1%	2.0 (0.1->20)	2.8 (0.10->20)
Side effects medication	5%	4%	-	-	1%	4%	0.5 (0.05-4.4)	0.4 (0.1-3.6)

[A] Immigrants versus Dutch as reference, adjusted for age and sex.
[B] Immigrants versus Dutch as reference, adjusted for age, sex and socioeconomic status.
*= $p< 0.05$

DISCUSSION

This study showed ethnic differences in complaints presented during the first consultation. Our findings showed that immigrant patients presented with pain more frequently and less often with tangible signs (diarrhea, melaena, rectal bleeding) than native Dutch patients. We also found some ethnic differences in the diagnostic process. Among immigrant patients, more diagnostic tests were requested during the first consultation and more consultations were necessary to reach a diagnosis. With the exceptions of the diagnosis of ‘Helicobacter pylori infection’, which occurred more among immigrant patients, no ethnic differences in diagnosis were found.

Before interpreting the results, a few limitations should be considered. Firstly, although all new patients with gastrointestinal complaints during a year were included, the number of patients from each ethnic group that were eligible for the current study were small. Therefore, the research questions could not be examined for the ethnic groups separately, and it was necessary to aggregate the ethnic minority groups to one ‘immigrant’ group. Ethnic differences in presenting complaints, in diagnostic process and in diagnoses may be greater than documented. Especially for the Surinamese population outcomes in diagnostic process and diagnoses seem to be more alike Dutch patients. Second, a similar limitation concerns the aggregation of diagnostic tests and diagnosis. Because of the sample size it was necessary to aggregate separate tests to groups, and the same applies for diagnosis. We created meaningful groups of both, but as a result of aggregation our ethnic group variable became less specific.

In this study all patients were referred to the outpatient clinic with ‘gastrointestinal signs and symptoms’. Despite the fact that general practitioners have reported experiencing difficulties in assessing the reasons for consultations among immigrant patients [18] and to refer immigrant patients more frequently to outpatient clinics with ‘gastrointestinal signs and symptoms’ [11], we found no ethnic differences in the percentages of native and immigrant patients receiving a diagnosis in the outpatient care. This study demonstrates that, after being referred to the outpatient clinic, most patients with gastrointestinal complaints –immigrant patients as well as native Dutch patients- receive a diagnosis, and that comparable percentages of both groups do not receive a diagnosis (immigrant patients 27% and native Dutch patients 31%).

The finding that immigrant patients reported pain more frequently during consultations can be explained by several reasons. The first explanation is that immigrant and native Dutch patients might have different pain sensations. There is evidence regarding ethnic differences in pain perception/tolerance across different types of pain and assessment [19-20]. The literature suggests that the sources of these disparities are complex, but it is confirmed that cultural factors in terms of attitudinal variables do exert a significant influence on pain perception [21]. Pain sensation does not follow automatically from the extent and nature of an injury. Beliefs about the meaning and significance of pain, the context in which it occurs, and the emotions associated with that context can all affect pain sensation [22]. The second explanation is that not all ethnic groups respond to pain in exactly the same way. The response is called pain behavior [23], and includes for instances certain sounds made by the victim, or as well as words used to describe his condition or appeal for help. Pain behavior reflects the diverse attitudes, beliefs, and expectations of the groups to which the patients belong. For instance, in a classic study of ethnicity and pain, it was found that patients' interpretation of pain and expectations regarding pain control varied widely across ethnic groups and that these expectations were communicated to physicians [24]. One study reported an example of Italian patients, which tend toward drama and exaggeration as a means of dissipating and coping with anxiety. That became very evident in the way patients presented their symptoms to their doctors [25]. This information can be meaningful for the results of this study; instead of emphasizing the difference in frequencies of presenting pain, it accentuates that physicians have to take the cultural background of patients into account in interpreting pain in the diagnostic process. Finally, we cannot exclude the influence of linguistic skills on presenting pain. How pain is described is influenced by a number of factors, including language facility and familiarity with medical terms. Turkish and Moroccan patients have difficulties with the Dutch language and this may result in presenting less differentiating complaints and placing more emphasis on pain [26].

In contrast with some other US studies [4][27-28], we did not find ethnic differences in the diagnostic process such as receiving fewer tests. These studies did not concern the specific area of 'gastrointestinal complaints'. Two studies were about diagnostic and therapeutic procedures in general for Medicare beneficiaries [27-28], and one concerns hospitalised patients with coronary heart disease [4]. Although diagnostic procedures for some disorders, like coronary heart disease, are more straightforward than for gastrointestinal complaints with an idiopathic background and, therefore, less susceptible to differences, ethnic inequalities were reported in one study [4]. The contrast with the results of our study could be explained by reasons that are offered in the literature to the observed ethnic differences in procedures. The explanations are varied. Researchers suggest patient choice or preference, unmeasured socioeconomic status, unmeasured clinical variables, unspecified sociocultural factors and differences in health beliefs, and impaired doctor-patient interactions. Other frequently mentioned factors are financial barriers and procedure costs as disincentives for care, differences in provider type and overuse of procedures for whites rather than underuse for ethnic minorities. Yet, almost all researchers raise the possibility of ethnic discrimination by providers [3]. Some of these explanations, like unmeasured socioeconomic status, are not applicable to our study and this may be one reason why we did not find ethnic differences. Due to the Dutch health insurance system there are few financial barriers, and due to the health care system in which general practitioners act as gatekeepers for consultations of outpatient clinics patients choices and preferences are of lesser influence. An additional reason could be the high degree of standardization of medical care. Because Erasmus MC is a university hospital, all physicians are under supervision in their professional education and one of the consequences of this approach is that care, including diagnostic procedures, is highly standardized.

Although we did not find ethnic differences in the amount of diagnostic tests, we did report differences in the process of care concerning early testing (requested during the first consultation) and in the amount of consultations necessary for making a diagnosis. Other studies have shown that physicians, in contact with immigrant patients, repeatedly doubt about the quality of their medical treatment. Physicians may feel uncomfortable because of the experience that health problems of immigrant patients are serious and more difficult to resolve, because they have to make decisions often without complete and accurate information [29-30]. It possibly means that physicians experience fewer opportunities for making diagnoses based on the history taking. When faced with these uncertainties they possibly try to increase certainties by requesting more diagnostic tests immediately after history taking [26]. It took more consultations among immigrant patients to reach a diagnosis, however immigrant patients did not have a higher likelihood of not receiving a diagnosis. It seems that physicians try hard to diagnose effectively, but they need more consultations in the diagnostic process with immigrant patients with gastrointestinal signs and symptoms. This phenomenon may be a result of *clinical uncertainty*. Clinical uncertainty is described as a result of the process in which physicians must balance new information gained from the patient and their prior expectations about the patient to determine the diagnosis. If physicians have difficulty in accurately understanding the symptoms or are less sure of the signs necessary to make diagnostic decisions, then they are likely to place greater weight on so called 'priors'. Priors are beliefs about the likelihood of the patient's condition and they will be different according to age, gender, socioeconomic status, and ethnicity. When these priors, which are taught as logical reasoning to medical students, are considered alongside the information gained in a clinical encounter, both priors and clinical information influence medical decisions [31]. In our study it is plausible that due to difficulties in understanding immigrant patients, physicians place greater weight on 'priors'. The fact that placing greater weight on priors apparently leads to more consultations in this study, suggest that priors about ethnic immigrants could be improved by presenting, among others, ethnic specific information in the course of medical training.

The results of our study regarding Helicobacter pylori are in agreement with the results of other studies. It is known that immigrants have high prevalence of Helicobacter pylori infections [32-33]. The prevalence of Helicobacter pylori infection continues to vary strongly between developing countries and developed countries, and according to living circumstances and socioeconomic factors among people living in the same country [34] .

We do not have reason to expect that the findings of this study would be different among other ethnic minority groups or in fields other than gastroenterology. In non-educational hospitals ethnic differences probably exist, based on the assumption that care is less standardized. Based on the results of this study we conclude that no large ethnic differences were detected in the diagnostic process among patients that were referred to the outpatient clinic. It means that in the clinical practice of outpatient care, introducing adaptations in the diagnostic process is not necessary. Given the fact that physicians are faced with higher levels of uncertainty in diagnostic processes among immigrant patients, it is of importance to provide a remedy. Less is known about the processes by which these uncertainties and preceding perceptions are formed in the course of medical training and clinical experience and incorporated into diagnostic processes. This aspect of medical training is an important subject for further research.

Acknowledgement: We thank Katrina Giskes for her helpful comments on a former version of this paper.

Appendix
Idiopathic abdominal signs

Aggregated group of signs	Underlying complaints
Referral reasons[1]	ICPC-codes: D01 (abdominal pain & cramps), D02 (abdominal pain epigastric), D03 (heartburn), D06 (other localised abdominal pain), D08 (gas pain, belching), D09 (nausea) , D10 (vomit), D11 (diarrhea), D12 (constipation), D15 (melaena), D16 (rectal bleeding), D17 (incontinence of bowel), D18 (change in bowel movements, bowel problems), D24 (abdominal mass, not other specified), D25 (change in abdominal size, distension), D29 (other symptoms, complaints digestive), D84 (indication of disease of esophagus), D86 (indication of other peptic ulcers), D87 (disorders of stomach function, gastritis), D93 (irritable bowel), D99 (other disease digestive system).
Idiopathic abdominal signs	Pain, vomit, nausea, constipation, melaena / rectal bleeding, diarrhea or dyspepsia, all signs with an idiopathic background.
Signs *open to objectification*	Diarrhea and/or melaena / rectal bleeding
Signs *not open to objectification*	Pain and/or vomit and/or nausea and/or constipation and/or dyspepsia

[1] Referral reasons are based on the International Classification of Primary Care (ICPC) and D-codes refer to digestive complaints

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PART II

4

Ethnic differences in mortality, end-stage complications and quality of care among diabetic patients: a review

Lanting LC, Joung IMA, Mackenbach JP, Lamberts SWJ, Bootsma AH.
Diabetes Care 2005; 28; 2280-2288.

Abstract

Objective – To determine the influence of ethnic differences in diabetic care on inequalities in mortality and prevalence of end-stage complications among diabetic patients. The following questions were examined: (1) are there ethnic differences among diabetic patients in mortality and end-stage complications? And (2) are there ethnic differences among diabetic patients in quality of care?

Research design and methods – A review of the literature on ethnic differences in the prevalence of complications and mortality among diabetic patients and in the quality of diabetic care was performed by systematically searching articles on Medline published from 1987 through October 2004.

Results – A total of 51 studies were included, mainly conducted in the US and the UK. In general, after adjusting for confounders, diabetic patients from ethnic minorities had higher mortality rates and higher risk of diabetic complications. After additional adjustment for risk factors such as smoking, socioeconomic status, income, years of education and body mass index, in most instances ethnic differences disappear. Nevertheless, blacks and Hispanics in the US, and Asians in the UK, have an increased risk of end-stage-renal-disease (ESRD), and blacks and Hispanics in the US have an increased risk of retinopathy. Intermediate outcomes of care were worse in blacks, and they inclined to be worse in Hispanics. Likewise, ethnic differences in quality of care in the US exist: process-of-care was worse in blacks.

Conclusions – Given the fact that there are ethnic differences in diabetic care and that ethnic differences in some diabetic complications persist after adjustment for risk factors, other than diabetic care, it seems the case that ethnic differences in diabetic care contribute to the more-adverse disease outcomes of diabetic patients from some ethnic minority groups. Although no generalizations can be made for all ethnic groups in all regions for all kind of complications, the results do implicate the importance of quality of care in striving for equal health outcomes among ethnic minorities.

INTRODUCTION

Diabetes mellitus (diabetes) is one of the most common chronic diseases in Europe and the United States [1-3]. Diabetes is divided into etiologic subclasses of which type 1 and type 2 are the most prevalent [4]. The prevalence of type 1 and, in particular, type 2 diabetes is rising in all European countries [2]. Type 2 diabetes is the major contributor to the epidemic rise in diabetes, because this type accounts for over 90% of diabetes. In the United States, the overall prevalence of diabetes increased from 4.9% in 1990 to 6.5% in 1998 [5]. There is a parallel rise in the prevalence of complications related to diabetes.

The prevalence of diabetes varies, among other factors, by ethnicity. Several studies on ethnic differences in diabetes have reported higher prevalence and incidence rates among ethnic minorities [3-6-7]. Furthermore, end stage complications of diabetes have been reported to be more common among ethnic minorities [8] [9] [10] who also experience higher mortality [11-12]. However, research on ethnic differences in mortality and complications among diabetic patients is fragmented; a systematic overview is missing.

Explanatory research of ethnic differences in general health, has mainly focused on factors that are related to the ethnic minorities directly, such as genetic, socioeconomic and socio-/ cultural factors [13]. Another possible determinant of ethnic health differences is health care itself, more specifically the accessibility and the quality of health care [13]. Although health care alone cannot be expected to eliminate ethnic inequalities in health outcomes, it potentially can play an important role, especially for chronic diseases for which prolonged and regular treatment is required. Only a few studies have examined the role of quality of care [14] [15] as a contributor to ethnic differences in health. For depression, another chronic disease requiring prolonged and regular treatment, it has been found that improving quality of care reduced ethnic disparities substantially [16].

Adequate treatment is important for the management of diabetes and the prevention of diabetes complications [17]. Although plausible, it is unknown whether ethnic differences in quality of care contribute to the explanation of ethnic differences in mortality and end-stage complications among diabetic patients. Therefore a review of the literature was performed in which the following research questions were addressed: (1) are there ethnic differences among diabetic patients in mortality and end-stage complications? (2) Are there ethnic differences among diabetic patients in quality of care?

METHODS

Search strategy

We searched the MEDLINE database for articles published between January 1987 and October 2004. Using the keywords ‘ethnic’ and ‘diabetes’ in combination with at least one of the next: ‘quality of care’, ‘mortality’, ‘complications’, ‘cardiovascular disease’, ‘nephropathy’, ‘retinopathy’, ‘lower extremity’, ‘end stage renal disease’, ‘care’, ‘outcome’ or ‘HbA1c’.

The following inclusion criteria were used:

- Studies in which ethnic minority groups were compared with a white/Caucasian majority group. Studies with international comparisons (comparing ethnic groups of different countries) were excluded.
- Only studies restricted to *diabetic* populations were included. Our interest was in ethnic differences in the development of diabetic complications and the risk of mortality among diabetic *patients,* and the effects of their quality of care. In studies of ethnic differences in diabetic complications performed among the *general* population, part of the ethnic differences is due to ethnic differences in the incidence of diabetes, which is beyond the scope of our paper. Studies on patients with both type 1 and/or type 2 were included.
- Studies that discussed ethnic differences in a quantitative manner, e.g. by giving relative risks, were included.
- Only mortality studies in which all-cause mortality rates were reported were included.
- We restricted quality of care to the actual care given (process). Studies about quality of care in which access to care is investigated, were not covered.

The search produced 407 articles. Screening titles and abstracts narrowed this down to 85 articles. In a careful examination of these 85 manuscripts, 43 studies did not meet the inclusion criteria and this left us with 42 eligible articles for our review. Then we examined the bibliographies of these articles and that added nine articles to our list. Finally, a total of 51 studies were included: Appendix 1 provides an overview of the eligible studies for this review indicating the ethnic groups and outcomes involved.

Variables

Most studies included patients with both type 1 and type 2 diabetes, or did not explicitly state the type of diabetes of the patients included in their study. Since the majority of studies did not make a distinction between patients with type 1 or 2 in the presentation of their outcomes, we were unable to make this distinction in our review.

There is no universally excepted definition of quality of care. For this review we focused on an important dimension of care: actually delivered care. We adapted an operational definition: whether the care individuals received was effective. Effectiveness is composed of the structure-, process- and outcome of care [18]. Structure of health care, referring to the organizational factors, is the first aspect. On the whole the structure is mainly an indirect and contingent influence on care, especially when ethnic differences in quality of care is studied within hospitals and not between hospitals. Although structural aspects can have a direct impact on outcomes, we do not think that they are the main reason of ethnic differences and we decided to leave them out of consideration [18]. Process of care is the actual delivery and receipt of care, with technical interventions and inter-personal interactions between users and members of a healthcare system as key processes. Process measures were ordered in five categories in order to assess the quality of care: Test HbA1C (test performing and treatment in case of poor control), test blood pressure (test performing and treatment in case of poor control), eye examination, renal function & lipids examination and others (physician visits, dietary consultations) [19]. Outcomes are consequences of care. Mortality and complications (lower extremity amputations, retinopathy, renal dysfunction, cardiovascular disease and neuropathy) are considered as long-term outcomes, while outcome measures like HbA1c and blood pressure, for instance, are considered intermediate outcomes of care.

We included all ethnic groups, but in practice the diversity is restricted to a few main groups. The different ethnic groups were categorized into four categories (Table 1) for ease of analysis.

Table 1
Summary table: Categories of ethnic minority groups and the number of studies in which the specific outcomes have been studied for each of the ethnic categories. The majority group consisted of Caucasians or (non-Hispanic) whites.

Cover terminology	Ethnic minority groups	Number of studies	OUTCOMES			
			Mortality	Complications	Intermediate outcomes	Process of care
BLACK	African American, Black, (non-Hispanic) black, African Caribbean	39	6	18	9	15
HISPANIC	Mexican American, Latino, Hispanic, Hispanic American	19	1	10	4	6
ASIAN	Asian, Indo Asian, South Asian	9	1	7	-	1
OTHER	Native American, Algerian, other ethnicity	5	1	3	-	2

ANALYSIS

We analyzed the data successively for mortality, complications of diabetes, intermediate outcomes of care and quality of care. In the different studies included in this review there was a large variation in the (number of) variables for which adjustments were made. To determine whether any ethnic differences existed between diabetic patients in mortality and end-stage complications (research question 1), we started to assess studies in which only adjustments were made for confounders. Only three factors were considered as *confounders:* age, sex and duration of diabetes. Other factors (such as socioeconomic status, smoking and health insurance) that can act as intermediaries in the causal chain between ethnic background and diabetic outcomes, were considered as *risk factors*. Studies in which adjustment is made for such risk factors could, indirectly, shed some light on the question whether quality of care has the potential to decrease ethnic differences in mortality and end-stage complications among diabetic patients. If ethnic differences disappear after controlling for other risk factors, there is no need to focus further on ethnic differences in quality of care as a possible explanation. On the other hand, if there has been extensive control for other risk factors, and still ethnic differences in diabetic complications and mortality persist, there is room for quality of care to play a role in the explanation of the remainder of the ethnic differences in diabetic outcomes. Therefore, the outcomes of the studies of this review are described in two steps. First, the outcomes of studies after adjustment for confounders are assessed, in order to determine whether there are ethnic differences among diabetic patients in mortality, end stage complications and intermediate outcomes of care. Secondly, the outcomes of studies are assessed after adjustment for risk factors of adverse diabetic complications, other than the quality of care (e.g. educational level, obesity status, smoking, income). Throughout the article adjustment for these risk factors is referred to as a ‘more comprehensive adjustment’ besides the ‘basic adjustment’ for confounders. In studies where more comprehensive adjustment for risk factors was made, we evaluated whether ethnic differences that could be attributed to ethnic differences in health care remained.

RESULTS

Ethnic differences in mortality and diabetic complications

Mortality

In Table 2 the outcomes of studies on ethnic differences in mortality are shown. In tables 2-5 a single study addressing several ethnic groups (and/or several outcome variables) could contribute more than one sign. That applies also for studies with stepwise adjustment for confounders and risk factors. Since there were only a few

Table 2
Ethnic differences in mortality (reference whites) reported by included studies (part of studies)

Region	Ethnicity	No adjustment	Adjusting for confounders	Adjusting for additional risk factors
USA	Black		- - - -	=
	Hispanic		- =	- = = =
UK	Black		+ +	=
	Asian		=	
Other	Other		- =	

Outcomes are coded as "-" (worse situation; higher mortality), "=" (no difference in mortality), "+" (better situation; lower mortality). Studies addressing several outcome variables and/or ethnic groups or studies making stepwise adjustment for confounders and risk factors could contribute more than one sign to the table.

studies that investigated more than one minority group or outcome variable or that made stepwise adjustments, nearly each sign represents one study.

A more detailed overview of mortality and morbidity data is given in Appendix 2.

Five US studies [12-20-23] reported higher mortality rates among ethnic minorities, after adjustment for confounders. In one study the ethnic differences in black versus white disappeared after adjustment for additional risk factors, like income and cigarette smoking [21]. In another study the ethnic differences persisted for U.S.-born Mexican Americans after adjusting for risk factors like smoking status and blood pressure. However, after additional adjustment for more risk factors like disease severity, the differences disappeared [23].

Two UK studies [11-24] reported, on the contrary, lower mortality rates among blacks after adjusting for age, sex and BMI, which was no longer statistical significant after adjustment for additional risk factors [24]. One UK study [25], in which was adjusted for sex, age and duration of diabetes, reported no differences in mortality rates between Asians and whites. A New Zealand study [26] showed higher mortality rate for Maori people, but no differences for inhabitants of the Pacific Islands.

After adjusting for confounders, higher mortality rates were found among blacks in the US but lower rates among blacks in de UK. After adjusting for other risk factors, besides age and sex, no ethnic differences in mortality were found in most studies.

Lower Extremity Amputations (LEA)

In four US studies [8-10-27] [28] in which no adjustments, apart from age and/or sex, were made, higher risks of LEA were reported among ethnic minorities. In other studies, in which more comprehensive adjustments were made, risks for ethnic groups were different compared to studies only adjusting for confounders. For blacks increased risks were seen in two studies [29-30], whereas in four other studies [27-31-33] no differences were reported. In two studies among Asians [29-32], in which comprehensive adjustments were used, a decreased risk of LEA was reported. For Hispanics results were more contradictory: one study [8], only adjusted for age, showed a lower risk. In other studies on Hispanics, after adjusting for additional factors, equal risk was reported in two studies [31-32] and increased risk in two studies [29] [28]. Native Americans have a higher risk of LEA; one study [29] reported an increased risk after adjusting for several risk factors besides age and sex.

In two UK studies [34-35], one without adjustment and another adjusting for only age and sex, lower risks for LEA were reported among blacks and Asians. The lower risk for blacks disappeared after adjusting for risk factors such as smoking and neuropathy [34].

After adjustment for confounders (age and sex) most ethnic minorities in the US have increased risks of LEA, which are absent after a more comprehensive adjustment for risk factors.

Retinopathy

After adjusting for confounders, blacks as well as Hispanics had a higher risk of retinopathy in the US [31]. In studies with more comprehensive adjustments, the risk of retinopathy for blacks in the US were conflicting: three studies reported equal risks of retinopathy [9-36-37], one reported a lower risk [38] and one demonstrated a higher risk for developing progressive retinopathy [39]. In other studies, in which only adjustments for risk factors were performed, risk for Hispanics (Mexican Americans) was higher than for whites in two studies [9-40], whereas one study noted a smaller risk [41].

In the UK, blacks had an equal risk of retinopathy after adjustment for age [24], and Asians had a lower risk after adjustment for risk factors like smoking or treatment [42]. In France, Algerian immigrants had equal risk of retinopathy compared to French people, after matching for sex and duration of diabetes [43].

Generally, ethnic minorities in the US seem to have a higher risk of retinopathy. After adjusting for risk factors results are inconsistent for blacks. Only the higher risk for Hispanics persists.

Renal complications (nephropathy and end stage renal disease-ESRD)

In the US the risk of ESRD is reported to be higher among Hispanics and blacks than among whites [44-45], after adjusting for confounders; one study reported equal risk [31]. In studies with adjustments for risk factors, equal risks for blacks are noted in one study [37]; while two studies noted an increased risk for blacks [32-46]. Asians were reported to have a higher risk of ESRD and for Hispanics conflicting results were reported: one study [41] reported an equal risk, and an increased risk was mentioned in another study [32].

Two UK studies [42-47] reported higher rates of ESRD among Asians; and one [24] found no differences between blacks and whites in proteinuria. Asians had an increased risk in a Dutch study [48], and a French study [43] reported no ethnic differences among Algerians who were living in France.

In conclusion, ethnic minorities showed a higher risk of ESRD than whites, especially blacks and Asians. After adjusting for risk factors the higher risk remains.

Cardiovascular disease

Cardiovascular complications included coronary heart disease, myocardial infarction, stroke and congestive heart failure. After adjustment for confounders, one US study

Table 3
Ethnic differences in diabetic complications (reference whites) reported by included studies (part of studies)

Complication	Region	Ethnicity	No adjustment	Adjusting for confounders	Adjusting for additional risk factors
Lower extremity amputations	USA	Black	- -	- - =	- - = = = =
		Hispanic	-	- + =	- =
		Asian			+ +
		Other			- =
	UK	Black	+		=
		Asian		+	
Retinopathy	USA	Black		-	- + = = =
		Hispanic		-	- - - +
	UK	Black		=	
		Asian			+
	Other	Other		=	
Nephropathy & End Stage Renal Disease (ESRD)	USA	Black		- - =	- - =
		Hispanic		- =	- =
		Asian			-
	UK	Black		=	
		Asian	-		-
	Other	Asian		-	
		Other		=	
Cardiovascular complications	USA	Black		= =	+ = =
		Hispanic		= =	+ + +
		Asian			+ + +
	UK	Black		+	
		Asian			+ =
Neuropathy	USA	Black		=	=
		Hispanic		=	=
	Other	Other		-	

Outcomes are coded as "-" (worse situation; increased/higher risk), "=" (the same situation; no different risk), "+" (better situation; decreased/lower risk). Studies addressing several outcome variables and/or ethnic groups or studies making stepwise adjustment for confounders and risk factors could contribute more than one sign to the table.

[31] reported equal risks of cardiovascular diseases for blacks and Hispanics. After adjustments for risk factors in another study, Asians and Hispanics had a lower risk, while an equal risk for blacks remained [32].

Two UK studies [24-42] reported a lower risk of cardiovascular disease in blacks and Asians, although Asians had an equal risk for heart vascular diseases (angina and myocardial infarction).

Overall, a lower risk of cardiovascular disease was reported for ethnic minorities.

Neuropathy

No ethnic differences were reported in risk of neuropathy in the US for blacks or Hispanics [31-37-41]. On the other hand, a French study [43] has reported a higher risk of neuropathy among Algerians in France.

Ethnic differences in intermediate outcomes of care

In 13 studies [14-15-49-55], all performed in the US, intermediate outcomes of diabetic care are discussed. In nine studies worse levels of outcomes (e.g. higher HbA1c, higher risk of hypertension) are reported among ethnic minorities (i.e. Hispanics, African Americans, blacks) [14-49-54-56-57]. Most studies among blacks reported worse outcomes [14-49-54-56-57], while two studies [58-59] report only worse outcomes among black women, but no differences for men. An interventional study showed no difference in the outcomes, neither before nor after the intervention took place [55]. The majority of studies about blacks adjusted for several factors [15-49-50-52-54-56-59]. Only two studies [14-51] did not adjust at all, with similar results compared to the adjusted studies. For Hispanics one (unadjusted) study reported worse glycemic control and a higher risk for clinical proteinuria [14]. Two other studies, after adjusting extensively, reported different outcomes in glycemic control; one study [59] demonstrate no ethnic differences in glycemic control, while another study [49] showed worse control among Hispanics.

Table 4

Ethnic differences in intermediate outcomes of care (reference whites) measured by separate indicators and reported by included studies (part of studies), all US-studies.

Intermediate outcome	Ethnicity	No adjustment	Adjusting for confounders	Adjusting for additional risk factors
HbA1C	Black	= =	-	- - - - - - - = =
	Hispanic	-		- =
Other	Black	- - - = = = = = = = +		- - = = =
	Hispanic	- = = +		- = = =

Outcomes are coded as "-" (worse outcome regarding one indicator), "=" (equal outcome regarding one indicator), "+" (better outcome regarding one indicator). Studies addressing several outcome variables and/or ethnic groups or studies making stepwise adjustment for confounders and risk factors could contribute more than one sign to the table.

Overall, intermediate outcomes of care were worse in blacks, and outcomes among Hispanics inclined to be worse.

Ethnic differences in quality of care

Results of ethnic differences in quality of care (process-of-care) are shown in Table 5. In this table a lot of studies investigated more than one process measure. That implies that in this table, in contrast with the previous tables, one study contributed on average more than one sign. Overall, 15 studies concerning ethnic differences in quality of care were included, all of which were performed in the US. As mentioned previously, we restricted ourselves to process of care; indicators were mainly the frequency of several preventive tests for treatment of diabetes. Two studies only took the frequency of eye care tests in account, while other studies assessed several tests

Table 5

Ethnic differences in process of care (reference whites) measured by separate indicators and reported by included studies (part of studies), all US-studies.

Process-of-care	Ethnicity	No adjustment	Adjusting for confounders	Adjusting for additional risk factors
Test HbA1c	Black	- - =		- - - = = = = = = = =
	Hispanic			= = = = = =
	Asian			+
	Other			
Blood-pressure	Black	= = = =		=
	Hispanic	- - = =		=
	Asian			
	Other			
Eye exam	Black	- - = =		- - - = =
	Hispanic	=		+
	Asian			=
	Other			
Lipids – and Renal function	Black	- - - - = = = =		- - - = = = = +
	Hispanic	- - - =		= = = =
	Asian			= = =
	Other			
Other	Black	- - + + = = =	+	- - - = = = = = = +
	Hispanic		=	- - - - = = =
	Asian			+ +
	Other		=	

Outcomes are coded as "-" (worse quality regarding one indicator), "=" (equal quality regarding one indicator), "+" (better quality regarding one indicator). Studies addressing several outcome variables and/or ethnic groups or studies making stepwise adjustment for confounders and risk factors could contribute more than one sign to the table.

simultaneously. In five studies [15-31-49-54-60], higher quality for ethnic minorities for at least one indicator was reported, while eight [14-37-50-52-61-63] reported an overall lower quality for ethnic minorities in process of care. The only intervention study included in this review, showed lower quality for ethnic minorities before the intervention was implemented, while after the intervention differences disappear [55]. Blacks especially scored lower on one or more indicators [14-37-50-52-61-63]. One study [53] reported equal quality of (process-of -) care for blacks and three studies [15-31-54] noted predominantly a higher quality of care for blacks. For Hispanics, two studies reported equal quality of process-of-care [31-53], two studies [14-63] reported lower quality and one study higher quality [49]. One study [60] involved non-English speaking Asians (56% of the Asians compared to 7% of whites were non-English speaking). Non-English speaking diabetic patients were receiving higher quality of process-of-care.

Overall, process of care was worse in blacks and Hispanics.

Relationship quality of care and diabetic morbidity and mortality

Studies in which both quality of care and outcomes of care (intermediate outcomes, morbidity and/or mortality) are measured and where associations between both factors have been analyzed would provide a direct opportunity to determine the influence of ethnic differences in diabetic care on inequalities in diabetic outcomes. Many studies have investigated quality of care and intermediate outcomes of care [14-15-49-54]. Unfortunately, with the exception of four studies [14-52-54-55], most research has treated the measurements separately and not analyzed the associations. The first [52] examined several factors that may explain why black patients, compared to whites, have worse intermediate outcomes (glycemic control). Process-of-care is considered as a determinant and three indicators were investigated: control of cholesterol, control of blood pressure and reporting of a flu shot in the past year. One indicator, receiving a flu shot, was associated with glycemic control: not receiving flu shots is related to worse glycemic control. This supports the notion that a higher quality of care is associated with better glycemic control. However, in this study no ethnic differences in glycemic control were found. In the second study [54], process-of-care (frequencies of tests: e.g. HbA1c) of African-Americans and Caucasians were compared. The finding that African-Americans were in poorer metabolic control than Caucasians led to the analysis of the relationship of glycemic control to determine test-frequency per group. There were no ethnic differences in the frequency of testing for HbA1c; African-Americans were more likely to have a cholesterol or creatinine test. Those in poorer control tended to have a low number of tests. The third study reported no association between outcomes of care and process of care (one indicator: the number of physician visits per year), with a few exceptions. Hypertensive blacks with six or more visits in the previous year were more likely to have a blood pressure

<140/90mmHg than those with less than six visits [14]. So, these studies do not suggest ethnic differences in outcomes, caused by ethnic differences in process-of-care. The fourth study is an intervention study, in which an intervention to improve health care was implemented, focusing on ethnic populations. The intervention had three foci; partly it consisted of improvements of quality of care. Two years after the implementation ethnic differences in the process of diabetes care was disappeared [55].

Two studies [31-37] investigated the quality of care and subsequent morbidity and/or mortality. In these studies, no analyses were conducted to assess the relationship between quality of care and morbidity and/or morbidity.

DISCUSSION

After adjusting for confounders, the literature shows that diabetic patients from ethnic minorities have higher mortality rates and a higher risk of diabetic complications. After additional adjustment for risk factors like smoking, socioeconomic status, income, years of education and body mass index, in most instances ethnic differences disappear. Nevertheless, among the US blacks and Hispanics, and among the UK Asians, an increased risk of ESRD is seen, and blacks and Hispanics in the US have an increased risk of retinopathy. Intermediate outcomes of care are worse in blacks, outcomes among Hispanics were also inclined to be worse. Likewise, ethnic differences in the quality of care in the US exist: process-of-care is worse among blacks.

Several limitations of this review need to be mentioned before the findings are discussed. A common problem in a review is the comparability of the studies included. In our review comparability may be limited by a lack of a clear definition of ethnic groups, the outcome measures (especially measures of the quality of care), a clear description of type of diabetic patient included in the study, and heterogeneity in the age range of patients and the source population of the patients.

Firstly, the lack of a clear definition of ethnicity makes it difficult to compare ethnic groups in a reliable way. Mexican Americans and Hispanics belong partly to the same ethnic group, but studies included probably one of the two, without giving a more precise definition. Creating subgroups as black and white Hispanics, without specifying the definition, makes it more complex to separate whites, blacks and Hispanics from each other.

A clear definition of outcome measures, especially for quality of care, was missing in most studies. Only a few studies discussed the criteria for quality in an explicit way; the lack of definitions of quality or operational definitions makes it difficult to compare studies regarding quality of care. In order to investigate the importance of quality of care for ethnic differences in diabetic outcomes, it is important that future research describes how quality of care is defined and operationalized. Besides, in most studies quality of care was not investigated. For these studies we infer the possible meaning of quality of care by assessing the explanation of ethnic differences by factors other than quality of care. However, most studies did correct for confounders and/or other factors, but only a few studies corrected for confounders in the beginning and subsequently extended the adjustment with risk factors. The last methodology would have produced results concerning the influence of quality of care on ethnic differences in outcomes. In the absence of these types of studies, we had to infer the explanations from different factors between different studies. In addition, the inclusion of different types of diabetes further complicated the preparation of this review. About half of the studies gave a description of the type of diabetes included; studies included type 1 diabetes and/or or type 2 or both types. Almost none of the studies, which included both types of diabetes, investigated in the analyses the role of the different types of diabetes on the outcomes. Two studies [44-46] reported different relative risks of ESRD for insulin dependent diabetes mellitus (IDDM) and non insulin dependent diabetes mellitus (NIDDM) separately. The relative risks for black versus white in the two studies for IDDM was respectively 0.90 and 1.03, while for NIDMM the risk was significant increased: 4.80 and 4.31. Based on only two studies, we cannot determine ethnic differences in outcomes regarding the type of diabetes. Finally, the comparability of studies is complex, because some studies used national data while others used data from one hospital. We did not give a higher weight to the results of a national study with large populations [54] in comparison with results based on a smaller population in one setting [48]. The methodological issues with regard to the comparability of the studies, only allow us to draw tentative conclusions.

We noticed differences between the results of studies conducted in the US and studies conducted in the UK: in many US studies ethnic minorities were found to have increased risks for mortality and diabetic complications, whereas in many UK studies ethnic minorities were reported to have lower or equal risks in comparison to the white majority. Ethnic minority groups in the US and UK are partly different: Asians in the US mainly originate from countries as China and Japan, while Asians in the UK mostly originate from India and Pakistan. Blacks in the US and blacks in the UK have, although both originating from Africa, different migration histories. However, with regard to this last group, it was remarkable that blacks in the US have an increased risk of mortality and diabetic complications, whereas in the UK blacks had lower risks. These differences cannot be attributed to genetic differences. Although cultural differences between blacks living in the US and UK could be an explanation, health care differences between these countries could also be a probable explanation. Access to care in the UK with its NHS is more equal than in the US [64]. It is also possible that differences in the quality of care exist between these countries with the quality of care in the UK being more equal among ethnic groups than in the US. Unfortunately, the studies on ethnic differences in quality of care all originated from the US, and consequently we are not able to study this assumption further.

Further, we did not take ethnic-specific guidelines into account and assume that optimally, the process of care should be the same for all ethnic groups. This is debatable, because the process of care is based on guidelines with overall less attention for ‘specific clinical circumstances’. Specific clinical circumstances usually refer to the age and sex of the patient. In ethnic minority groups particular diseases can be more prevalent or more severe, and this may also determine the patient’s clinical circumstances. Ignorance of ethnic differences between patients could lead to inferior quality of care for ethnic minorities [65].

We found no studies in which the role of quality of care in the explanation of ethnic differences in mortality and diabetic complications was empirically tested. However, recently a study showed by improving (in a broad approach with tree different main foci) the quality of care, ethnic differences in process of care disappeared [55]. Further, there are several indirect indications that the quality of care might be of importance. In studies in which extensive adjustment was made for other risk factors except the quality of care, e.g. by adjusting for patient and socioeconomic characteristics, for several outcome measures ethnic differences in the outcomes remained present. Differences in risk of retinopathy and ESRD mainly persisted for blacks and Hispanics after adjustment. Because adjustments were made for a wide range of variables, except for quality of care, it is plausible to state that quality of care might play a role. Additionally, although there were no studies in which adjustment was made for quality of care, there were several studies in which adjustment was made for intermediate outcomes of care. While studies adjusted for confounders demonstrate the presence of ethnic differences, subsequent adjustment for intermediate outcomes of medical care, like hypertension, HbA1c levels, cholesterol levels and proteinuria, result in no ethnic differences in long-term diabetic outcomes [21] [24] [27] [34]. To elaborate on this, outcomes of medical care have a direct influence on morbidity and mortality; it therefore can be concluded that the quality of this care plays an important role.

We did not investigate the reasons of ethnic differences in the quality of care, but recently a US study explored the reasons why black patients received lower-quality health care than white patients. Black patients and white patients are to a large extent treated by different physicians. The physicians treating black patients may be less well trained clinically and may have less access to important clinical resources than physicians treating white patients. In a certain extent these differences may have lead to disparities in the outcomes [66]. Other reasons could be racism [67], physicians’ perceptions of patients [68], preferences of the patients [69-70] or the patient-caregiver relationship [71].

We conclude that, especially for blacks and Hispanics in the US, differences in outcomes can decrease by improving the quality of care. For the UK, only Asians have a higher risk of end stage renal disease and the influence of quality of care on this result is less convincing than in the US. There is no general pattern in risks of complications or mortality for ethnic minorities as a whole. The diversity in risks of the several diabetic complications in ethnic groups, combined with the different results for the US and the UK, does not allow us to generalize the results to other regions or other ethnic groups. However, the results indicate that quality of care is an important factor among ethnic minority groups.

Acknowledgement: This project was funded by Erasmus MC 'Doelmatigheid Zorg' (internal fund for efficiency of care). We thank Katrina Giskes for her helpful comments on a former version of this paper.

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Appendix 1: Overview of included studies

Author (reference)	Region	Study population, all diabetic patients	Definition ethnic groups (data derived from)	Ethnic groups in study					Outcomes			
				Black	Hisp.	Asian	White	Other	Mortal-ity	Com-plica-tions*	In-terme-diate out-come	Quality of Care
Arfken et al. 1994 (39)	USA	IDDM patients	-	58	-	-	142	-		2		
Asch et al 2000 (52)	USA	Elderly Medicare beneficiaries	-	5729	-	-	39,739	-			X	X
Bell et al 2001 (15)	USA	Aged > 18 years	-	188	7	-	201	33			X	X
Bonds et al 2003 (54)	USA	Diabetic patients (type 2), aged 40-69	-	147	156	-	149	-			X	X
Brancati et al 1992 (47)	USA	Black and white (total 442) NIDDM & IDDM patients with ESRD	-	x	-	-	x	-		3		
Brown et al 2003 (50)	USA	Aged 18 years and older	- (survey)		1742		2941				X	X
Burden et al 1992 (48)	UK	Patient control group	Country of birth (survey)	-	-	10	14	-		3		
Chandie Shaw et al 2002 (49)	The Netherlands	Diabetic patients (type 2), older than 30 years of age	Country of birth (municipality registration)	-	-	29	27	-		3		
Chaturvedi et al 1996 (25)	UK	NIDDM patients	Country of birth (survey)	77	-	-	150	-	X	2-3-4		
Chin et al. 1998 (38)	USA	Aged 65 years and older	- (survey)	190	-	-	1,186	-		2-3-5		X
Cowie et al 1989 (45)	USA	Diabetic (type 1 and 2) patients with end-stage renal disease	-	470	-	-	861	-		3		

Author (reference)	Region	Study population, all diabetic patients	Definition ethnic groups (data derived from)	Ethnic groups in study					Outcomes			
				Black	Hisp.	Asian	White	Other	Mortal-ity	Com-plica-tions*	In-terme-diate out-come	Quality of Care
Cowie et al. 1997 (64)	USA	Noninstitutionalized adults with NIDDM.	- (survey)	588	114	-	1,468	-				X
Davis et al 2004 (29)	USA	Diabetic (type 1 and 2) patients ; in total 33704	-	x	x		x			1		
Delamater et al 1999 (57)	USA	Children and adolescents with type 1 diabetes	Descent (medical chart, confirmed by nurse)	68	145	-	44	-			X	
Eberhardt et al 1994 (58)	USA	Aged > 17 years	- (interview)	79	-	-	123	-			X	
Gu et al 1998 (23)	USA		- (interview)	145	-	-	515	-	X			
Guadagnoli et al 1995 (31)	USA	Patients who underwent surgery for peripheral vascular disease in one of 3313 hospitals	- (race: data set from the Health Care Financing Administration)	1,109	-	-	5,190	-		1		
Gujral et al 1993 (36)	UK	Patients (IDDM and NIDDM) who underwent a lower extremity amputation	Country of birth (survey)	-	-	3	266	-		1		
Haffner et al 1988 (41)	USA	NIDDM patients	Country of birth (interview)	-	257	-	56	-		2		
Hamman et al 1991 (42)	USA	NIDDM patients	Self-identification (interview)	-	187	-	92	-		2-3-5		
Harris et al 1993 (37)	USA	NIDDM patients, age older than 40 year	- (Race: data collected during a visit)	468	-	-	960	-		2		

Harris et al 1998 (9)	USA	Patients DM type 2	- (interview)	261	308	-	345	-		2		
Harris et al 1999 (60)	USA	Noninstitutionalized DM type 2 patients, Aged 20 year and older	- (interview)	405	450	-	590	-			X	
Harris et al 1999 (40)	USA	Patients DM type 2, aged 40-69	-	49	-	-	56	-		2		
Harris 2001 (14)	USA	Diabetic patients (type 2)	- (questionnaire)	405	450	-	590	-			X	X
Heisler et al 2003 (51)	USA		-	115	-	-	801	-			X	X
Hunt et al 2002 (24)	USA	Aged 25-72 years old. Mexican Americans were divided in Mexico-born and U.S.-born M.A.'s	Parental surnames and birthplaces, stated ethnicity of grandparents, and self- identification (interview)		649		178		X			
Jenkins et al. 2004 (56)	USA	270 patients represent the community of 12000 diabetes patients	-	158	-	-	112	-			X	X
Karter et al 2002 (33)	USA	Patients registered in a diabetes registry	Self-identification (survey)	8,740	6,243	7,491	39,956	-		1-3-4		
Lavery et al 1996 (8)	USA	Noninstitutionalized adults with NIDDM.	-	588	114	-	1,468	-		1		
Lavery et al 1999 (10)	USA	Patients with amputations	- (Race based on physician's history and physical examination, hospital admission database, and the nurse's hospital notes)	71	815	-	157	-		1		

Author (reference)	Region	Study population, all diabetic patients	Definition ethnic groups (data derived from)	Ethnic groups in study					Outcomes			
				Black	Hisp.	Asian	White	Other	Mortality	Complications*	Intermediate outcome	Quality of Care
Leggetter et al 2002 (35)	UK	178 (patient with LEA) and 350 controls (with no LEA)	Self-identification (medical records)	39 Control: 129	-	-	139 Control: 221	-		1		
Martin et al 1995 (32)	USA	NIDDM patients	- (survey)	232	29	-	81	-		1-2-3-4-5		X
Mather et al 1998 (26)	UK		-	-	-	730	304	-	X			
Nishimura 2001 (21)	USA	Diabetic patients (type 1)	- (questionnaire)	79	-	-	995	-	X			
Pugh et al 1988 (46)	USA	Patients with end-stage renal disease	Nominator: - Denominator: self-designation. (Denominator: Survey Nominator: as recorded in an application form, usually by the patient or a social worker)	684	1297	-	641	-		3		
Rekeneire et al. 2003 (53)	USA	Nondisabled patients, aged 70-79 years	- (interview)	274	-	-	194	-			X	X
Resnick et al 1999 (28)	USA	Subjects from a follow-up study	- (survey, interview)	2,199	-	-	12,036	-		1		
Samanta et al 1991 (43)	UK	Patients aged 35-55 years	Country of birth (interview)	-	-	456	451	-		2-3-4		
Schneider et al 2002 (63)	USA	Aged 65 and older	- (Center for Medicare and Medicaid Services, CMS)	17,729	8,058	-	128,943	8,058				X

Selby and Zhang 1995 (34)	USA	Primarily NIDDM patients; 150 patients with a first non-traumatic LEA; 278 control subjects matched on age, sex and duration of diabetes	- (-)	172	-	18	210	28		1		
Simmons et al 1999 (27)	New Zealand	Diabetic patients (type 2)	Self-identification (survey)	-	-	-	394	153 and 218	X			
Tocher et al 1998 (61)	USA	Diabetic patients (type 2)	- (data from physician and hospital billing databases)	151	-	87	345	39				X
Tull and Barinas 1996 (12)	USA	IDDM patients	- (database Diabetes Epidemiology Research International DERI)	67	-	-	941	-	X			
Vaccaro et al 1998 (22)	USA	Male patients	Self-identification (interview)	610	-	-	3997	-	X			
Vague et al 1988 (44)	France	IDDM patients	Country of birth (-)	-	-	-	41	41		2-3-5		
Wang et al 1996 (62)	USA	Medicare beneficiaries, aged 65 and older	- (datafile)	21,256	-	-	153,759	-				X
Weatherspoon et al. 1994 (59)	USA	NIDDM patients	Self classification (Medical record)	248	-	-	280	-			X	
Weng 2000 (11)	UK	African Caribbean and Caucasian patients (total 958)	-	x	-	-	x	-	X			
Wisdom et al 1997 (55)	USA		- (Billing system)	715	-	-	1,597	-			X	X

* Complications: 1= Lower extremity amputation, 2= Retinopathy, 3= Nephropathy and End Stage Renal Diseases (ESRD), 4= Cardiovascular , 5= Neuropathy.
- : Ethnicity/race not defined

Appendix 2: Overview of the results of the included studies

Region	Outcome measure	Results (whites as reference)	Adjustment for	Ref
Mortality				
USA	Risk of death	African-American: 1.68 (95% CI 1.35-2.10)	Age	21
USA	Mortality rates per 1,000 person-years	Black: +	Age	12
USA	Relative Risk	Black: 1.84 (95% CI 1.13-3.01)	Sex, age	23
USA	All-cause mortality	Black: +	Age	22
	All-cause mortality	Black: =	Age and income, cholesterol, Syst. BP and cigarette smoking	
USA	All-cause mortality	U.S. –born Mexican American: + Mexico-born Mexican American: =	Age, sex Age, sex, medication, total cholesterol, HDL cholesterol, smoking status, blood pressure	24
	All-cause mortality	U.S. –born Mexican American: + Mexico-born Mexican American: =	2 + fasting glucose, duration of diabetes and disease severity	
	All-cause mortality	U.S. –born Mexican American: = Mexico-born Mexican American: =		
UK	Mortality rate per 100 person years	African Caribbean's: -	Age	11
UK		African Caribbean		25
	All-cause Hazard ratio	0.47 (95% CI 0.26-0.85)	Sex, BMI	
		0.59 (95% CI 0.32-1.10)	Sex, BMI, proteinuria, smoking	
UK	Mortality rate ratios (All cause)	South Asian 30-54 1.50 (95% CI 0.72-3.12) 1.20 (95% CI 0.75-1.91) 0.90 (95% CI 0.62-1.31) 75+ 0.53 (95% CI 0.31-0.89)	Sex, duration of DM, age at baseline	26
New Zealand	Standardized mortality ratios per 100,000 person years	Maori: + Pacific Islander : =	Age and sex	27
Complications				
A. Lower Extremity Amputations (LEA)				
USA	Incidence of foot amputations	Hispanic: + Black: +	Unadjusted	29
USA	The incidence of LEA (all sites) per 10.000 persons at risk	Hispanic: 44.43 (95% CI 41.64-47.21) Non-Hispanic white: 55.98 (95% CI 52.85-59.10) African-American: 95.25 (95% CI 87.79-102.71)	Age	8

USA	Incidence rate of LEA per 10,000	Black 146.59 (95% CI 79.58-94.44) M.A. 94.08 (95% CI 85.39-102.77) NHW 60.68 (95% CI 44.34-77.03)	Age	10
USA	Relative Risk of LEA	Black: 1.93 (95% CI 1.26-2.96) Black: 1.49 (95% CI 0.95-2.34)	Unadjusted Education, hypertension, smoking.	28
USA	Prevalence (%) of LEA	Hispanic: = Black: =	Age, duration of diabetes	32
USA	Odds ratio of LEA	Black: 0.84 (CI 95% 0.43-1.29) Other: 0.84 (CI 95% 0.36-1.96)	Glucose score, duration of diabetes, type of diabetes, BMI, treatment	34
USA	Relative risk of amputation	African American: 1.41 (95% CI 1.34-1.48) Hispanic: 1.28 (95% CI 1.20-1.38) Native American: 1.74 (95% CI 1.39-2.18) Asian: 0.31 (95% CI 0.19-0.50)	Age, sex, cardiovascular disease, hypertension, COPD, service connection, region and stroke	30
USA	1. Odds ratio of above-knee amputation 2. Odds ratio of toe and/or foot amputation	1. African American: 1.58 (95% CI 1.32-1.90) 2. African American: 1.09 (95% CI 0.92-1.29)	Age, gender, number of hospitalizations during the 12 month period prior to surgery, presence of cardiac disease, geographic region and teaching status of the hospital.	31
USA	Hazard ratio LEA	Black 0.84 (95% CI 0.65-1.08) Asian 0.40 (95% CI 0.28-0.62) Latino 0.85 (95% CI 0.63-1.14)	Age, sex, educational level, group level annual income, proportion of neighbourhood with working-class occupations, smoking status, alcohol intake, frequency of self-monitoring of blood glucose levels, exercise reported as a treatment for diabetes, obesity status, first degree family history of diabetes, duration of diabetes	33
UK	The incidence rate of LEA per 10,000 patient years	Asian: 3.4 (95% CI 1.1-10.7) White: 14.2 (95% CI 12.6-15.9)	Age, sex	51
UK	Odds ratio of amputation	1. African Caribbean 0.32 (95% CI 0.17-0.61) 2. African Caribbean 0.97 (95% CI 0.34-2.73)	1. Unadjusted 2. Peripheral vascular disease, neuropathy, ever smoked, age at amputation	35
B. Retinopathy				
USA	Prevalence (%) of retinopathy	Black: + Hispanic: +	Age, duration of diabetes	32
USA	Retinopathy as a diabetic complication	African American: =	Sex, education, age	38
USA	Odds ratio any retinopathy Odds ratio severe retinopathy	Mexican American: 2.01 (95% CI 1.01-4.03) Mexican American: 3.18 (95% CI 1.32-7.66)	Duration of diabetes, SES, glucose serum, age, systolic blood pressure	41

Region	Outcome measure	Results (whites as reference)	Adjustment for	Ref
Complications				
B. Retinopathy – continued				
USA	Odds ratio of retinopathy	Mexican American: 2.15 (95% CI 1.15-4.04) NH black: 0.94 (95% CI 0.54-1.66)	Severity of diabetes (=diabetes duration, HbA1c, treatment with oral agents or insulin) and systolic blood pressure	9
USA	Odds ratio of retinopathy	Black: 2.96 (95% CI 1.00, 8.78)	Sex, HbA1c, systolic blood pressure at follow-up, type of treatment (insulin/oral agents)	40
USA	Odds ratio of retinopathy	Hispanic: 0.47 (95% CI 0.24-0.94)	Sex, age at onset of diabetes, duration of diabetes, HbA1c, therapy (=use of insulin; yes/no) and hypertension (yes/no)	42
USA	Odds ratio of retinopathy	African American: Men: 1.23 (95% CI 0.80-1.91) Women: 1.03 (95% CI 0.76-1.40)	Age at time of exam, type of treatment for diabetes, duration of diabetes and presence/absence of high BP	37
USA	Odds ratio for developing a (two-steps-or-more) progression of retinopathy	Black: 0.38 (95% CI 0.15-0.97)	Duration of diabetes, follow-up interval, HbA1c, serum creatinine. Since there were no significant differences in following basic characteristics, they did not correct for age, systolic and diastolic blood pressure, fasting cholesterol and tryglyceride levels, percentage desirable weight, gender and baseline retinopathy severity	39
UK	Prevalence of microvascular complications	African Caribbean: =	Age	25
UK	Relative Risk of eye disease	Asian: 0.31 (95% CI 0.19-0.51)	Age, sex, age at diagnosis, duration of diabetes, hypertension, smoking and treatment (with or without insulin)	43
France	Incidence of retinopathy	Algerian: =	Matched for sex and duration of disease	44
C. Nephropathy & End Stage Renal Disease (ESRD)				
USA	Diabetes-related incidence of ESRD	Mexican American: + Black: +	Age	46
USA	1. Incidence ratio of diabetic ESRD 2. Incidence ratio of diabetic (IDDM) ESRD 3. Incidence ratio of diabetic (NIDDM) ESRD	1. Black: 2.39 (95% CI 2.00-2.78) 2. Black: 1.03 (95% CI 0.73-1.33) 3. Black: 4.31 (95% CI 3.36-5.25)	Age, sex	45
USA	Prevalence of chronic renal failure	Black: = Hispanic: =	Age, duration of diabetes	32
USA	Nephropathy as a diabetic complication	African American: =	Sex, education, age	38

USA	1. Relative Risk of ESRD related to overall diabetes 2. Relative Risk of ESRD related to NIDDM 3. Relative Risk of ESRD related to IDDM	1. Black: 2.70 (95% CI 1.89-3.86) 2. Black: 4.80 (95% CI 3.09-7.46) 3. Black: 0.90 (95% CI 0.52-1.55)	Poorly controlled hypertension, prevalence of diabetes, lack of regular source of health care, lower socio-economic status	47
USA	Odds ratio 1. Albuminuria >25.5 vs. < 25.5 µg/ml 2. Albuminuria >255 vs. < 25.5 µg/ml	1. Hispanic: 1.11 (95% CI 0.54-2.27) 2. Hispanic: 0.72 (95% CI 0.25-2.01)	Sex, age at onset of diabetes, duration of diabetes, HbA1c, therapy (use of insulin: yes/no) and hypertension (yes/no)	42
USA	Hazard ratio for ESRD	Black: 2.03 (95% CI 1.62-2.54) Asian: 1.85 (95% CI 1.40-2.43) Latino: 1.46 (95% CI 1.10-1.93)	Age, sex, educational level, group level annual income, proportion of neighbourhood with working-class occupations, smoking status, alcohol intake, frequency of self-monitoring of blood glucose levels, exercise reported as a treatment for diabetes, obesity status, first degree family history of diabetes, duration of diabetes	33
UK	Relative risk of ESRD (diabetes related)	Asian: 13.6 (95% CI 6.04-30.6)	No adjustment	48
UK	Prevalence of proteinuria as a diabetic complication	African Caribbean: =	Age	25
UK	Relative risk of kidney disease	Asian: 3.36 (95% CI 1.88-5.99)	Age, sex, age at diagnosis, duration of diabetes, hypertension, smoking and treatment (with or without insulin)	43
France	Incidence of nephropathy	Algerian: =	Matched for sex and duration of disease	44
The Netherlands	Relative risk of ESRD (diabetes related)	Indo-Asian: 21.7 (95% CI 10.1, 42.7)	Age	49
D. Cardiovascular complications				
USA	Prevalence of specific complications of diabetes.	1. Myocardial infarction: Black: = Hispanic: = 2. Cong. heart failure: Black: = Hispanic: =	Age, duration of diabetes	32
USA	1. Hazard ratios for myocardial infarction 2. Hazard ratios for stroke 3. Hazard ratios for congestive heart failure	1. Black 0.56 (95% CI 0.47-0.66) Asian 0.68 (95% CI 0.57-0.82) Latino 0.68 (95% CI 0.56-0.81) 2. Black 1.04 (95% CI 0.89-1.22) Asian 0.76 (95% CI 0.62-0.93) Latino 0.72 (95% CI 0.59-0.88) 3. Black 0.93 (95% CI 0.79-1.10) Asian 0.70 (95% CI 0.56-0.87) Latino 0.61 (95% CI 0.48-0.76)	Age, sex, educational level, group level annual income, proportion of neighbourhood with working-class occupations, smoking status, alcohol intake, frequency of self-monitoring of blood glucose levels, exercise reported as a treatment for diabetes, obesity status, first degree family history of diabetes, duration of diabetes	33
UK	Prevalence of coronary heart disease	African Caribbean: -	Age	25

Region	Outcome measure	Results (whites as reference)	Adjustment for	Ref
Complications				
D. Cardiovascular complications – continued				
UK	1. Relative Risk of heart vascular disease 2. Relative Risk of cerebrovascular disease	1. Asian: 1.15 (95% CI 0.84-1.57) 2. Asian: 0.61 (95% CI 0.27-0.96)	Age, sex, age at diagnosis, duration of diabetes, hypertension, smoking and treatment (with or without insulin)	43
E. Neuropathy				
USA	Prevalence of neuropathy	Black: = Hispanic: =	Age, duration of diabetes	32
USA	Diabetic complications (neurological)	African American: =	Sex, education, age	38
USA	Odds ratio of neuropathy	Hispanic: 0.59 (95% CI 0.29-1.20)	Sex, age at onset of diabetes, duration of diabetes, HbA1c, therapy (use of insulin: yes/no) and hypertension (yes/no)	42
France	Incidence of neuropathy	1. Moderate: Algerian: + 2. Severe: Algerian: +	Matched for sex and duration of disease	44

Intermediate outcomes of Care

Region	Intermediate outcomes of Care Clinical indicators	Results	Adjustment for	Ref
USA	Indicator for avoidable outcome: 1. Admission for hyperosmolar or ketotic coma	1. Black: +	Unadjusted	52
USA	1. Systolic BP <140 mmHg 2. Diastolic BP < 90 mmHg 3. LDL cholesterol < 130 mg/dl 4. HbA1c level increased	1. Black men: = Black women: = 2. Black men: - Black women: = 3. Black men: = Black women: = 4. Black: +	1-3 Unadjusted 4. Age, sex, disease severity, BMI, education, social support, health status, quality of care	53
USA	1. Microalbuminuria	1. African American: = Mexican American: =	Unadjusted	14
	2. Clinical proteinuria	2. African American: + Mexican American: +		
	3. Previously diagnosed hypertension A. Blood pressure <140/90mmHg B. Blood pressure >- 140/90 mmHg	3. A. African American: = Mexican American: = B. African American: = Mexican American: =		
	4. HbA1c >=7.0%	4. African American: = Mexican American: +		
	5. Having good cholesterol level	5. African American: + Mexican American: +		

USA	1. To be in good glycemic control (<=7%) 2. LDL level: 3. Blood pressure (good control<=130/80)	Before intervention 1. Black: = 2. Black: = 3. Black: = After intervention 1. Black: = 2. Black: = 3. Black: =	Unadjusted Note: Broad intervention with three main foci, partly consist of quality improvement of care	56
USA	1. Diabetes control (HbA1c >8% vs. lower) 2. Hypertension control (BP>140-90 vs. lower) 3. Lipid control (LDL>130 mg/dl vs. lower)	1. African American: 2.23 (95% CI 1.26-3.94) Hispanic: 1.68 (95% CI 0.79-3.58) 2. African American: 2.69 (95% CI 1.42-5.10) Hispanic: 1.65 (95% CI 0.71-3.87) 3. African American: 1.49 (95% CI 0.73-3.05) Hispanic: 1.99 (95% CI 0.78-5.05)	Age, sex, clinic site	54
USA	1. Odds ratio for having poor glycemic control 2. Mean level HbA1c ± SD Avoidable outcome: 3. Admission for diabetic keto-acidosis	1. Black: 3.9 (95% CI 1.8-8.6) 2. Hispanic: + Black: + 3. Hispanic: = Black: =	Age, age at diagnoses, insulin doses, BMI	57
USA	1. Odds ratio for having poor glycemic control 2. Mean level HbA1c ± SD	1. African American: 1.45 (95% CI 0.99-2.11) 2. African American: +	Insulin use, sex, socio-economic status and marital status	55
USA	Odds ratio for good glycemic control	African American 0.75 (95% CI 0.45-1.27)	Sex, age, smoking, insulin use, macro- and microvascular disease. All patients belong to low-income populations in North Carolina.	15
USA	HbA1c in good control (<8)	Latino: -	Age, sex, income, education, specialty of primary care provider, comorbidity, physical and mental health score.	50
USA	1. HbA1C (in good control) 2. LDL level 3. Blood pressure (in good control)	1. Black: 0.44 (95% CI 0.23-0.83) 2. Black: = 3. Black: 0.39 (95% CI 0.24-0.62)	Age, sex, education, income, insulin use, diabetes self-management, duration DM, severity, co morbidities, health services utilization and facility effects.	51
USA	1. Odds ratio for having an increased level of HbA1c	1. Black: 2.88 (95% CI 1.43-5.79) 2. Black: 2.46 (95% CI 1.23-4.91) 3. Black: 2.47 (95% CI 1.23-4.91) 4. Black: 1.96 (95% CI 0.94-4.07) 5. Black: 2.08 (95% CI 1.01-4.28)	1. Race, sex, age 2. Race, sex, age, waist-hip ratio 3. Race, sex, age, waist-hip ratio, education 4. Race, sex, age, waist-hip ratio, education, insulin use 5. Race, sex, age, insulin use	58
USA	Test HbA1c: 1. Odds ratio to be in poor glycemic control (White ♀1,0 reference)	Black ♀ 2.2 (95% CI 1.4, 3.4) Black ♂ 1.5 (95% CI 0.8, 2.9) White ♂ 1.4 (95% CI 0.8, 2.5)	Age, treatment, duration of diabetes, obesity	59

Region	Intermediate outcomes of Care Clinical indicators	Results	Adjustment for	Ref
USA	Test HbA1c: 1. Odds ratio for having an increased level of HbA1c (Non-Hispanic white ♂: reference)	Non-Hispanic white ♀: 1.04 (95% CI 0.56-1.94) Non-Hispanic black ♂: 0.98 (95% CI 0.52-1.88) Non-Hispanic black ♀: 2.01 (95% CI 1.13-3.58) Mexican American ♂: 1.36 (95% CI 0.65-2.85) Mexican American ♀: 1.15 (95% CI 0.58-2.28)	Education, income, health insurance coverage, frequency of physician visits, blood glucose-self monitoring, BMI, physical activity, cigarette smoking, age and duration of diabetes	60

Process of Care

Region	Process measures and indicators	Results	Adjustment for	Ref
USA	Test HbA1c:		Unadjusted	52
	1. HbA1c test every 6 months	1. Black: -		
	Eye examination:			
	2. Eye care examination every year	2. Black: -		
	Other:			
	3. Regular visits (every 6 months)	3. Black: -		
USA	Other:			53
	1. Had a flu shot in the past 12 months	1. Black men: = Black women: -	Unadjusted	
USA	Blood pressure:		Unadjusted	14
	1. Blood pressure checked in past 6 months	1. African American: = Mexican American: =		
	2. Hypertension: previously diagnosed and treated	2. African American: = Mexican American: -		
	3. Hypertension: previously diagnosed and not treated	3. African American: = Mexican American: +		
	4. Hypertension: undiagnosed	4. African American: = Mexican American: =		
	Eye examination:			
	5. Eye examination in the past year	5. African American: = Mexican American: =		
	Lipids & nephro-function:			
	6. Cholesterol checked	6. African American: - Mexican American: -		
	7. Dyslipidemia previously diagnosed and treated	7. African American: - Mexican American: -		
	8. Dyslipidemia: previously diagnosed and not treated	8. African American: = Mexican American: =		
	9. Dyslipidemia: undiagnosed	9. African American: + Mexican American: +		

USA	Test HbA1c: 1. HbA1c test at least annual Eye examination: 2. Eye care examination at least annual Lipids & nephro-function: 3. Lipid profile at least annual 4. Renal microalbumin at least annual Others: 5. Footexamination at least annual 6. Education (diabetes & nutrition)	Before intervention 1. Black: - 2. Black: - 3. Black: = 4. Black: - 5. Black: + 6. Black: =	After intervention 1. Black: = 2. Black: = 3. Black: = 4. Black: = 5. Black: + 6. Black: =	Unadjusted Note: Broad intervention with three main foci, partly consist of quality improvement of care	56
USA	Test HbA1c: 1. Glycosylated hemoglobin measurement Eye examination: 2. opthalmological visits Lipids & nephro-function: 3. lipid testing	African American: 1. 0.65 (95% CI 0.48-0.88) 2. 0.72 (95% CI 0.56-0.93) 3. 0.66 (95% CI 0.48-0.89)		Sex, education, age	38
USA	Test HbA1c: 1. Test HbA1c Lipids & nephro-function: 2. Test cholesterol 3. Test creatinine	African American (only for insulin users): 1. 1.43 (95% CI 0.83-2.47) 2. 1.45 (95% CI 1.07-1.96) 3. 1.26 (95% CI 1.00-1.51)		Insulin use, sex, socio-economic status and marital status	55
USA	Test HbA1C: 1. Diabetes treatment Blood pressure: 2. Hypertension treatment Lipids & nephro-function: 3. Lipid treatment 4. Albuminuria treatment	1. African American: 0.57 (95% CI 0.27-1.23) Hispanic: 0.86 (95% CI 0.37-2.0) 2. African American: 1.93 (95% CI 0.64-5.83) Hispanic: 1.17 (95% CI 0.28-4.87) 3. African American: 0.66 (95% CI 0.38-1.12) Hispanic: 1.50 (95% CI 0.75-2.98) 4. African American: 2.10 (95% CI 0.98-4.51) Hispanic: 1.16 (95% CI 0.51-2.62)		Age, sex, clinic site	54
USA	Other: 1. Adherence to guidelines (general prevention score)	Hispanic: = Black: + Other: =		Age, sex, duration of diabetes	32

Region	Process measures and indicators	Results	Adjustment for	Ref
USA	Test HbA1C:	Non-English speaking vs. English-speaking	NOTE: From Whites (incl. Hispanics) 7% is non-English speaking, for Blacks, Asians and others this is respectively 6.6%, 56%, 25.6%.	61
	1. Standardized HbA1C >2 test	1. 1.9 (95% CI 1.2-3.0)		
	Eye examination:			
	2. Ophthalmologic examinations	2. 1.0 (95% CI 0.6-1.6)		
	Lipids & nephro-function:		Adjusted for: Age, sex, new patients status, insurance status.	
	3. Urinalysis	3. 1.5 (95% CI 0.9-2.4)		
	4. Lipid tests	4. 0.6 (95% CI 0.4-1.1)		
	5. Serum creatinine tests	5. 1.4 (95% CI 0.8-2.6)		
	Others:			
	6. Physician visits >2	6. 2.6 (95% CI 1.2-5.4)		
	7. Dietary consultation >1	7. 2.8 (95% CI 1.3-6.1)		
USA	Test HbA1c:	Latinos (both English- and Spanish-speaking)	Age, sex, income, education, specialty of primary care provider, comorbidity, physical and mental health score.	50
	1. Received HbA1c test	1. Latino: =		
	Eye examination:			
	2. Received dilated-eye exam	2. Latino: +		
	Lipids & nephro-function:			
	3. Lipid profile assessed	3. Latino: =		
	4. Nephropathy assessed	4. Latino: =		
	Others:			
	5. Received foot exam most or all visits	5. Latino: =		
	6. Received influenza vaccine	6. Latino: =		
USA	Test HbA1c:		Education, income, place of residence, health insurance, diabetes duration, diabetes education (how to manage diabetes, and number of hours of instruction) and hospitalization in the past year	64
	1. Hyperglycemic therapy	1. African American: = Mexican American: =		
	2. Monitoring of glycemic control	2. African American: = Mexican American: =		
	Others:			
	3. Screening for and monitoring of complications	3. African American: = Mexican American: =		
	4. To have diabetes education.	4. African American: + Mexican American: -		
	5. Hours of getting diabetes education	5. African American: - Mexican American: -		
	6. Frequency of physician visits	6. African American: - Mexican American: -		
	7. Regular physician for diabetes care	7. African American: - Mexican American: -		
USA	Lipids & nephro-function:		Sex, age, smoking, insulin use, macro- and microvascular disease. All patients belong to low-income populations in North Carolina.	15
	1. Nephropathy assessment	1. African American: 2.44 (95% CI 1.09-5.56)		
	Other:			
	2. Sensory examination	2. African American: 0.64 (95% CI 0.26-1.54)		

USA	Eye examination: 1. Ethnic differences in eye care in %	Differences between black and white 1. 4.3 (95% CI -1.0-9.5)	Age, Sex, Medicaid insurance, income, education, rural vs. urban residence	63
USA	Eye examination: 1. Eye care examinations	1. Black: 0.70 (95% CI 0.67- 0.72)	Age, sex, poverty level, years of education, regional eye care provider supply	62
USA	Test HbA1c: 1. Received HbA1c test Eye examination: 2. Dilated eye examinations Lipids & nephro-function: 3. LDL checked in past 2 years 4. Nephropathy screen Others: 5. Foot examination 6. Treatment intensity (pharmacy filled prescriptions)	1 A. Black: = 1 B. Black: = 2 A. Black: 0.58 (95% CI 0.38-0.96) 2 B. Black: = 3 A. Black: 0.49 (95% CI 0.34-0.84) 3 B. Black: 0.41 (95% CI 0.24-0.73) 4 A. Black: = 4 B. Black: = 5 A. Black: = 5 B. Black: = 6 B. Black: =	1 t/m 5 A: Age, sex, education, income, insulin use, diabetes self-management, duration DM, severity, comorbidities, health services utilization 1 t/m 6 B= adjustment A + facility effects	51

Included studies reported different units for indicators of process of care. To simplify the interpretation, results are showed as either relative risks or, when that was not possible, results are coded as "+" (more), "=" (equal) and "-" (less).

5

Differences in the quality of outpatient diabetes care between immigrants and native Dutch

Stirbu I, Lanting LC, Joung IMA, Mackenbach JP, Lamberts SWJ, Bootsma AH.

Submitted 2006.

Abstract

Introduction – Diabetes-related complications and mortality disproportionately affect ethnic minorities compared to the native population in Western countries. Outcomes of diabetes are highly dependent on appropriate management by the physician as well as the self-management behavior exercised by patients. Variations in the process and outcomes of care for immigrants suffering from diabetes in the Netherlands in relation to their acculturation status have not been previously documented.

Study objective – To investigate the differences in the process and outcomes of outpatient diabetes care for Turkish and Moroccan patients compared to the native Dutch patients, and to explore the role of acculturation in diabetes outcomes.

Methods – An interview and a medical record review were conducted for 204 immigrant and native Dutch diabetic patients of a university hospital's outpatient department. We compared the processes and outcomes of outpatient diabetes care of immigrant patients with the native Dutch patients. We also examined whether immigrants' acculturation could explain diabetes outcomes.

Results – We observed no consistent differences regarding the process of outpatient care for diabetes delivered by the medical providers for Turkish and Moroccan patients relative to Dutch patients. Diabetes outcomes, however, differed significantly; immigrant patients had higher levels of HbA1c (difference in mean HbA1c=0.95% CI: 0.48; 1.42) and lipids (difference in mean lipids=0.80 CI: 0.40; 1.21). Turkish and Moroccan patients experienced more than two times higher risk of having HbA1c above 8.5% and increased lipids compared to the native Dutch patients. These results were not explained by the quality of care provided to immigrant patients. Adjustment for educational status reduced the mean difference of HbA1c and lipids by about 30%. Turkish and Moroccan patients who were better integrated into the Dutch society had similar diabetes outcomes compared to their less integrated counterparts.

Conclusion – Compared to the native Dutch population, immigrants had sub-optimal glucose and fat spectrum levels more frequently, which places them at a higher risk for diabetic complications. These differences could not be explained by the quality of care provided to the patients. Partial integration of first-generation immigrants into the Dutch society does not systematically lead to better diabetes outcomes.

INTRODUCTION

Diabetes outcomes, including diabetes-related complications and mortality, disproportionately affect ethnic minorities compared to the native population in many countries [1-3]. Patients of foreign descent often suffer more severe morbidity and higher mortality from diabetes [3-5]. Although some evidence suggest that genetic differences among people from different cultural backgrounds may influence illness [6], ethnic group health disparities are more likely to be caused by environmental and socio-political factors [7-10].

The Dutch society encompasses a diverse immigrant community with Turkish and Moroccan groups representing approximately 8% of the population. The prevalence of diabetes among Turkish and Moroccan population living in the Netherlands was found to be between 11-12%, almost 4 times higher compared to the native Dutch population [3][11-12]. A wealth of epidemiological data shows that a progressive increase in the prevalence of diabetes is associated with the process of urbanization and westernization that immigrants to The Netherlands often experience with migration [13].

The challenge of diabetes care lies in its complexity: it requires adequate access to health care, implementation of an appropriate process of care (correct diagnostic scheme and treatment prescription outlined in clinical guidelines) by the provider, and rigorous self-management by the patient. Access to care, previously reported as powerful barrier to the proper management of diabetes [14], is assured in the Netherlands by a safety net of public health insurance that is designed to capture the poor, disadvantaged and minorities, therefore, is believed not to have a major influence over the outcomes [15]. However, less is known about the quality services provided to the patients. Some studies suggest that poorer outcomes of diabetes among immigrants are caused by inferior service quality provided to immigrant patients compared to the native population [16], and that current clinical evidence is not effectively and widely translated into usual practice [17]. While other studies find no significant differences between the care provided to immigrant and native patients, and argue that the poor adherence to guidelines (best evidence) is not a valid explanation to observed differences in outcomes of diabetes among immigrant patients [18-19].

Self-management behavior of patients is based on their cultural norms, trust, beliefs, and knowledge about the disease. Language barriers and an inability to comprehend the provider's instructions may lead to poorer compliance with recommended treatment and under-use of healthcare services [20-22], which are crucial for secondary and tertiary prevention of diabetes. Immigrants that are better acculturated into the new environment may have health outcome indices more similar to the local population. However, in many studies the concept of acculturation has been limited to immigrants' knowledge of local language, thus not acknowledging other aspects of acculturation in diabetes outcomes.

This study aims to investigate the differences in the process and outcomes of outpatient diabetes care for immigrant patients compared to the native Dutch patients, and to explore the role of acculturation in diabetes outcomes. The results of this research may help health providers and managers take appropriate decisions in regard to the most suitable care for immigrant patients with diabetes.

METHODS

Selection of participants

In order to be included in the study, patients had to be either of Dutch origin or immigrants from Turkey or Morocco, be clinically diagnosed with Diabetes Mellitus (type 1 or 2), and be treated for it at least for one year by a diabetes specialist at the outpatient department of a university hospital. There were 67 Turkish and 63 Moroccan patients who fulfilled these inclusion criteria. Their ethnic origin was identified initially on the basis of their last names. After a number of checks of origin, one person was identified as Dutch and excluded. In addition, we excluded 2 patients who underwent kidney transplantation. The remaining 129 patients of ethnic origin were approached for an interview. Of them 51 Turkish and 51 Moroccan agreed to participate (response rate 79%). For each immigrant patient a Dutch patient with diabetes was selected from the hospital's outpatient database with the best matching demographic (sex, age) and socio-economic characteristics (calculated based on the mean household income equivalent of the neighborhood). This resulted in a total sample of 204 patients included in our analyses, of which 102 were the native Dutch patients, 51 were patients of Turkish descent, and 51 were patients of Moroccan descent.

Data

Two types of data were collected: a face-to-face interview with the patient and a summary of records from the patient's medical chart. The interview was based on the questionnaire that was developed by the expert team consisting of researchers and diabetes specialists. The questionnaire, formulated in Dutch, included 95 questions and sub-questions focusing on language skills, ethnic self-identity, behavior, education and religion. To ensure that immigrant patients understood the questions, interviewers were selected from the same ethnic background and translated the questions, when necessary. Consensus on appropriate translations was agreed on beforehand. The questionnaire was pre-tested. During the period January-December 2003 trained interviewers conducted interviews. During the same period data on process and outcomes of care were extracted from the medical records of all studied patients. All participating patients provided their informed consent.

Processes and outcomes of care

Standards for process and outcomes of care were based on the 1998 diabetes management clinical guideline developed by Dutch Institute for Healthcare (CBO) in collaboration with Dutch Diabetes Federation. To assess the process of care we determined whether the physician performed the following diagnostic tests: blood pressure (BP), control of diabetes (measured by the level of HbA1c), control of lipids (measured as ratio of 'total cholesterol' over 'high-density lipoprotein' [TC:HDL]), smoking status, weight and height, albumin in urine, eye examination, and foot examination. All measurements had to be done within the time frame indicated by the guidelines. Based on all measurements we calculated the quality of care index, which represents the number of tests performed by the physician. In addition to diagnostic tests, as part of process of care we also collected information on the presence of an action to control elevated levels of lipids and HbA1c.

We used five outcomes of care: body-mass index (BMI, calculated as body height divided by square weight), control of systolic and diastolic BP, control of diabetes, and control of lipids. Blood pressure was considered within normal range if systolic BP was < 140 mmHg and diastolic BP < 90 mmHg in patients under 60 years or systolic BP < 160 mmHg and diastolic BP < 90mmHg in patients above 60 years of age. Diabetes control was measured using HbA1c level. Diabetes was considered under control if HbA1c was less than 7.0%, in borderline control if HbA1c values ranged between 7.0 and 8.5%, and uncontrolled if HbA1c values exceeded 8.5% [23-24]. Controlled level of lipids (TC:HDL) was defined as =<5 among smokers above 50 years of age and <6 among smokers younger than 50 years old and among any age group for non-smoking patients [23-24].

Acculturation

We classified all immigrants into four distinct types of acculturation: assimilation (abandonment of native cultural identity and adoption of the values and norms of the larger society), integration (maintenance of ethnic cultural integrity at the same time as becoming an integral part of a larger society), separation (self-imposed withdrawal from the larger society, while preserving the native culture), and marginalization (out of cultural contact with both traditional culture and the larger society) [25-26]. We used three main determinants to classify immigrants in one of the above four categories of acculturation: self-identification, behavior and language skills. To determine self-identification, immigrant patients were asked to identify their sense of belonging to Dutch or their own ethnic society and feelings about being group member of that society on a 5 point scale. This scale was adapted from the ICSEY questionnaire [27]. Immigrants were also asked about their behavior: amount of time spent outside of the house, number of Dutch and non-Dutch friends and the amount of time spent with them, celebrating Dutch and own ethnic holidays, etc. Competence in immigrants' native and Dutch languages was measured by a self-report on a scale constructed by Kwak [28]. We inquired about an immigrant's abilities to understand, speak, read, and write the immigrant's native and Dutch languages. All answers were given on a five-point score system ranging from “not at all” (score 1) to “very well/much” (score 5). The sum of scores for each determinant was further calculated. Based on this score, all immigrant patients were assigned to one of the acculturation groups.

Analysis

We compared the process and outcomes of outpatient diabetes care of Turkish and Moroccan immigrants to that of the native Dutch patients. The size of the difference was calculated using conditional logistic regression in Glim statistical software (version 4) accounting for matching. Odds ratios were adjusted for the duration of diabetes (when appropriate). Differences in means were estimated using univariate linear model in SPSS (version 11). Adjustment for age, sex and socioeconomic status was made in the design of the study (matched case control). Additional adjustment was performed separately to estimate the role of socio-demographic factors, education, quality of care and acculturation.

Table 1
General information about the study population

	Dutch	Turkish	Moroccans
Number of people in the study	102	51	51
Mean age (Standard error)	54.8 (1.3)	54.2 (1.6)	52.3 (1.7)
Gender (% males)	39.2	35.3	43.1
Marital status (% married)	42.2	74.5	78.4
Education level (%)			
No/primary education	17.6	80.4	86.3
Lower & intermediate general/vocational education	69.6	19.6	13.7
Higher vocational & university	12.7	0	0
Duration of diabetes, mean self reported years (Standard error)	16.4 (1.2)	13.8 (1.3)	12.6 (0.9)
Type of diabetes mellitus (% type 2)	67.6	90.2	86.3
Regularity of visits (% patients with <2 missed visits)	86.3	64.7	45.1
Acculturation* (% integrated patients)	NA	34.7	42.6
Language acculturation (% integrated** patients)	NA	44.0	49.0

* Overall acculturation was calculated based on three dimension of acculturation: immigrant's self-identity, behavior, and language skills. Integrated type of acculturation means that immigrants reported gaining Dutch self-identity, behavior, and language knowledge while retaining ethnic self-identity, behavior, and language knowledge.
** Immigrants reporting having relatively good knowledge of both Dutch and their native languages

RESULTS

The study population consisted of 204 participants, of whom 50% (102 persons) were of Dutch origin, 25% (51) were immigrants from Turkey and 25% (51) where from Morocco (Table 1). Immigrants were similar in terms of their age and gender distributions. Patients from foreign descent were more likely to be married and have a lower education. From the medical perspective immigrant patients on average had shorter duration of diabetes, were more likely to have type 2 diabetes, and missed the appointments with the specialist more frequently. All immigrant patients belonged to either the integrated (38.5%) or separated (61.5%) acculturation groups. There were no patients who were classified in assimilated or marginalized groups by any of the acculturation determinants used.

Results of the process of outpatient diabetes care are presented in Table 2. There were no significant differences between immigrant and Dutch groups in the diabetes observation and treatment approach taken by medical staff. In some cases, immigrant patients had more opportunity to receive care in accordance with the guidelines than Dutch patients. For example, they were somewhat more likely to be consistently tested for HbA1c (Odds ratio [OR]=1.19) and have urine or eyes examined in the past

Table 2

Differences in the process of care between Turkish & Moroccan and Dutch patients

Process of care indicators	Dutch patients (%) N=102	Turkish & Moroccan patients (%) N=102	Odds ratio[a] (95% Confidence interval)
Three measurements of blood pressure performed (% of all patients with indication)	67.6	70.8	1.08 (0.79-1.49)
HbA1c tested during last 2 visits (%)	68.6	80.4	1.19 (0.86-1.64)
No action to control high HbA1c (% out of all patients with high HbA1c)	6.9	6.3	0.99 (0.75-1.36)
Fat spectrum analysed in the past 12 months (%)	73.5	82.4	1.14 (0.83-1.55)
No action to normalize level of lipids (% out of all patients with high level of lipids)	5.9	7.8	1.03 (0.70-1.35)
Smoking assessed (%)	93.1	89.2	0.96 (0.72-1.28)
Weight and height examined in the past 12 months (%)	68.6	68.6	1.01 (0.73-1.42)
Urine albumin checked in the last 12 months (%)	80.4	90.2	1.14 (0.84-1.53)
Eye examination done in the past 12 months (%)	63.7	76.5	1.20 (0.86-1.67)
Feet examined in the past 12 months (%)	63.7	68.6	1.08 (0.77-1.52)
Any 4 out of 8[b] examinations done	73.7	89.5	1.38 (0.97-1.94)
All[b] examinations done	27.3	20.0	0.72 (0.41-1.27)

[a] Turkish and Moroccan immigrants compared to the native Dutch patients; adjusted for matching pairs

[b] Blood pressure, HbA1c, fat spectrum, smoking status, weight and height, urine albumin, eye and feet examinations

Table 3
Differences in the outcomes of care between Turkish & Moroccan and Dutch patients

Outcome indicators	Dutch patients Mean scores[a]	Turkish & Moroccan patients mean scores[a]	Difference in means[b] (95% Confidence interval)
BMI, mean (SD)	31.06 (8.75)	30.05 (5.44)	0.34 (-2.48; 3.16)
Systolic BP, mm Hg, mean (SD)	135.00 (19.24)	135.95 (22.08)	1.31 (-4.22; 6.83)
Diastolic BP, mm Hg, mean (SD)	77.06 (10.73)	77.46 (10.12)	0.34 (-2.58; 3.25)
HbA1c mean score (SD)	7.62 (1.21)	8.60 (1.80)	**0.95 (0.48; 1.42)**
TC:HDL mean score (SD)	3.80 (1.56)	4.60 (1.53)	**0.80 (0.40; 1.21)**
Patients with adverse outcomes	%	%	Odds ratio[b] (95% Confidence interval)
BMI ≥ 30	32.4	36.3	1.30 (0.73-2.33)
Increased BP for age	27.5	30.4	1.11 (0.66-1.85)
HbA1c above 7%	61.8	81.4	1.31 (0.94-1.83)
HbA1c above 8.5%	18.6	46.1	**2.37 (1.39-4.05)**
Increased TC:HDL	12.7	25.5	**2.00 (1.03-3.89)**

[a] Mean scores or % in each ethnic group, unaccounted for matching
[b] Immigrants compared to the native Dutch patients, accounting for matched pairs

12 months. Patients of non-Dutch origin had a slightly higher chance of having at least 4 out of the 8 examinations recommended by the guideline performed in the past year (OR=1.38), however they were less likely to have had all the measurements done (OR=0.72).

The mean BMI, systolic, and diastolic blood pressures were similar in both Dutch and immigrant groups (Table 3). Compared to the native Dutch, the mean level of HbA1c for immigrant patients was significantly elevated (difference in mean 0.95 CI:0.48; 1.42). Similarly, the TC:HDL scores were significantly higher among the immigrant patients (difference in mean =0.80; CI:0.40; 1.21). Non-Dutch patients were more than 2 times more likely to have had HbA1c above 8.5% (OR=2.37; CI:1.39-4.05) and increased level of TC:HDL (OR=2.00; CI:1.03-3.89).

Adjustment for disease-related factors such as diabetes type and duration did not change the mean difference of any of the outcome variables (Table 4). Neither quality of care, nor diabetes regime or treatment for hyperlipidemia contributed to explaining the differences in outcomes between immigrant patients and Dutch patients. The level of education of patients and their knowledge of diabetes, on the other hand, reduced the mean difference of HbA1c between immigrant and Dutch groups by about 30% (difference in means with adjustment for education decreased from 0.95 to 0.61). Education also contributed to the reduction of mean TC:HDL values (difference in means from 0.80 to 0.56). Other outcome measures (BMI, systolic and diastolic BP) did not change significantly from their baseline values.

Table 4
Differences in the outcomes of diabetes care between Turkish & Moroccan and Dutch patients adjusted for various factors

	Difference in means[a] (95% Confidence interval)				
	BMI	Systolic BP	Diastolic BP	HbA1c	TC:HDL
Unadjusted	0.34 (-2.48; 3.16)	1.31 (-4.22; 6.83)	0.34 (-2.58; 3.25)	**0.95 (0.48; 1.42)**	**0.80 (0.40; 1.21)**
Adjusted for diabetes type	0.17 (-2.69; 3.02)	1.30 (-4.26; 6.85)	0.31 (-2.60; 3.22)	**0.95 (0.48; 1.42)**	**0.80 (0.40; 1.20)**
Adjusted for duration of diabetes	-0.52 (-3.39; 2.34)	2.32 (-3.27; 7.90)	0.55 (-2.41; 3.50)	**0.93 (0.43; 1.44)**	**0.74 (0.32; 1.16)**
Adjusted for marital status	0.37 (-2.47; 3.22)	1.25 (-4.30; 6.80)	0.28 (-2.64; 3.20)	**0.95 (0.48; 1.42)**	**0.81 (0.40; 1.21)**
Adjusted for education	-0.59 (-4.88; 3.71)	2.40 (-6.17; 10.98)	0.39 (-4.13; 4.92)	0.61 (-0.13; 1.35)	0.56 (-0.07; 1.18)
Adjusted for diabetes knowledge	-0.32 (-3.70; 3.07)	0.87 (-5.73; 7.47)	-0.44 (-3.92; 3.05)	**0.68 (0.12; 1.24)**	**0.80 (0.32; 1.29)**
Adjusted for quality of care*	0.07 (-2.75; 2.89)	1.53 (-4.02; 7.07)	0.30 (-2.64; 3.24)	**0.95 (0.48; 1.43)**	**0.82 (0.42; 1.22)**

[a] Immigrants compared to the native Dutch patients

* Quality of care index represents the total number of tests that the physician performed out of all required for diabetes patients diagnostic tests.

Table 5
Difference in means in the outcomes of diabetes for each acculturation determinant
Separated immigrant group compared to integrated immigrant group (95% confidence interval)

	Language	Self identity	Behavior	Overall acculturation
BMI	0.20 (-2.48; 2.88)	0.58 (-2.31; 3.47)	0.98 (-1.77; 3.73)	0.84 (-1.98; 3.67)
Systolic BP	-3.24 (-13.18; 6.70)	-3.94 (-14.33; 6.45)	-0.43 (-10.41; 9.54)	0.25 (-10.12; 10.62)
Diastolic BP	-1.92 (-5.98; 2.13)	-3.88 (-8.13; 0.36)	-1.87 (-6.02; 2.28)	-1.57 (-5.79; 2.65)
Increased HbA1c (8.5%)	0.09 (-0.66; 0.84)	-0.14 (-0.93; 0.66)	0.04 (-0.72; 0.80)	0.02 (-0.75; 0.80)
Increased TC:HDL	-0.04 (-0.82; 0.74)	0.08 (-0.74; 0.90)	0.53 (-0.23; 1.30)	0.18 (-0.64; 1.00)

Overall, there was not a consistent pattern of change in the mean values of any of the diabetes outcomes associated with acculturation status (Table 5). BMI had a tendency to be higher and blood pressure to be lower among patients belonging to separated group in relation to more integrated immigrant patients. At the same time, HbA1c and TC:HDL had only marginal differences between integrated and separated groups.

DISCUSSION

In our study, we observed no consistent differences regarding the process of outpatient care for diabetes delivered by the medical providers for Turkish and Moroccan patients compared to the native Dutch counterparts. However, diabetes outcomes differed significantly, with immigrant patients having higher levels of HbA1c and lipids. Turkish and Moroccan patients experienced more than two times higher risk of having HbA1c above 8.5% and increased level of lipids compared to the native Dutch patients. These differences were not explained by the quality of care provided to patients. Adjustment for educational status significantly reduced the difference in mean of HbA1c and lipids by about 30%. Turkish and Moroccan patients who were better integrated into the Dutch society had similar outcomes as those that were less well integrated.

Some limitations of the data deserve consideration. First, due to the small numbers of our study population we had limited power to demonstrate statistically significant differences in the outcomes of diabetes when sub-groups of immigrants were examined separately. Second, among the diabetes patients only the first-generation immigrants were available for the study. Larger differences between the separated and integrated group may have been observed in a setting where second-generation immigrants could have been included. Third, several data collection processes might have affected our results, such as interviewer bias, translation bias, and inter-rater bias. To minimize these effects, we conducted thorough training of the interviewers, discussing in detail possible translations and medical record review mechanisms. Finally, the information may not always have been recorded in the medical charts, thus underestimating the process of care results. However, we have no reason to suspect systematic differences in recording between immigrant and the native Dutch patients.

In our study the process of care was similar for the native Dutch and immigrant patients. Our results are consistent with other findings from USA [29], Europe [30] and the Netherlands [18] that report no differences in the process of care among ethnic minorities/immigrants and the native population in inpatient and primary healthcare settings. Nevertheless, the fact that we observed large differences in diabetes outcomes suggests that these are more likely to be caused by characteristics of the patients, and not the providers.

Although the process of care was similar for both Dutch and immigrant patients, the overall level of adherence to guidelines was variable, ranging from about 90% for smoking status assessment to about 25% for performing all necessary measurements. We did not collect information on appropriateness of indicated treatment. This information would have provided more details on variations in practice. Less adequate adherence to guidelines has been earlier reported in the Netherlands and other countries [17][31-32]. It is also supported by the general sub-optimal control of diabetes found in our study for both native Dutch and immigrant patients. Using more recent guidelines where BP and HbA1c targets are set at lower levels (130/80 mm Hg for BP and 6.9% for HbA1c) [33] would have increased the number of patients with poor main outcome indices. Results from clinical trials over the past decade indicate that aggressive management of hyperglycemia and hyperlipidemia among diabetes patients is imperative in order to decrease the risk of complications and improve quality of life. The main barriers to the implementation of diabetes guidelines that are frequently mentioned in the literature are a high staff workload, inadequate financial compensation, and a shortage of personnel [34]. It is possible that similar barriers prevent specialists in the studied outpatient department to comply with guidelines.

One of the potential causes of differences in the control of diabetes and control of lipids could be a variation in the physiologic response to diabetes control treatment among immigrant groups. Several studies have reported ethnic differences in response to particular medications [35-37]. However, no known study has examined the physiological responses of Turkish and Moroccan ethnic groups to anti-diabetic agents. The understanding of the etiology and mechanisms causing increased susceptibility to diabetes and resistance to treatment in Turkish and Moroccan patients will provide clues to more effective prevention and treatment of diabetes among these groups. Despite this, our data suggest that more intensive treatment is required in these groups. Although patient education and lifestyle counseling are fundamental to effective diabetes management, medical therapy remains the major strategy by which levels of glucose and lipids are lowered. Our findings also raise the need to revise current guidelines that do not, at the moment, advocate the use of ethnic-specific targets of treatment [38-39].

We hypothesized that immigrant patients who are better integrated into the Dutch society would understand and trust the Dutch (in most cases) health provider and, thus, would be more likely to comply with recommended treatment compared to the patients that are not integrated. Despite our expectations, we found that none of the acculturation determinants (self-identity, behavior and language) played a sizable role in predicting any of the diabetes outcomes among immigrants. This could be related to the fact that Turkish and Moroccan immigrants in our study belonged to either the separated or integrated acculturation groups. There were no immigrants who lost their ethnic self-identity, ethnic behavior, and native language completely (marginalized or assimilated types of acculturation). Potentially, partial integration does not influence compliance to recommended treatment to the extent to be reflected in diabetes outcomes. This increases the importance of programs that employ strategies to improve compliance and self-management targeted to all patients of foreign descent [14][40-42].

Our study demonstrated that the immigrants' proficiency in the Dutch language did not predict the outcomes of diabetes. Similar results were found elsewhere [43] and could be attributed to two main factors. First, language proficiency is only one of many factors needed for an effective communication. Literature shows, that less information and less communication overall is provided to immigrant and low income patients [44] and the quality of information is rated less favorably by patients of foreign descent [43]. A large discrepancy was found between patients' and professionals' perceptions and recollection of the content of the consultations [45]. These discrepancies may be even larger when immigrants are involved. Secondly, patients that have little to no Dutch language skills might have often benefited from the translation provided by an accompanying bilingual person (usually a family member), while patients who have some knowledge of Dutch might rely more on their own (possibly limited) capacities, thus loosing, misunderstanding or misinterpreting given recommendations for self-management.

Several studies have suggested that differences in diabetes outcomes between immigrant and Dutch patients might be related to the differences in self-management. We observed in our study that HbA1c and level of lipids decreased by about 30% when education level of the patients and their knowledge about diabetes was taken into account. Patients with higher general education and better knowledge about diabetes are potentially more likely to understand and comply with recommended home treatments than patients with lower education. Contrary to our findings, previous studies reported that education was not predictive of poor glycemic control [46]. We attribute that to the unique distribution of educational level in immigrants in our study, 80% of whom had no education or very basic education.

Missed appointments could be regarded as lost opportunities for diabetes specialists' control, adjustment of the previous treatment and an additional communication session that is, undoubtedly, a point of concern. Our study points out that immigrant patients were more than two times as likely to miss their appointment. Several factors could play a role: inability of an accompanying person (most often an immediate dependent) to join [41]; previous negative experience with the system; long stays abroad; and neglect or low assessment of the necessity to come for an appointment. More research is needed to identify and address these problems.

The findings of our study lead to some important conclusions. Compared to the native Dutch patients, Turkish and Moroccan patients had a sub-optimal glucose control and levels of lipids more often, which places them at a higher risk of diabetic complications and should warrant greater attention. Both the native Dutch patients and immigrants suffering from diabetes in the Netherlands would benefit from activities targeted to maintaining a long-term glycemic control and low levels of lipids. Immigrant patients would benefit from more aggressive treatment, from improved communication that would ascertain patients' self-management skills, and from strategies that would increase health literacy in the area of diabetes. Researchers are encouraged to study barriers and facilitating factors for an adequate compliance to recommended treatment among immigrant patients.

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6

Ethnic differences in outcomes of diabetes care and the role of self-management behavior

Lanting LC, Joung IMA, Vogel I, Bootsma AH, Lamberts SWJ,
Mackenbach JP.
Submitted 2006.

Abstract

Aim – To describe ethnic differences in outcomes of outpatient diabetic care and assess the role of self-management behavior and its determinants in explaining observed differences.

Methods – Face-to-face interviews were held with 102 Turkish or Moroccan, and 102 native Dutch diabetic patients to measure self-management behavior and determinants of self management (as derived from the Attitudes-Social support- self-Efficacy model, and Personal Models and Barriers). A medical record review was conducted to measure ethnic differences in outcomes of diabetes care. Data were analyzed using multiple linear regression.

Results – Outcomes differed significantly with ethnic minorities having higher levels of lipids (Risk difference=RD=0.7; CI: 0.3-1.2) and HbA1c (RD=0.9 %; CI: 0.4-1.4) than native Dutch patients. Differences in self-management could not explain the ethnic differences in outcomes. The determinant *self-efficacy* explained 18% of the ethnic differences in HbA1c. *Beliefs about seriousness of diabetes* and *social support regarding diabetes management* together explained 47% of the ethnic differences in lipids.

Conclusions – This study provides evidence for ethnic differences in outcomes of diabetes care. Self-efficacy is the most important determinant in explaining the differences in HbA1c. For diabetes practice this suggests that strengthening patients' self-efficacy may improve the control of HbA1c and may result in a decrease of ethnic differences. The mechanism of action by which the determinants of self-management influence health outcomes is unclear, since they do not act through self-management in this study population with people with low levels of socio-economic status. The relationship between behavioral determinants like seriousness and social support and outcomes of diabetes care was differential by ethnic group, implying that caution is required when applying behavioral models to different ethnic groups.

INTRODUCTION

Diabetes mellitus is a major health problem in Europe and the United States, mainly because of the end-stage complications. In both continents, diabetes and its complications disproportionately affect minority populations [1][2]. Diabetic patients have to deal with a complex package of tasks in order to treat and regulate their disease. This self-management behavior includes adherence to dietary advice, engaging in regular exercise, adjusting medication, and monitoring blood glucose levels. Supporting diabetes self-management is a crucial task in diabetes care, because good/adequate self-management leads to better glycemic [3], metabolic [4], blood pressure [5] and weight control [6], which are important predictors of complications. Although the relationship between self-management and the outcomes of diabetes care has been demonstrated, the relationship between determinants of self-management in diabetes care, and the influence of self-management on ethnic differences has not yet been studied. Several models are available for explaining self-management behavior. In particular, the Personal Models and Barriers (PMB) has been applied in diabetes studies to explain variance in self-management (Figure 1). Personal Models are patients' representations of their illness, including disease-related beliefs, emotions, knowledge, and experiences [7]. Studies concerning Personal Models mainly reported that beliefs about treatment effectiveness appear to have an important influence on diabetes self-management [8]. Patients' barriers represent the problems experienced in self-management, for example how often a patient is outdoors at the moment that medication should be taken [8]. Barriers and beliefs about treatment effectiveness do

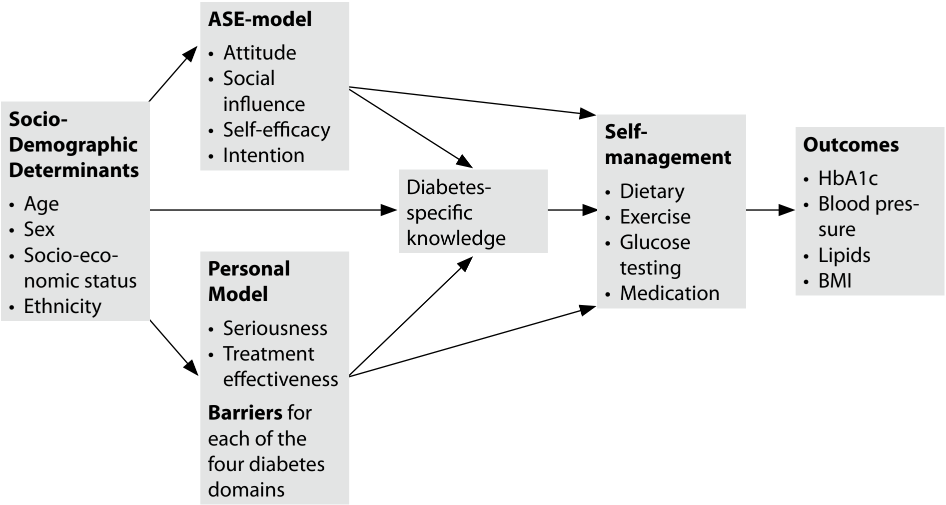

Figure 1
Model of studied variables influencing outcomes of diabetes care

influence self-management [7]. Another useful tool in describing the determinants of self-management is the Attitudes-Social support- self-Efficacy (ASE) model (Figure 1). This model has been successfully applied to explain various aspects of health behavior, such as fruit and vegetable consumption [9] [10], fat intake [11], smoking [12] [13], and participation in fitness programs [14]. In the ASE-model, it is assumed that intention and subsequent behavior are primarily determined by the following variables: attitudes, social influences, and self-efficacy expectations [9]. Empirical support exists that at least two constructs of the ASE-model, social support and self-efficacy, play an important role in the self-management of diabetes [15] [16].

We conducted a study to describe ethnic differences in the outcomes of outpatient diabetic care, and investigated whether these differences could be explained by self-management and its determinants. Ascertaining the role of self-management in ethnic differences in outcomes of diabetes will help health professionals to take appropriate decisions with regard to the most suitable care for ethnic minority patients with diabetes.

METHODS

Study population

The study was performed at the outpatient department of a university hospital (Erasmus Medical Center in Rotterdam, the Netherlands). Patients were selected according to two inclusion criteria. Firstly, patients had to be clinically diagnosed with Diabetes Mellitus (type 1 or 2) and be under the treatment of a diabetes specialist for at least one year. Secondly, patients were either of Dutch origin or immigrants from Turkey or Morocco. The latter groups consisted of immigrant workers who settled in the Netherlands in the last four decades, and they form large groups (total population in the Netherlands consist of 2.2% people from Turkish descent and 1.9% from Moroccan descent; both groups contain more than 300.000 persons). We excluded patients who had undergone kidney replacement therapy. Ethnicity is not recorded in the hospital information system. In order to identify the ethnic minority patients, research associates from Turkish and Moroccan descent first selected patients on the basis of last name identification. This resulted in 67 Turkish and 63 Moroccan patients. By checking the country of origin through the hospital computer system, one person was identified as of Dutch descent and excluded. All Turkish and Moroccan patients who fulfilled the inclusion criteria were invited for an interview. Of these 129 immigrant patients, 51 Turkish and 51 Moroccan patients participated (response rate 79%). For each ethnic minority patient a Dutch patient was selected from the hospital's database with the best matching variables with regard to demographic (sex, age) and socioeconomic characteristics (based on the mean household income equivalent of the neighborhood). This resulted in a total sample of 204 patients (51 Turkish, 51 Moroccan, and 102 Dutch).

Data collection

An expert team consisting of researchers and diabetes specialists developed a questionnaire, which was the basis of an interview. The questionnaire was formulated in Dutch and contained 95 items focusing on self-management behavior and determinants. The questionnaire was pilot-tested on the comprehensibility of questions and the ability of subjects to provide the requested information. During the period January-December 2003 trained interviewers, from the same ethnic background as the patients, conducted face-to-face interviews among both immigrant and Dutch patients. All participating patients gave their informed consent. When necessary questions were translated in a structured way; the translation was agreed on beforehand. During the same period outcomes of care were extracted from the medical records of all included patients. The research proposal, including the plan of data collection, is authorised by the research ethnics committee of the Erasmus MC.

Outcomes of diabetes care

Four outcomes of diabetes care were studied: body-mass index (BMI), blood pressure (BP), glycemic control, and control of cholesterol. The BMI is calculated by body height (meters) divided by square weight (kilogram2). Blood pressure is reflected in two measures: systolic BP (mmHg) and diastolic BP (mmHg). The unit of glycemic control is HbA1c (%). Lipids are expressed as ratios of ‘total cholesterol’ divided by ‘high-density lipoprotein’ (TC: HDL). In the analysis all outcome measures were treated as continuous variables.

Questionnaire

The questionnaire consisted of two parts: 1) questions about self-management behavior and 2) questions about determinants of self-management.

1) An existing questionnaire on beliefs towards self-management was adapted to measure self-management behavior itself [17]. The diabetes self-management questionnaire consisted of 21-items that assessed four domains of diabetes self-management: diet, exercise, monitoring blood glucose levels, and medication. The number of items per domain varied from 2 to 9, all measured on a 4-point scale. For example regarding diet, participants were asked: “Do you take your meals according to the guidelines when you are at home?” Answers ranging from 1 (“no certainly not”) to 4 (“yes always”). Scores were determined for the four domains separately, and an overall score (the mean score based on all filled in items) for

self-management, with an internal consistency of 0.62 (see appendix).

2) In the interview constructs of two different behavioral models were included. First, the PMB in which beliefs about the seriousness of diabetes, beliefs about the treatment effectiveness and barriers in the four domains of diabetes self-management (diet, exercise, monitoring blood glucose levels and medication) were measured. An existing questionnaire [18] was adapted in order to make the questions specific for diabetes. Beliefs about seriousness and treatment effectiveness were measured on a 5-point scale (1, not at all important; 5, very important). For example regarding treatment effectiveness, participants were asked: "How important do you believe diet is for controlling your diabetes?" Barriers of monitoring blood glucose (4 questions) and medication adherence (4 questions) were assessed on an eight-point scale, ranging from 0 ("does not apply to me") to 7 ("daily"). The other barriers (of diet and exercise) were assessed by 13 questions about the occurrence of certain situations (dichotomous).

Regarding the second model the ASE-variables were operationalized by referring to all four domains separately. Each domain was addressed by four questions, asking respectively about attitude, social support, self-efficacy and intention on a 4-point scale. For example with respect to attitude, participants were asked whether they agreed with the statement: "If I took my diabetes medication every day that would be very good or bad" (1= ' very good' to 4= 'very bad'). We also used four questions to measure social support, one question for each domain: "Do your significant others think that compliance to diet rules is important for you as a diabetic patient?" Participants responded on a 4-point scale (1= not at all important; to 4= very important). As an example for self-efficacy the question "Do you think you are able to check your own blood glucose?" was asked, and response was given on a 4-point scale (1= totally positive; to 4= totally negative). For intention, a question such as "Do you really intend to take your diabetes medication every day?" was asked and a response was given on a 4-point scale (1= totally positive; to 4= totally negative). The questions about attitude, social support and self-efficacy regarding dietary behavior (but also regarding exercise etc) were grouped together and recoded as 'ASE diet', 'ASE exercise', 'ASE medication' and 'ASE monitoring blood glucose', in order to compare the ethnic groups on these specific domains.

Except for the barriers concepts, a higher score on all constructs is indicative of the patient having a more positive, or desirable, view of that aspect of diabetes self-management.

Analysis

Mean differences between the ethnic minority groups (Turkish and Moroccan) and Dutch patients in the outcomes of diabetes care, self-management and behavioral determinants were examined. We did this through paired-samples t-tests in which the design of the study (matching on age, gender and SES) inevitable was taken into account (Statistical Package of Social Science –SPSS- version 11). Additionally, adjustments for type and duration of diabetes mellitus were done. When statistically significant differences between ethnicity and outcomes of diabetes care were found, we investigated whether they could be explained by the behavioral determinants. Requirements for a statistically significant explanation were: (1) the behavioral determinant must be associated with ethnicity, (2) the behavioral determinant must be associated with outcomes of diabetes, (3) the behavioral determinant must cause a statistically significant change in the ethnic difference in outcomes, after controlling for it. To test requirements 1 and 2, a series of multiple regressions were performed. To examine whether the strength of the association between ethnicity and outcomes of diabetes care changed significantly after adding a potential mediator to the model (requirement 3), a bootstrap analysis was conducted in S-Plus 6.0 for Windows. Bootstrapping uses the study sample as the population. By drawing random samples with replacement from the study population, 1000 replications were formed to estimate confidence intervals around the beta-differences (i.e. the regression coefficient of ethnicity). When the interval did not contain 0, the change was considered statistically significant.

RESULTS

Study population

The study included 204 patients, of which 50% were of Dutch origin, 25% were immigrants from Turkey and 25% from Morocco (all first-generation immigrants) (Table 1). No differences were observed between the three groups for age and gender, which implied that matching for these variables was successful. Nevertheless, matching for socioeconomic status was not fully successful. Although all groups had an income

Table 1
Characteristics of the study population

	Dutch N=102	Turkish N=51	Moroccans N=51
Mean age (Sd)	54.8 (13.1)	54.1 (11.6)	52.3 (12.3)
Gender (% males)	39.2	35.3	43.1
Mean household income[a], mean (Sd)	86.8 (11.0)	80.0 (8.8)	77.7 (7.4)
Duration of diabetes, mean self reported years (Sd)	16.4 (12.1)	13.8 (8.9)	12.6 (6.5)
Type of diabetes mellitus (% type 2)	69.7	92.0	86.3

[a] Mean household equivalent income of the neighborhood (National mean=100).

Table 2
Ethnic differences in outcomes of diabetes care

Comparison of mean values	Dutch[a,c]	Turkish and Moroccans[a,c]	Mean difference[b,c] (95% CI[d])
BMI, kg/m^2, mean (Sd)	31.7 (8.1)	30.2 (8.1)	1.5 (-1.6-4.5)
Systolic BP, mm Hg, mean (Sd)	134.7 (21)	135.7 (20)	1.0 (-4.9-6.8)
Diastolic BP, mm Hg, mean (Sd)	76.8 (11)	77.1 (10)	0.2 (-2.8-3.3)
HbA1c, %, mean score (Sd)	7.7 (1.8)	8.6 (1.8)	0.9** (0.4-1.4)
TC:HDL, ratio, mean score (Sd)	3.8 (1.6)	4.5 (1.5)	0.7** (0.3-1.2)

[a] Mean scores
[b] Turkish and Moroccans compared to the native Dutch patients, accounted for matched pairs
[c] Adjustment for diabetes mellitus duration and type of diabetes
[d] Confidence interval
** = $p<0.05$

below the national average, the Dutch patients had a higher mean income than the ethnic minority groups. Ethnic minority patients were more likely to have been identified with type 2 diabetes and the duration since their diagnosis was shorter.

Ethnic differences in outcomes of diabetes care

Table 2 presents results for outcomes of diabetes care. Mean BMI, and systolic and diastolic blood pressures were similar for both groups. The mean HbA1c and lipids were significantly higher among immigrants compared to the native Dutch patients, risk differences were 0.9 % (95% CI: 0.4-1.4) and 0.7 (95% CI: 0.3-1.2), respectively. After additional adjustment for diabetes regime, that correlates with type of diabetes, and the treatment for hyperlipidemia, the ethnic differences remain to exist in HbA1c and lipids (data not shown).

Ethnic differences in (determinants of) self-management

The mean scores on self-management (total score and sub-scores on the four domains) and on the constructs of the ASE- and PMB models are presented in table 3. For total self-management, and for the separate domains ‘diet’ and ‘monitoring blood glucose levels’, immigrant patients reported better (healthier) behavior.

Concerning the constructs of PMB, immigrant patients viewed their diabetes more seriously than native Dutch patients. The treatment effectiveness was also believed to be more important among immigrant patients, which meant that they believe that rules concerning the treatment are crucial for the management of their disease. Dutch patients reported more barriers for compliance with taking the prescribed medications and monitoring blood glucose levels, while the dietary barriers were higher among immigrant patients (i.e. immigrant patients experienced it being more impolite to refuse food when offered). In general, the direction of the relationship between

Table 3
Scores self-management and scores constructs ASE- and PMB model

Comparison of mean values	Scale	Dutch[a]	Turkish/ Moroccans[a]	p-value[b]
Self-management total	1-4	3.01	3.20	0.01**
a. diet	1-4	2.89	3.09	0.05*
b. exercise	1-4	2.78	2.94	0.29
c. medication	1-4	3.15	3.30	0.13
d. monitoring blood glucose	1-4	3.33	3.57	0.00 ***
Personal Model and Barriers				
Seriousness	3-15	10.55	12.31	0.00 ***
Risk perception	1-25	17.37	16.47	0.42
Treatment effectiveness	1-5	3.51	4.13	0.00 ***
Barrier diet	1-18	1.18	1.90	0.00 ***
Barrier exercise	1-19	1.56	1.47	0.70
Barrier medication	1-9	5.98	4.10	0.00 ***
Barrier monitoring bloodglucose	1-9	5.45	4.62	0.14
ASE-model				
Attitude[c]	1-4	3.34	3.55	0.02 **
Social support[c]	1-4	3.08	3.40	0.01 **
Self-efficacy[c]	1-4	3.35	3.07	0.01 **
ASE diet[d]	1-4	3.14	3.23	0.39
ASE exercise[d]	1-4	2.99	3.05	0.59
ASE medication[d]	1-4	3.79	3.60	0.01 **
ASE monitoring blood glucose[d]	1-4	3.13	3.52	0.00 ***
Intention	1-4	3.43	3.33	0.21
Intention diet	1-4	3.06	3.17	0.49
Intention exercise	1-4	3.12	3.01	0.45
Intention medication	1-4	3.86	3.67	0.06*
Intention monitoring blood glucose	1-4	3.72	3.44	0.01**
Knowledge diabetes	1-12	9.79	7.78	0.00***

[a] Mean scores, adjusted for diabetes mellitus duration and type of diabetes
[b] Ethnic minorities compared to the native Dutch patients, accounted for matched pairs
*=p<0.1 ** = p<0.05 ***=P<0.01
[c] with regard to all four domains of diabetes self management behavior
[d] items on attitude, social support, and self-efficacy are grouped by domain of diabetes self management behavior

the determinants and outcomes of care was negative: the better (higher score) the determinant, the better (lower score) the outcomes. Only for seriousness and dietary barriers we found: the higher the score on the determinant, the worse (higher score) for the outcomes.

Concerning the ASE-model, immigrant patients reported a more positive attitude towards the four domains of self-management and experienced higher levels of social support regarding their diabetes. Dutch patients, on the other hand, reported higher levels of self-efficacy, and, thus, were more convinced about their ability to perform certain diabetes tasks. Regarding the separate domains, the ASE+I score on *taking medication* was higher among the Dutch patients, while *monitoring blood glucose levels* was higher among immigrant patients. Although the ASE-model postulates that intention predicts behavior, native Dutch patients reported higher scores on the *intention* to perform monitoring blood glucose levels, but immigrant patients reported better *self-management* (behavior) of it. Dutch patients had better knowledge of the aspects of their diabetes, which implies a greater understanding of diabetes self-management. Of all the determinants, only *self-efficacy* and *social support* had an association with the outcomes of care: the better (higher score) the self-efficacy the better the outcomes, better (higher scores) on social support were associated with worse lipid profiles.

Role of (determinants of) self-management in explaining the ethnic differences in outcomes

Table 4 contains the seven determinants (self efficacy, seriousness, barriers diet, diabetes knowledge, social support, treatment effectiveness, and monitoring blood glucoses) that have the potential to explain the ethnic differences in HbA1c and lipids. These seven determinants fulfill the first requirement (the behavioral determinant

Table 4
Explaining determinants in ethnic differences in outcomes

Outcome	Behavioral determinants	Ethnic difference in outcome initially	Ethnic difference after introducing variable in model	Effect on ethnic differences	p-value of effect on ethnic diff
HbA1c	Seriousness	0.91	0.76	-17%	0.07
	Barrier diet	0.91	0.83	-9%	0.39
	Self-efficacy*	0.91	0.75	**-18%**	0.02
	ASE monitoring blood glucose*	0.91	1.13	**+23%**	0.02
	Knowledge diabetes	0.91	0.76	-17%	0.27
Lipids	Seriousness*	0.70	0.47	**-33%**	0.02
	Treatment effect	0.70	0.60	-14%	0.32
	Barrier diet	0.70	0.59	-16%	0.12
	Social support*	0.70	0.60	**-14%**	0.05
	Self-efficacy	0.70	0.61	-13%	0.20
	Social support & seriousness*	0.70	0.39	**-44%**	0.04

must have been associated with ethnicity) and second requirement (the behavioral determinant must have been associated with outcomes of diabetes) for a potential contribution to the explanation of the ethnic difference in outcomes. To ascertain whether these determinants actually contribute to the explanation of ethnic differences in diabetes outcomes, multiple regression models were applied: ethnic differences were estimated without and with adjustment for each of the determinants. When a change in the ethnic difference was observed after adjustment for one of the determinants, bootstrap analysis was used to determine whether the change was statistically significant (requirement 3).

Regarding HbA1c, the determinant *Self-efficacy* explained 18% of the ethnic differences in HbA1c. Adjustment for *ASE monitoring blood glucose* resulted in an *increase* of the ethnic differences in HbA1c of 23% and thereby could be considered as a protective factor for immigrant patients. Immigrant patients reported higher scores on *ASE monitoring blood glucose,* which resulted in better control of HbA1c.

The ethnic differences in lipids were partially explained by the determinants *social support* (20%) and *seriousness* (33%). Together they explained 47% of the ethnic differences.

The constructs of self-management did not meet the requirements for inclusion, thus were not able to explain part of the ethnic differences in HbA1c or lipids.

DISCUSSION

This study showed ethnic differences among diabetes patients, with ethnic minorities having higher levels of HbA1c and lipids than native Dutch patients. These differences could not be explained by ethnic differences in levels of self-management. However, several determinants of self-management partly contributed to an explanation of these ethnic differences. Self-efficacy explained a fifth of the ethnic differences in HbA1c. ASE for monitoring of blood glucose proved to be a protective determinant for immigrants' HbA1c levels. Regarding lipids two determinants, seriousness and social support, explained nearly half of the ethnic differences.

Before interpreting the results, some potential limitations should be considered. First, the number of immigrant patients was small and limited the statistical power to demonstrate significant differences. However, the size of our study population is comparable to that of other studies, in which ethnic differences in diabetes outcomes are investigated [19-21]. Moreover, the high response rate (79%) in this study minimizes the risk of selection bias. The second limitation is our reliance on patients' self-reports e.g. for data on self-management. Patients' self-reports are open to bias. In order to prevent/minimize this response bias we used specific, nonjudgmental questions [22]. Third, we selected Dutch patients with the best matching variables, including socioeconomic status. Therefore, in this study the native Dutch patients were a select sample with a lower socioeconomic status than the general Dutch population. Fourth, we did not have enough statistical power to distinguish patients by ethnicity as well as by gender. In many aspects Turkish and Moroccan groups remain different, although they have factors in common such as their religion and immigrant status in the Netherlands. This could be reflected in their health beliefs, behavior and health outcomes. A larger study would possibly provide more information on differences between both ethnic groups. Finally, this study was conducted in one outpatient setting of a university hospital, thereby limiting external generalisability of the results. On the other hand, all Turkish and Moroccan diabetic patients from the outpatient setting were approached, the response rate was high, and most patients were referred to Erasmus MC for treatment of basic diabetes care and not for tertiary medical care.

No ethnic differences were found in outcomes like blood pressure and BMI. Regardless of ethnicity, the average blood pressure of the patients in this study was acceptable. Lipid targets are the easiest, blood pressure targets are next and blood glucose targets are the most difficult to meet, in particular in advanced diabetes and when using complex treatment regimens (such as multidose insulin regimens). The mean BMI on the other hand was much too high (mean > 30 kg/m^2) according to health recommendations, for both for the Dutch and the immigrant patients. The finding that all ethnic groups in this study are dealing with severe overweight and the complexity of battling overweight, stresses the importance of attention for weight loss in diabetes care.

No statistically significant relationship was found between self-management and outcomes of diabetes care, nor in the total diabetes population neither in the ethnic groups separately. Other studies reported that patient's assessment of their diabetes self-management was associated with achieved glycemic control (HbA1); the better the self-management the better the glycemic control [23][24]. An explanation for the deviate results could be that the population of our diabetes study, immigrant as well as native Dutch patients, belongs to the lower socioeconomic groups. Especially patients with lower levels of socioeconomic status are more vulnerable for giving answers that reflect social desirability [25]. Additionally, patients really believe that they are highly compliant to the diabetes regime, but in practice there is inadvertent noncompliance attributable for instance to patient-provider miscommunication, patient knowledge/skill deficits or to the behavioral complexity of the diabetes regimen. Moreover, people with lower levels of socioeconomic status can be very content with their diabetes behavior, even if they demonstrate a very small portion of the recommended behavior. Frequently, their image of the recommended behavior does not correspond with the recommendations as given [26]. This could possibly explain the absence of the relationship between self-management and outcomes of diabetes care in our study. As the most important dimensions of self-management are incorporated in our questionnaire [17], it is unlikely that incompleteness might be the explanation for the absence of the association between self-management and outcomes of diabetes care.

We found higher levels of self-efficacy among Dutch patients. This finding is in agreement with a recent study, in which it is reported that cultural differences may promote different self-efficacy appraisals [27]. People brought up in a society based on 'dependent' collectivism' and hierarchical relationships learn to obey, which implies less independent behavior with lowered self-efficacy. While people brought up in societies based on 'independent individualism' are treated as equals and are encouraged to be independent, and thus act more independent. Despite the lower levels of self-efficacy among immigrants in our study, higher levels of self-management were reported compared to native Dutch. On the contrary, Hjelm assumed that higher levels of self-efficacy result in higher levels of self-management [27]. Patients with higher levels of self-efficacy possibly show more active self-management behavior according to Hjelm. Regarding the direction of the relationship between self-efficacy and outcomes of diabetes we must be cautious, because the measures in our study were cross-sectional. This applies also for all other determinants of self-management like social support.

Immigrants reported higher levels of social support and seriousness. In several studies and theories seriousness is considered as a proxy for behavior; higher levels of seriousness result in healthier behavior and better outcomes [7]. However, in our study the stronger beliefs in the seriousness of the disease lead to an increase in the ethnic differences, because higher levels of seriousness correlate with unhealthy outcomes among immigrant patients. This is in agreement with several other studies that reported that seriousness in the absence of one's ability to cope with the threat might result in maladaptive responses [28][29]. If the threat is high but coping appraisal is low, feelings of helplessness will be high, which will result in maintaining or even intensifying the risk behavior – e.g. not taking their meals according to the guidelines – generating the threat. So misjudgment regarding the seriousness of diabetes can inhibit active participation in the treatment. Learning to understand the patient's perspective will help health care professionals communicate more effectively and tailor the treatment to the needs of the patients [30]. Concerning social support and lipids, our results showed, in contrast with previous studies [10][31], that more social support leads to worse outcomes. This might be explained by the fact that all evidence for the favourable role of social support comes from research with non-Turkish and non-Moroccan groups. Turkish and Moroccan people spent more time with family and peer members, family ties are more important and more coercive. In our questionnaire we noticed that family ties could have negative side effects for diet and exercise. More immigrant than Dutch patients reported that exercising is unaccustomed in their family and that eating food different to the rest of the family is impolite, and that these factors were barriers for compliance.

Given the differences in socioeconomic status of ethnic minority and native Dutch people, and the knowledge of the relationship between socioeconomic status and health, it is likely that differences in socioeconomic status contribute to ethnic differences in health. That is why we decided to match on demographic (age and sex) and socioeconomic (based on the mean household income equivalent of the neighborhood) characteristics. However, matching for socioeconomic status was not fully successful and some additional analyses were done in which we adjusted for socioeconomic status. These extra adjustments did not influence the results: ethnic differences in HbA1c and lipid remain to exist.

Moreover, socioeconomic status is a complex concept, for which several indicators are used in health research: income, occupational level, and educational level. Since there was indication that there could be differences in education level between native Dutch and immigrant people who have a similar socioeconomic status with regard to other indicators (e.g., income levels, occupational status, neighborhood), a question on educational level could have been incorporated into the questionnaire. We indeed found differences in levels of education between ethnic groups. Among immigrant patients more than 83%, compared to 19% of the Dutch patients, had no education at all or the highest grade of school they completed was of a primary level. To more closely examine the role of education, again some additional analyses were done in which we adjusted for education. The results showed that education contribute to the explanation of ethnic differences in HbA1c and lipids via the following determinants of self-management; monitoring blood glucose, barriers of diet and medication, attitude, self-efficacy, social support and knowledge of diabetes. These determinants, for which statistically significant differences were found between the ethnic groups, were no longer different after adjustment for education. In contrast with these results, Bonds [32] did not find an association between levels of education and outcomes of diabetes care. And also Harris [33] found that education was not predictive of poor glycemic control. The lowest level of education in those studies is higher than in this study. In our immigrant study population almost all patients of the lowest education level did not follow school at all and nearly all these patients are illiterate. To instruct illiterate patients on self-management behavior requires individualized teaching with low-literacy techniques and it is more complicated to obtain the same levels of glycemic control.

The determinants of self-management could only partly explain the ethnic differences in outcomes of diabetes care. Also the diabetes regime, that correlates with type of diabetes, or the treatment for hyperlipidemia did not explain the ethnic differences in HbA1c or lipids. Other possible explanations for ethnic differences in outcomes of diabetes care that have been shown to contribute to some of the variance in diabetes outcome are genetic characteristics, socioeconomic, and cultural factors or the doctor-patient-relationship [34-36].

The finding that determinants of self-management in diabetes care are correlated with outcomes, while self-management itself is not correlated with outcomes, raises questions about the mechanism of action. What is the mechanism of action by which self-efficacy influences health outcomes if it does not act through self-management? Differences in response bias with regard to self-management and the determinants of it could be an explanation, for instance if the last scores are more realistic than the self-management scores. But since there is no empirical support for this assertion, we raise the question about the mechanism as unanswered and recommend further research on this topic.

In summary, this study provides evidence for ethnic differences in outcomes of diabetes care. Self-efficacy is the most important determinant in explaining the ethnic differences in HbA1c. For researchers and theorists, these findings suggest that certain aspects of self-efficacy are important for understanding patients' health outcomes in diabetes care. For the practice of diabetic care, these findings suggest that strengthening patients' self-efficacy beliefs may improve their control of HbA1c and may result in a decrease of ethnic differences. Especially for those patients who lack confidence in their ability to perform diabetes-related tasks, it is of importance to introduce interventions to strengthen their self-efficacy. The mechanism of action by which the determinants of self-management influence health outcomes is unclear. Another important finding is that regarding ethnicity there is a different relationship between behavioral determinants like seriousness and social support and outcomes of diabetes care. Apparently the PMB and the ASE model are not applicable in the same way for different ethnic groups and these models must take account of ethnic specific influences.

Appendix

Domains of self-management (internal consistency overall is moderate, α = 0.62)

Blood sugar	
1.	to provide a remedy too high blood sugar
2.	to provide a remedy too low blood sugar
3.	self-control blood glucose
4.	feel when blood sugar is too low
5.	feel when blood sugar is too high
Nutrition general	
6.	variation in nutrition
7.	stick to diet most of the time
8.	adjust diet in case of stress
9.	adjust diet when ill
Nutrition specific	
10.	stick to diet when away from home
11.	stick to diet on vacation
12.	stick to diet at home
13.	stick to diet at work
14.	stick to diet on party/reception
Physical exercise	
15.	Take care for sufficient physical exercise
16.	adjust diet for extra physical exercise
Apply medication	
17.	take your tablets according prescription when away from home
18.	adjust tablets (dose) when ill
19.	take your insulin according prescription when away from home
20.	adjust insulin (dose) when ill
21.	adjust medication (dose) in case of stress, when ill, extra physical exercise

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7

General discussion

The aim of this study was to analyze ethnic differences in processes and outcomes of outpatient hospital care, with special attention to diabetes mellitus and gastrointestinal complaints. Specifically, we addressed the following research questions:

Q1. Are there ethnic differences in the use of outpatient hospital care?
Q2. Are there ethnic differences in the diagnostic process of gastrointestinal complaints?
Q3. Are there ethnic differences in the quality of diabetes care?

In this final Chapter we provide an overview of our results, we evaluate the data and methods used, and discuss the significance of the observed ethnic differences in process and outcomes of outpatient hospital care. Finally, we consider implications for further research and policy.

SUMMARY OF RESULTS

In the first part of this thesis, ethnic differences in health care use were examined. With respect to research question 1 we found that Surinamese, Turkish and Moroccan immigrants living in the referral area of the Erasmus MC made more use of outpatient care than native Dutch people. In Rotterdam municipality the five largest ethnic minority groups demonstrated a higher use of the outpatient care facilities than native Dutch residents. This increased use can be predominantly ascribed to first-generation immigrants; second-generation immigrants do not appear to have an increased use of health care services. Immigrant patients are more likely to be referred for analysis and treatment of ‘gastrointestinal signs & symptoms’ and were less often referred for ‘indefinite and ambiguous signs’. Immigrant patients were more frequently diagnosed with ‘liver diseases’, and less often with ‘analysis without diagnosis’.

Additionally, in research question 2, ethnic differences in referral reasons, diagnosis and in the preceding diagnostic procedures among patients with gastrointestinal complaints were examined. We found ethnic differences in complaints presented during the first consultation, with immigrant patients presenting with pain more frequently but presenting less with tangible signs (i.e.diarrhea, melaena, rectal bleeding) than native Dutch patients. No large ethnic differences were detected in the diagnostic process or in the final diagnosis. Among immigrant patients more diagnostic tests were requested during the first consultation and it took more consultations to reach a diagnosis. ‘Helicobacter pylori infection’ was the only diagnosis that occurred more frequently among immigrant patients.

In the second part of the thesis, ethnic differences in the quality of diabetes care were described (research question 3). We focused on two important dimensions of quality of care: process and outcomes. The process of care was considered as the actual delivery and receipt of care, and outcomes were considered as consequences of care. First, a review of the literature on ethnic differences in long-term outcomes, i.e. the prevalence of complications and mortality among diabetic patients and in the quality of diabetic care was performed. The literature showed that (after adjusting for confounding factors) diabetic patients from ethnic minorities have higher mortality rates and a higher risk of diabetic complications. After additional adjustment for risk factors (like smoking, socioeconomic status, income, years of education and body mass index), ethnic differences disappeared in most instances. Exceptions were an increased risk of end-stage-renal-disease (ESRD) among the US blacks and Hispanics, and an increased risk of retinopathy among the UK Asians and blacks and Hispanics in the US. Intermediate outcomes of care such as HbA1c and blood pressure were worse among blacks, outcomes among Hispanics also tended to be worse. Likewise, ethnic differences in the quality of care in the US exist: process-of-care was worse among blacks. Overall, the review suggested marked ethnic differences in intermediate outcomes and quality of diabetes care in the US. Based on the results of the review, we questioned whether ethnic differences in outcomes and quality of diabetes care existed in the Netherlands. Thus, a study was performed in order to describe ethnic differences in outcomes of outpatient diabetic care and assessed the role of quality of care. In this study we found that diabetes outcomes differed significantly, with ethnic minority patients having higher levels of HbA1c and lipids. Turkish and Moroccan patients were more than two times as likely to have had HbA1c above 8.5% and have increased lipids compared to native Dutch patients. We observed no consistent differences regarding the process of outpatient care for diabetes delivered by the medical providers for Turkish, Moroccan and Dutch patients. That implies that the ethnic differences in outcomes cannot be explained by differences in the quality of care provided to patients of foreign descent. Adjustment for educational status reduced the mean difference of HbA1c and lipids by 30%. Additionally, the role of self-management was assessed in explaining the ethnic differences in outcomes of diabetes care. The results showed that self-management was unable to explain the differences. However, the determinant self-efficacy explained 18% of the ethnic differences in HbA1c. And beliefs about the seriousness of diabetes and social support regarding diabetes management explained 47% of the ethnic differences in lipids together. Finally, we examined the assumption that ethnic differences would decrease as immigrant patients were better integrated into the Dutch society. We found that integration was not associated with more favourable diabetes outcomes of immigrant patients. Turkish and Moroccan patients who were better integrated into the Dutch society had similar diabetes outcomes as those who were less well integrated.

METHODOLOGICAL ISSUES

Specific methodological limitations of the studies that are included in this thesis have been discussed in Chapters 2 through to 6. In this section we discuss the internal and external validity of the studies.

Bias due to selection can be a serious threat to the internal validity of both quantitative and qualitative studies. Selection bias leads to inadequate representation for statistical interpretation, hampering extrapolation of study results to the base population. Low response rates can be the cause of selection bias. The latter particularly applies to studies examining ethnic inequalities, since participation is often difficult to obtain among ethnic minority groups [1]. For the diabetes part in our study, *all* Turkish and Moroccan diabetic patients from the outpatient setting (under the treatment of a diabetes specialist for at least one year) were approached. And regarding registration we asked *all new* patients for their and their parents' country of birth. Both approaches minimise the occurrence of selection bias. We obtained a high response rate for the registration of ethnicity and for the interviews among diabetes patients, respectively 90% and 79%. In our opinion the high response rate is due to the approach of the patients in both parts of the study in our opinion. First, for the registration part of the study it was important to give instructions to the professional counter staff and to inform all new patients about the aim of the registration. We translated the information letter into five languages (English, Spanish, Turkish, Moroccan and Dutch) in order to cover the largest ethnic minority groups. Second, the interviews among diabetic patients took place at patients' homes. Trained interviewers, from the same ethnic background as the patients, conducted face-to-face interviews among both immigrant and Dutch patients. The questionnaire was pilot-tested on the comprehensibility of questions and the ability of subjects to provide the requested information. Taking all the abovementioned factors into account we judged that the results of our study are not influenced to a large extent by selection bias.

Information bias is another threat to the internal validity of studies. Most of our data were extracted from medical records or were based on face-to-face interviews. Differences in describing information in medical records could be a threat if it concerns ethnic differences in a systematic way. We have no indications that describing information in medical records was connected with the ethnicity of patients. The absence of reports was equally distributed over all ethnic groups. In the diabetes study, data were obtained by face-to-face interviews. Trained interviewers, from the same ethnic background as the patients, conducted face-to-face interviews among both immigrant and Dutch patients. When necessary, questions were translated in a structured way; the translation was agreed on beforehand. Self reports introduce the risk of information bias increasing the likelihood of socially desirable answers. It is remarkable that immigrant patients consequently reported healthier behavior on the more subjective items like diet- and exercise behavior, while they obtained lower scores on 'objective' items, like diabetes knowledge. However, social desirability may apply to both groups, since immigrant as well as native Dutch patients belong to lower socioeconomic groups [2]. Patients with lower socioeconomic status are more vulnerable for giving answers that reflect social desirability. A high level of self-management was scored among all diabetic patients. Patients may believe that they are highly compliant to the diabetes regime, but in practice there is inadvertent noncompliance attributable, for instance, to patient-provider miscommunication, patient knowledge/skill deficits or to the behavioral complexity of the diabetes regimen. Moreover, people with lower levels of socioeconomic status can be very content with their diabetes behavior, even if they demonstrate only some of the recommended behavior. Frequently, their image of the recommended behavior does not correspond with the recommendations as given [3]. Our finding that there is no correlation between self-management and outcomes of diabetes may be (partly) a consequence of the fact that patients reported higher levels of self-management than they actually performed. This could have resulted in the absence of a mechanism of action by which the determinants of behavior influence diabetes outcomes.

To avoid *confounding* in our study we followed a number of procedures. First, in the diabetes study we matched on variables with regard to demographic (sex, age) and socioeconomic characteristics (based on the mean household income equivalent of the neighborhood). Matching for gender and age was successful. No differences were observed between the ethnic groups for these variables. Nevertheless, matching for socioeconomic status was not fully successful. Although all groups had an income below the national average, the Dutch patients had a higher mean income than the ethnic minority groups. In the next paragraphs we address this point. Second, in the diabetes study we did a type of analyses in which the study design (matching on age, gender and socioeconomic status) and type and duration of diabetes mellitus were taken into account. In the other analyses, we adjusted for confounding variables such as sex and age. For the demographic characteristics it is reasonable to assume that control for confounding was adequate.

Concerning socioeconomic status, it is debatable whether this factor should be considered as a confounding variable or as an intermediate factor. The main difference between both premises is the direction of the relationship between socioeconomic status and the immigrant status; is the immigrant status predominantly determined by socioeconomic status, or is socioeconomic status determined by the immigrant status? Concerning labor immigrants at least one of the indicators of socioeconomic status, education, precedes the immigrant status, because in the 1960s and 1970s most immigrants were selected on low/no education. Immigrant workers came, initially on a temporary basis to the Netherlands, for only low educated work. Indicators of socioeconomic status like income and occupational class, on the contrary, are predominantly determined by the immigrant status and the corresponding type of jobs. Income as well as occupational class is not only influenced by the level of education, but also by the opportunities/limitations in the Netherlands for immigrants to climb the social ladder. Thus, for the first-generation immigrants, who were initially foreign workers, it is arguable that ethnicity precedes the socioeconomic position of the immigrant workers. Because of the ambiguous role of socio-economic status in the relationship between ethnicity and health, all results are shown unadjusted for socioeconomic status but we also performed analyses adjusted for it. The difference between adjusted and unadjusted methods was small, which lead to the conclusion that socioeconomic status as a confounder or as an intermediator did not explain much of the ethnic differences in our analyses.

We approximated socioeconomic status at the individual level by making use of mean neighborhood incomes, a variable at the ecological level. This measure, as a proxy for the individual level of socioeconomic status, may not be equally good for all ethnic groups. In some groups, the place of residence is determined by the mean socioeconomic status of a neighborhood, whereas in others it is predominantly determined by the ethnic composition of a neighborhood. In that case, neighborhood income may be a less valid indicator of socioeconomic status. For Antilleans this does not seem to be the case however for Turks, Moroccans and Surinamese a somewhat larger proportion (5 to 15%) of the population belonged to the lowest income quintile according to the measure at the ecological level than according to the measure at the individual level. This means that the place of residence of Turks, Moroccan and Surinamese may be more strongly determined by factors other than neighborhood income. As the discrepancy was fairly small, the influence of the differential validity on the outcomes of this study would be limited. In general, the effect of adjustment for socioeconomic status measured at the neighborhood level on health outcomes is likely to be underestimated. This is mainly because of the mathematical reason that adjusting for mean values results in smaller effects than adjusting for individual values.

External validity refers to the generalisability of the study results. With respect to health care use, the results of our study are comparable with the results of other national studies. These studies mostly reported a higher use of general practitioners and outpatient care among immigrant patients [4]. Our results differ from outcomes of international studies. For example, in the US a lower use of outpatient care is seen among ethnic minorities [5]. Differences between the Netherlands and the US could be explained partly by differences in health care insurances. Approximately 47 million Americans have no or inadequate health insurance. Ethnic minorities are significantly over-represented in this group. In the Netherlands access to health care is guaranteed, based on the health insurance system. Another explanation for the different findings between other countries and the Netherlands could be the importance of geographic and spatial behavioral factors in health care utilization. Long distances between places of residence and health care services are reported to be negative for disadvantaged populations such as immigrants [6]. However in a country like the Netherlands where distances are small and public transport is well organized, geographic inaccessibility plays no role in health care use. Regarding ethnic differences in outcomes of diabetes, the results of our study are comparable with the results of other international studies. Correspondingly, they reported ethnic differences in outcomes of diabetes [7][8]. A Dutch study found that ethnic differences in outcomes were not attributable to poorer quality of diabetes care provided to patients by general practitioners [9]. Our results demonstrated a comparable finding for diabetes care in outpatient clinics. In brief, due to differences in contextual factors in different countries it will generally not be possible to generalize empirical findings regarding ethnic disparities in health care use to other countries. Also within the Netherlands no generalizations can be made for all ethnic groups for all kinds of diseases or complications. Moreover, care was restricted to outpatient care and delivered by a university hospital. Since other educational hospitals have the delivery of highly standardized care in common with university hospitals, the results regarding diabetes and gastrointestinal diseases are likely valid for that type of hospitals.

INTERPRETATION OF THE RESULTS OF THIS THESIS

Ethnic differences in use of health care facilities and in process of care

We found that ethnic minorities were 1.5-2 times more frequently referred to the internal medicine outpatient clinic than the Dutch majority population, but that differences in the process of care were small. Among immigrant patients with gastrointestinal complaints, more diagnostic tests were requested during the first consultation and it took more consultations to reach a diagnosis. Concerning diabetic care, we observed no consistent differences in the process of care. In order to compare our results with other research, we discuss ethnic differences in *use* and *process* of health care separately.

Use of health care

We found that ethnic minorities were 1.5-2 times more frequently referred to the internal medicine outpatient clinic than the Dutch majority population. Ethnic patterns in health care utilisation are reported to be complex, and we need to take a few points into consideration when we want to interpret the findings of our study.

First, differences in the use of health services can be explained by differences in need. In our study we have not accounted for differences in need, but previous studies have reported a higher incidence of infectious diseases, hypertension, circulatory diseases, diabetes, and worse general health among immigrant groups.

Second, next to differences in needs there are other explanations for a higher use of outpatient care, for instance different styles/patterns in referrals to the outpatient care. Current referral patterns are derived largely from experiences with / research among majority populations. Cultural differences between majority norms and normative ways of experiencing and communicating symptoms among immigrant patients may lead to different patterns in referrals. As a result of different patterns in referrals one might expect a higher proportions of misfits between referral reasons and diagnosis among immigrant patients compared to native Dutch patients. Additionally, higher proportions of misfits between referral reasons and diagnosis among immigrant patients may be a result of ethnic differences in care-seeking. Immigrant people are reported to have a more positive attitude towards care-seeking [10][11] and have different beliefs concerning health and illness [12]. As a result immigrant patients seek professional medical help more often, not only because they actually do have more health problems, but they also tend to report physical symptoms more often. Thus reasons of a more positive attitude towards care-seeking and different beliefs concerning health and illness could also play a role in differences in health care use.

Considering the first explanation, the empirical finding of our study showed that immigrant patients were more frequently referred with ‘gastrointestinal signs & symptoms’ and ‘liver diseases’, and immigrants indeed are known to have a higher incidence of these diseases/symptoms. The higher use of outpatient care among immigrants in our study seems to be a direct reflection of a higher incidence and prevalence of certain diseases. Regarding the second explanation, based on misfits between referral reasons and diagnosis, one might expect more referrals for indefinite or general signs among immigrant patients. Specifically, in the case of misfits, immigrant patients would be more likely to end up in the category ‘analyses without diagnosis’. In our study we found the opposite: less immigrant patients came to the outpatient clinic with ‘indefinite, ambiguous signs’, and compared to Dutch patients they had a lower risk for the category ‘analysis without diagnosis’.

In summary, immigrants make more use of the internal medicine outpatient clinic than the Dutch majority population. The higher use among immigrants seems to be a direct reflection of a higher incidence and prevalence of diseases that are referred to the internal medicine clinic (i.e., diabetes, liver diseases and gastrointestinal complaints). The equal amount of misfits between referral reasons and diagnosis among immigrant patients and native Dutch patients might confirm that health complaints perceived as inappropriate have been effectively filtered out by the general practitioner. That means that referring inaccurately to the outpatient care probably is not the explanation of the increased use of the internal medicine outpatient clinic among immigrants.

Process of care

We found no large ethnic differences in the process of care. While we reported small ethnic differences in the diagnostic process among patients with gastrointestinal complaints, we found no differences in process of health care provision among diabetic patients. The deviation between both fields could be explained by two factors.

First, in diabetes care we studied differences in process of treatment and follow-up, while in the field of gastroenterology the diagnostic process was under study. In general, treatments and follow-up are more standardized than diagnostic processes. Reaching a diagnosis is a more deductive process, driven by the information patients give and physicians questions. In this process, information from the history-taking has a high predictive value for adequately/efficiently diagnosing, which underlines the importance of good history-taking [13]. While in the process of treatment the influence of communication is essential, in history-taking effective communication is a basic requirement that directly influences the outcome. Especially in studying ethnic differences, the dissimilar influence of communication on both processes results in different findings concerning the process of diagnosing and treatment. Physicians may feel uncomfortable because of the experience that health problems of immigrant patients are more difficult to solve, because they have to make decisions often without complete and accurate information. It possibly means that physicians experience fewer opportunities for making diagnoses based on the history taking. When faced with these uncertainties they might try to increase certainties by requesting more diagnostic test immediately after history taking. That could partly explain why we found ethnic differences in the diagnostic process of gastroenterology compared to no differences in the process of diabetes care.

Second, diabetes concerns a more straightforward field than gastroenterology, and is generally less susceptible to differences. Gastrointestinal complaints belong to a field in which physicians are facing more uncertainties, because most of the complaints have an idiopathic background. Abdominal complaints are often presented as non-specific or vague, whereas early symptoms of diabetes are easier to identify.

No previous studies about ethnic differences in diagnostic process among patients with *gastrointestinal* complaints were found. Results of Dutch studies about process of *diabetes* care are predominantly in agreement with our findings [9]. In Chapter 4 we described that, overall, process of diabetes care is worse among blacks in the United States. Several explanations have been mentioned for these differences in the US. First, the physicians treating black patients may be less well trained clinically and may have less access to important clinical resources than physicians treating white patients. [14]. Other reasons could be racism [15], physicians' perceptions of patients [16], preferences of the patients [17][18]or the patient-caregiver relationship [19]. Differences between the findings in the United States and our empirical findings could result from the fact that previous explanations are less applicable in the Netherlands.

In summary, we did not find indications for ethnic differences in the process of care. Clinical guidelines were followed to the same extent when treating diabetic patients from either the majority population or ethnic minority populations. In the diagnostic process of gastrointestinal complaints only small ethnic differences were seen. Among immigrant patients more diagnostic tests were requested after the first consultation and it took more consultations to reach a diagnosis. A likely explanation seems that physicians are faced with higher levels of uncertainty in diagnostic processes involving immigrant patients. This finding could be considered as an opportunity for improvement.

ETHNIC DIFFERENCES IN OUTCOMES OF CARE

In this thesis we found ethnic differences in two important outcomes of diabetes care: HbA1c and lipids.

Previous studies showed that not all ethnic differences could be explained by the usual risk factors (e.g. socioeconomic status, BMI, health status, disease severity). Therefore, we studied the contribution of three additional factors: quality of care, acculturation and self-management behavior. Our findings showed that ethnic differences in HbA1c and lipids could not be explained by the quality of care provided to the patients. In addition, differences in acculturation were not related to differences in HbA1c of lipid levels. Neither difference in self-management behavior could explain the ethnic differences in outcomes of diabetes care. We found that self-efficacy, as a behavioral determinant, was the most important determinant in explaining the ethnic differences in HbA1c partly.

The finding of ethnic differences in HbA1c has been known for a few years. At least one Dutch study reported worse glucose levels among immigrant patients [20]. Also studies abroad have repeatedly reported ethnic differences, with ethnic minorities generally having higher levels of HbA1c [8][21-22]. Similarly, but to a much lesser extent, ethnic differences in lipids have been reported earlier [8]. In order to reflect our results, we discuss the contribution of *quality of care, acculturation* and *self-management behavior* separately.

Role of quality of care

Our findings showed that ethnic differences in HbA1c and lipids could not be explained by the quality of care provided to the patients. We found no Dutch or European studies in which the role of quality of care in the explanation of ethnic differences in HbA1c (or other intermediate outcomes) was tested directly. Most studies looked separately to quality of care and/or outcomes and no longitudinal studies were found in which investigators have empirically tested the role of quality of care in explaining ethnic differences. However, like we described in Chapter 4, there are several indirect indications that the quality of care might be of importance: ethnic minorities have higher HbA1c levels, quality of care provided to ethnic minorities (in the US) is lower, quality of care is associated with outcomes of diabetic care. In addition, one US study showed that after improving the quality of care, ethnic differences in outcomes of care disappeared [23]. But our findings do not correspond with these indications, because we did not find ethnic differences in quality of care. In most studies, including our diabetes study, process of care is defined by means of measures that reflect national guidelines. Since we find that outcomes of care are worse for ethnic minority populations despite the fact that patients were treated according to the guidelines, makes one wonder whether the current national guidelines provide optimal treatment for ethnic minority patients. There is a development towards incorporating diversity into Dutch clinical guidelines. For example, compared to the UK, Dutch guidelines contain a minimum of ethnic specific statements [24]. Concerning diabetes education an example of an ethnic specific statement is: 'Nutrition recommendations should consider cultural and ethnic background' and concerning the diagnosis of diabetes: 'Testing for diabetes at younger age or more frequently among immigrant groups'. The lack of ethnic specific information may lead to ineffective or sub-optimal care for ethnic minorities, therefore guideline developers should be aware of the potential problems of ignoring differences in ethnicity. A Dutch study among general practitioners ended up with a similar conclusion, after the finding that it is more difficult to effectively control diabetes in ethnic minority patients, and that this cannot be attributed to poorer adherence of general practitioners to guidelines. They plead for more tailor-made diabetes care with respect to the individual needs [13]. Ignorance of ethnic differences might be an expression of ethnocentrism (inappropriate assumptions are made about the needs of people from ethnic minority groups on the basis of the majority experience) and among professionals this seems to contribute to ethnic differences in outcomes of care. Studies have confirmed that ignorance of ethnic differences between patients leads to inferior outcomes of care for ethnic minorities in the Netherlands, at least for two high-prevalence health problems (type 2 diabetes mellitus and hypertension) [25][26]. Another Dutch study that emphasized the importance of having regard for ethnicity in daily medical practice, suggested that the quality of medical services may contribute to ethnic differences in diabetes-specific mortality. Ethnic minorities experienced an elevated risk of death from diabetes (relative risk above 3.0). After adjustment for social factors (like income and marital status) the risk of mortality for diabetes remained elevated. Ethnic variation in diabetes-specific mortality may be produced by the higher incidence of diabetes mellitus among immigrant patients. Nevertheless, the substantial difference in diabetes-specific mortality suggest opportunities for improvement of the healthcare system targeted to disadvantaged groups [27].

Role of acculturation

Although the subject ‘acculturation’ has attracted increasing attention in Dutch research in the last years, we did not find Dutch studies in which acculturation was associated with outcomes of care. Studies abroad reported that the strength of the relationship between ethnicity and health outcomes appears to be influenced by acculturation [28]. In general, it is a very complex relationship. In some cases, higher levels of acculturation are correlated with the adaptation of negative health behaviors and subsequent poorer health outcomes, while in other cases lower levels of acculturation are correlated with poorer health outcomes [29]. An increasing duration of residence, but also continuous firsthand contact between two cultures, may result in adaptation of behavior. The consequences of adaptation depend on whether immigrant people adopt favorable (like frequent exercise) or unfavorable behavior (like taking up unhealthy eating and smoking habits) [30]. Especially two forms of acculturation (assimilation and integration) would lead to adaptation of behavior that is common in the host country [31][32]. In our study partial integration of first-generation immigrants into the Dutch society does not systematically lead to better diabetes outcomes. All included Turkish and Moroccan immigrants in our study belonged to either the separated or integrated acculturation groups. There were no immigrants who lost their ethnic self-identity, ethnic behavior, or native language completely (marginalized or assimilated types of acculturation) [31]. Partial integration did not influence diabetes self-management to the extent that it was reflected in diabetes outcomes. Perhaps assimilated types of acculturation would be, but we were unable to verify that.

Role of self-management behavior

No relationship was found between self-management and outcomes of diabetes care among the total diabetes population in our study. That means that differences in self-management do not contribute to the explanation of ethnic differences in outcomes of diabetes care. The absence of the relationship between self-management and outcomes of diabetes care differs from outcomes in other studies. These studies reported for example that patients' assessment of their diabetes self-management was associated with achieved glycemic control (HbA1); the better the self-management the better the glycemic control [33-36]. An explanation for the deviant results could be that the population of our diabetes study belongs to the lower socioeconomic groups. Especially patients with lower levels of socioeconomic status are vulnerable for giving answers that reflect social desirability concerning recommended behavior [2]. Additionally, patients may believe that they are highly compliant to the diabetes regime, but in practice there is inadvertent noncompliance attributable for example to patient-provider miscommunication, patient knowledge/skill deficits or to the behavioral complexity of the diabetes regimen. Moreover, people with lower levels of socioeconomic status can be very content with their diabetes behavior, even if they demonstrate a very small portion of the recommended behavior. Frequently, their image of the recommended behavior does not correspond with the recommendations as given [3]. These explanations could contribute to the absence of the relationship between self-management and outcomes of diabetes care in our study. And that might be the reason for the absence of a mechanism of action by which the determinants of behavior (like self-efficacy) influence diabetes outcomes.

In summary about ethnic differences in outcomes of care: we found ethnic differences in two important outcomes of diabetes care, HbA1c and lipids. Those differences could not be explained by the quality of care provided to the patients. Nor were levels of acculturation related to differences in HbA1c of lipid levels, neither self-management of diabetes behavior. Concerning quality of care, it seems worthwhile to pay attention to ethnic differences between patients, e.g. by means of integrating ethnic specific statements in guidelines. Based on substantial difference in diabetes-specific mortality there might be opportunities for improvement of the healthcare system targeted to disadvantaged groups. There is no evidence that higher levels of acculturation correlate with better diabetes outcomes among Turkish and Moroccan patients in the Netherlands. Thus, systematic improvement of diabetes outcomes in the future among Turkish and Moroccan patients that are better integrated into the Dutch society is not obvious. This finding increases the importance of programs that employ strategies to improve outcomes of diabetes care to all patients of Turkish and Moroccan descent, independent of levels of integration. Regarding self-management behavior among diabetic patients belonging to lower socioeconomic groups it is worth to improve the levels of self-management. Diabetes care providers may face the greatest challenges in changing the self-management behavior in a way that patients not only believe that they are highly compliant to the diabetes regime, but that they are actually compliant in daily practice. It is necessary to deal with images of the recommended diabetes behavior among patients belonging to lower socioeconomic groups, since their image does not always correspond with the recommendations. Concerning ethnic differences in outcomes of diabetes care, we would recommend to strengthen patients' self-efficacy in diabetes practice. Higher levels of self-efficacy among immigrant patients may improve their control of HbA1c and may result in a decrease of ethnic differences. That means that diabetes care should be focused on expanding the reach of self-efficacy interventions among ethnically diverse populations.

IMPLICATIONS FOR RESEARCH AND POLICY

We want to outline a few directions for future research that we consider important.

Final recommendations for research

1. Causes of ethnic differences in outcomes of diabetes care need further research. Before recommending adaptation of guidelines, we need to explore the effectiveness of ethnic-specific guidelines.
2. The role of acculturation overall is indistinct and it needs further research to investigate if acculturation must be assessed as part of the clinical encounter, in order to make sense of patients' responses to treatment.
3. Research on differences in health care use and in outcomes of care among second-generation immigrants should be undertaken.
4. It is important to gain further insight into differences within ethnic groups instead of comparing 'immigrants' with 'native Dutch' as a reference
5. A longitudinal research design with several measures in time instead of measuring transversal could illuminate the relevance of self-management in relation with diabetes outcomes.

Final recommendations for policy

In this thesis we have provided an overview of the ethnic differences in process and outcomes of care in the Netherlands, with a special focus on diabetes mellitus and gastrointestinal complaints. We observed among others that a) there are no large ethnic differences in the diagnostic process or in the final diagnosis among patients with gastrointestinal complaints, b) the five largest ethnic minority groups all demonstrate a higher use of the outpatient care facilities, c) diabetes outcomes differed significantly, with ethnic minority patients having higher levels of HbA1c and lipids and d) no consistent differences exist regarding the process of outpatient care for diabetes delivered by the medical providers. One may wonder whether these observations justify the conclusion that future monitoring of ethnic differences in care is not necessary. As an objection we provide three recommendations for policy.

1. Because of several ethical and juridical problems, registration of ethnicity is not a policy in the Netherlands. Based on ethnic differences in outcomes of diabetes care and literature about ethnic differences in incidence of several diseases (like diabetes, schizophrenia) we are of the opinion that it is important to take patient's ethnicity into account in the medical care. Therefore, we suggest that counter staff classify the ethnic background routinely, by asking the patient's and the parents' country of birth as part of the registered information.
2. The fact that Dutch guidelines contained a minimum of ethnic specific statements might lead to ineffective or sub-optimal care for ethnic minorities. Guideline developers should be aware of the potential problems of ignoring differences in ethnicity and therefore we recommend more tailor-made diabetes care with respect to ethnicity. But previously it is necessary to explore the effectiveness of diabetes treatment among ethnic minority groups.
3. Based on the finding that physicians have more difficulties in accurately understanding the symptoms or are less sure of the signs necessary to make diagnostic decisions among immigrant patients, we think that the process of history taking could be improved by presenting, among others, ethnic specific information in the course of medical (or paramedical) training. Additionally, if immigrant patients have not yet mastered the Dutch language, we support a cooperation between physicians and a bicultural educator (to bridge the language and cultural gap between physician an patient during their consultation) or a professional translator. In case of language barriers, it is also advisable to present information folders in different languages.

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Summary

This thesis contains studies about ethnic differences in processes and outcomes of outpatient hospital care, with special attention to diabetes mellitus and gastrointestinal complaints. Currently, about 10% of the population that lives in the Netherlands is of non-western origin. These are persons of which at least one parent is born in a non-western country. As a result of the increasing numbers of immigrant groups, the Netherlands is facing numerous new challenges. One issue of special interest is the consequence for population health. Current knowledge about ethnic differences demonstrates a worse self-reported health among ethnic minorities compared to native Dutch people, and differences in general morbidity and mortality. Explanatory factors are for example genetic factors, cultural behavior, effects of migration, effects of racism, exposure to health promoting and health damaging factors in the country of origin and in the Netherlands. Furthermore, differences are attributed to environmental and economic factors. However, these factors do not fully explain the ethnic differences. Health care itself could be of importance in explaining the ethnic differences, mainly the access and the quality of care. International and national literature did not provide sufficient information about ethnic differences in relation to health care processes in the Netherlands. This is the reason why we formulated a research project to analyze ethnic differences in health care processes. To be specific, in this thesis we compared health care processes and outcomes of outpatient hospital care among immigrant patients and native Dutch patients, with special attention for diabetes mellitus and gastrointestinal complaints. Immigrant patients were restricted to non-western immigrants from Turkish, Moroccan, Surinamese, Cape Verdean and Antillean and Aruban descent.

The following research questions were addressed:
Q1. Are there ethnic differences in the use of outpatient hospital care?
Q2. Are there ethnic differences in the diagnostic process of gastrointestinal complaints?
Q3. Are there ethnic differences in the quality of diabetes care?

The study population consisted of all *new* patients that visited the outpatient clinic of Internal Medicine, Erasmus University Medical Center, in Rotterdam, the Netherlands between March 2002 and March 2003. All new patients were asked for their and their parents' country of birth. The database derived from this registration was used for the studies in Chapters 2 and 3 (Q1 and Q2). We also selected all patients that were clinically diagnosed with Diabetes Mellitus (type 1 or 2) and were under treatment of a diabetes specialist for at least one year. This group constituted the study population described in Chapter 5 and 6 (Q3). Furthermore, hospital registration data, data from medical records and face-to-face interviews with patients were used.

Part I of the thesis (i.e. Chapters 2 to 3), is about the description of ethnic differences in the use of health care and about ethnic differences in referral reasons, diagnosis and diagnostic procedures (Q1 and Q2).

In Chapter 2, ethnic differences in the use of internal medicine outpatient care were determined, specifically to examine ethnic differences in the reason for referral and diagnosis. We conducted an open cohort study and registered the ethnicity, living area, sex and age of the 3,985 new patients that visited the internal medicine outpatient clinic in the course of one year. Patients were eligible for inclusion in the study if 1) they resided in the municipality of Rotterdam, and 2) they were of Surinamese, Turkish, Moroccan, Aruban/Antillean, Cape Verdian or Dutch descent. In total 1,332 patients were included for whom we collected referral reasons and diagnosis. The results showed that all included ethnic minority groups living in Rotterdam municipality, made significantly more use of the outpatient clinic than native Dutch people. Furthermore, immigrant patients were more likely to be referred for analysis and treatment of 'gastro-intestinal signs & symptoms' and were less often referred for 'indefinite, general signs'. Ethnic minorities were more frequently diagnosed with 'Liver diseases', and less often no diagnosis was reached among them. The increased use of the outpatient facilities seemed to be restricted to first generation immigrants, and was mainly based on a higher risk of being referred with 'gastro-intestinal signs & symptoms'. We concluded that the findings demonstrate substantial ethnic differences in the use of the outpatient care facilities and that ethnic differences may decrease in the future when the proportion of first generation immigrants decreases.

Chapter 3 concerns ethnic differences in the process of care among patients with gastrointestinal complaints. We investigated whether immigrant patients with gastrointestinal complaints received similar diagnostic procedures as native Dutch patients and at the same rates, and whether there were ethnic differences in the diagnosis. We examined the ethnic differences in gastrointestinal complaints presented during the first consultation at the outpatient clinic of Internal Medicine. Of the study population as described in Chapter 2 (1,332 patients), reasons for referral were collected and coded according to the International Classification of Primary Care (ICPC). We included only those patients who were referred for abdominal complaints, and on condition that complaints were not otherwise specified at the time of referral. Besides, the study was restricted to patients of the four largest ethnic groups: Surinamese, Turkish, Moroccan, and native Dutch (N=205). The results showed ethnic differences in complaints presented during the first consultation. Immigrant patients presented more frequently with pain but less frequently with tangible signs (i.e.diarrhea, melaena, rectal bleeding). We also found ethnic differences in the diagnostic process. Among immigrant patients, more diagnostic tests were requested during the first consultation and more consultations were needed before a diagnosis was reached. 'Helicobacter pylori infection' was the only diagnosis that occurred more frequently among immigrant patients, no other ethnic differences were found in other diagnoses. We concluded that physicians appeared to initiate testing earlier among immigrant patients, suggesting that reaching a diagnosis based on history taking is more difficult among this group. However, on the whole, no large ethnic differences were detected in the diagnostic process among patients with gastro-intestinal complaints.

In Part II of the thesis (i.e. Chapters 4 to 6) analyses of ethnic differences in the quality of care (outcomes and process) are described (Q3).

Chapter 4 contains a review study about ethnic differences in mortality, end-stage complications and quality of care among diabetic patients. We examined the literature on ethnic differences among diabetic patients in mortality and end-stage complications. Specifically, we assessed if there were ethnic differences among diabetic patients in the quality of care. We included 51 studies, mainly conducted in the United States (US) and the United Kingdom (UK). We found that diabetic patients from ethnic minorities had higher mortality rates and higher risk of diabetic complications. After additional adjustment for risk factors such as smoking, socioeconomic status, income, years of education and body mass index, the ethnic differences disappeared in most instances. Nevertheless, we reported that blacks and Hispanics in the US, and Asians in the UK, have an increased risk of end-stage-renal-disease (ESRD), and that blacks and Hispanics in the US have an increased risk of retinopathy. Besides, we found that intermediate outcomes of care, such as blood pressure and HbA1c, were worse among blacks, and showed a trend of being worse among Hispanics. Likewise, we noted ethnic differences in quality of care in the US: process-of-care was worse among blacks. We concluded that ethnic differences in diabetic care might contribute to the more-adverse disease outcomes of diabetic patients from some ethnic minority groups.

Based on the results of the review we questioned whether ethnic differences in outcomes and quality of diabetes care existed in the Netherlands. Thus, we performed a study to describe ethnic differences in outcomes of outpatient diabetic care and to assess the role of quality of care (Chapter 5 and Chapter 6).

We selected immigrant and native Dutch patients if patients were 1) clinically diagnosed with Diabetes Mellitus (type 1 or 2) and had been under the treatment of a diabetes specialist for at least one year, and 2) of either Dutch origin or immigrants from Turkey or Morocco. All Turkish and Moroccan patients who fulfilled the inclusion criteria were invited for an interview. Of the 129 immigrant patients, 51 Turkish and 51 Moroccan patients participated (response rate 79%). For each ethnic minority patient a Dutch patient was selected from the hospital's database with the best matching variables with regard to demographic (sex, age) and socio-economic characteristics (based on the mean household income equivalent of the neighborhood). This resulted in a total sample of 204 patients (51 Turkish, 51 Moroccan, and 102 Dutch). Trained interviewers, from the same ethnic background as the patients, conducted face-to-face interviews (following a standardized questionnaire) among both immigrant and Dutch patients. Subsequently, a medical record review was conducted for all patients. Diabetes outcomes differed significantly; immigrant patients had higher levels of HbA1c and lipids. Turkish and Moroccan patients experienced more than two times higher risk of having HbA1c above 8.5% and increased levels of lipids compared to the native Dutch patients. We investigated whether these differences could be explained by quality of care, acculturation or by self-management and its determinants.

Chapter 5 is about the contribution of quality of diabetes care and acculturation to ethnic differences in HbA1c and lipids. To assess the quality of care we determined whether the physician performed diagnostic tests according to clinical guidelines for diabetes (e.g. blood pressure, control of diabetes, control of lipids, smoking status) within the indicated time frame. Based on the questionnaire, we classified all immigrants into four distinct types of acculturation:

- assimilation: abandonment of native cultural identity and adoption of the values and norms of the larger society;
- integration: maintenance of ethnic cultural integrity at the same time as becoming an integral part of a larger society;
- separation: self-imposed withdrawal from the larger society, while preserving the native culture;
- marginalization: out of cultural contact with both traditional culture and the larger society.

The ethnic differences in outcomes of diabetes care that were found, were not explained by the quality of care provided to immigrant patients. However, adjustment for educational status reduced the mean difference of HbA1c and lipids by about 30%.

Turkish and Moroccan patients who were better integrated into the Dutch society had similar diabetes outcomes as their less-integrated counterparts. The conclusion is that compared to the native Dutch population, immigrants had sub-optimal glucose and lipid levels more frequently, which places them at a higher risk for diabetic complications. We conclude that partial integration of first generation immigrants into the Dutch society does not systematically lead to better diabetes outcomes.

In Chapter 6 we assessed the role of self-management behavior and its determinants in explaining the ethnic differences in HbA1c and lipids. Diabetic patients have to deal with a complex package of tasks in order to treat and regulate their disease. This self-management behavior includes adherence to dietary advice, engaging in regular exercise, adjusting medication, and monitoring blood glucose levels (four domains). Supporting diabetes self-management is a crucial task in diabetes care, because good/adequate self-management leads to better glycemic, metabolic, blood pressure and weight control, which are important predictors of complications. Through a questionnaire we assessed the four domains of diabetes self-management. Additionally, the determinants of self management were assessed as derived from the Attitudes-Social support- self-Efficacy model, and Personal Models and Barriers. No relationship was found between self-management and outcomes of diabetes care (HbA1c and lipids). We think that the absence of the relationship between self-management and outcomes was due to response bias. The determinants *beliefs about seriousness of diabetes* and *social support regarding diabetes management* explained 47% of the ethnic differences in lipids together. The determinant *self-efficacy* explained 18% of the ethnic differences in HbA1c, and was thus the most important determinant for explaining the differences in HbA1c. For diabetes practice, this suggests that strengthening patients' self-efficacy may improve the control of HbA1c and may result in a decrease of ethnic differences.

Chapter 7 provides an overview of the main study results and an evaluation of the data and methods that we used. In addition, we discuss the significance of the observed ethnic differences in process and outcomes of outpatient hospital care. In our opinion, the higher use of the internal medicine outpatient clinic among immigrants might be a direct reflection of a higher incidence and prevalence of diseases such as diabetes, liver diseases and gastro-intestinal complaints. Reasons for medical consultation among immigrant patients may be more frequently misunderstood or perceived as not being appropriate by physicians, and diagnostic process among immigrant patients may be more complicated because of language barriers, other concepts of disease, and other expressions of pain or other symptoms. This may lead to more referrals for indefinite or general signs and immigrant patients would be more likely to end up in the category 'no diagnosis', but we found the opposite: less immigrant patients came to the outpatient clinic with 'indefinite general signs', and compared to Dutch patients they had a lower risk for the category 'no diagnosis'. The equal amount of misfits between referral reasons and diagnosis among immigrant patients and native Dutch patients may confirm that health complaints perceived as inappropriate have been effectively filtered out by the general practitioner. That means that inaccurate referral to the outpatient care probably is not the explanation of the increased use of the internal medicine outpatient clinic among immigrants. Based on only small ethnic differences in the diagnostic process of gastro-intestinal complaints, we think that introducing adaptations is not necessary in the diagnostic practice of outpatient care. Among immigrant patients more diagnostic tests were requested after the first consultation, and more consultations were required to reach a diagnosis. We interpreted these findings as a possible consequence of higher levels of uncertainty in diagnostic processes among physicians when dealing with immigrant patients. Regarding ethnic differences in outcomes of diabetes care, we think it is necessary to pay attention to ethnic differences between patients, e.g. by means of integrating ethnic specific statements in guidelines. We found no evidence that higher levels of acculturation correlated with better diabetes outcomes among Turkish and Moroccan patients in the Netherlands. Therefore, we do not expect a systematic improvement of diabetes outcomes in the future among Turkish and Moroccan patients, who are better integrated into the Dutch society. We highlight the importance of programs that aim to improve outcomes of diabetes care for all patients of Turkish and Moroccan descent, independent of their levels of integration. Diabetes care providers may face the greatest challenges in changing self-management behavior among diabetic patients belonging to lower socioeconomic groups so that patients not only believe that they are highly compliant to the diabetes regime, but also are so in their daily practice. It is necessary to deal with images of the recommended diabetes behavior among patients belonging to lower socioeconomic groups, since their idea of the recommended behaviour does not always correspond with the actual recommendations. Concerning ethnic differences in outcomes of diabetes care, we would recommend to strengthen patients' self-efficacy in diabetes practice. Higher levels of self-efficacy among immigrant patients may improve their control of HbA1c and may result in a decrease of ethnic differences. That means that diabetes care should be focused on expanding the reach of self-efficacy interventions among ethnically diverse populations. Finally, we consider implications for further research and policy, such as the recommendation of more tailor-made diabetes care with respect to ethnicity.

Samenvatting

In het inleidende hoofdstuk 1 staat beschreven dat momenteel ongeveer 10% van de Nederlandse bevolking van niet-westerse herkomst is. Dit zijn mensen van wie tenminste één van de ouders in een niet-westers land is geboren. Als gevolg van het groeiende aantal immigranten, staat Nederland tegenover een aantal nieuwe uitdagingen. Een bijzonder interessante uitdaging is het gevolg van diversiteit in de bevolking voor de volksgezondheid.

De huidige kennis van etnische verschillen laat zien dat etnische minderheden een slechtere gezondheid rapporteren dan autochtone Nederlanders. Ook is bekend dat er etnische verschillen in morbiditeit en mortaliteit bestaan. Verklaringen hiervoor zijn onder andere genetische factoren, gedrag (cultureel bepaald), effecten van migratie, effecten van racisme en de blootstelling aan gezondheidsbevorderende en gezondheidsbedreigende factoren in het land van herkomst en in Nederland. Daarnaast zijn verschillen toe te schrijven aan omgevingsfactoren en economische factoren. De laatste twee factoren verklaren trouwens nooit volledig de etnische verschillen. Gezondheidszorg kan ook een belangrijke rol spelen in de verklaring van etnische verschillen, vooral de toegankelijkheid en de kwaliteit ervan.

Er zijn onvoldoende internationale en nationale studies die de relatie gezondheidszorg en etnische verschillen beschrijven in Nederland. Dat is de aanleiding van het onderzoeksproject waarin de etnische verschillen in gezondheidszorgprocessen is onderzocht. Daarbij werden gezondheidszorgprocessen en de uitkomsten van poliklinische zorg tussen allochtone en autochtone patiënten vergeleken, met speciale aandacht voor diabetes mellitus en buikklachten. De allochtone patiënten in dit onderzoek zijn afkomstig uit niet-westerse landen, ze zijn van Turkse, Marokkaanse, Surinaamse, Kaap Verdiaanse, Antiliaanse en Arubaanse herkomst.

De volgende onderzoeksvragen zijn beantwoord:
V1. Zijn er etnische verschillen in het gebruik van poliklinische zorg?
V2. Zijn er etnische verschillen in de diagnostische processen bij buikklachten?
V3. Zijn er etnische verschillen in de kwaliteit van diabeteszorg?

Proefschrift deel I

Deel I van het proefschrift beschrijft de etnische verschillen in het gebruik van de gezondheidszorg en de etnische verschillen in verwijsredenen, diagnoses en diagnostische procedures. Alle nieuwe patiënten die tussen maart 2002 en maart 2003 de polikliniek Inwendige Geneeskunde van het Erasmus Medisch Centrum in Rotterdam bezochten vormden de populatie in dit deel. Het betrof een open cohort, waarin etniciteit, leefomgeving, geslacht en leeftijd van nieuwe patiënten, die de polikliniek Inwendige Geneeskunde bezochten in de loop van één kalenderjaar, geregistreerd werden. Bij het inschrijven aan de patiëntenbalie werd gevraagd in welk land ze geboren zijn en in welk land(en) hun ouders geboren zijn. De geregistreerde gegevens, in combinatie met gegevens uit medische dossiers, zijn gebruikt voor het beantwoorden van onderzoeksvragen V1 en V2 (respectievelijk hoofdstuk 2 en 3).

In hoofdstuk 2 worden etnische verschillen in het zorggebruik van de polikliniek Inwendige Geneeskunde onderzocht. Er is speciaal gekeken naar etnische verschillen in verwijsredenen en diagnoses. In totaal zijn er 3.985 nieuwe patiënten geregistreerd tussen maart 2002 en maart 2003. De patiënten kwamen in aanmerking voor inclusie in de studie als ze 1) in de gemeente Rotterdam woonden en 2) van Surinaamse, Turkse, Marokkaanse, Arubaanse/Antilliaanse, Kaapverdiaanse of Nederlandse herkomst waren. In totaal zijn 1.332 patiënten geïncludeerd van wie de verwijsredenen en diagnoses verzameld zijn volgens de Internationale Classificatie van Huisartsen Geneeskunde (International Classification of Primary Care, ICPC) en diagnosebehandelcombinaties (DBC). De resultaten laten zien dat alle geïncludeerde etnische minderheidsgroepen, die in de gemeente Rotterdam wonen, significant meer gebruik maken van de polikliniek dan autochtone Nederlanders. Bovendien werden patiënten van allochtone herkomst vaker door de huisarts verwezen voor analyse of behandeling van buikklachten en werden ze minder vaak doorverwezen met ‘vage, onduidelijke klachten’. De patiënten van Surinaamse, Turkse, Marokkaanse, Arubaanse/Antilliaanse of Kaapverdiaanse herkomst kregen vaker de diagnose ‘ziekte van de lever’ en minder vaak werd er ‘geen diagnose’ gesteld. Het verhoogde zorggebruik van de poliklinische ziekenhuisdiensten lijkt beperkt te blijven tot de eerste generatie allochtonen. Het verhoogde gebruik lijkt voornamelijk te berusten op het verhoogde risico om met buikklachten naar de polikliniek verwezen te worden. Op basis van deze bevinding hebben we geconcludeerd dat het verhoogde zorggebruik door mensen van allochtone herkomst van de polikliniek in de toekomst mogelijk afneemt, als de eerste generatie allochtonen in omvang minder wordt.

Hoofdstuk 3 gaat over etnische verschillen in de processen van zorg bij patiënten met buikklachten. We hebben onderzocht of patiënten van allochtone herkomst, die zich met buikklachten presenteren, dezelfde diagnostische procedures krijgen als autochtone Nederlandse patiënten met buikklachten. Ook is gekeken of ze dezelfde hoeveelheid diagnostische testen ondergaan en of er sprake is van etnische verschillen in diagnoses. We hebben de etnische verschillen onderzocht in buikklachten zoals die gepresenteerd werden in het eerste consult op de polikliniek Inwendige Geneeskunde. Van de studiepopulatie uit hoofdstuk 2 (1.332 patiënten) zijn alleen de patiënten geïncludeerd die verwezen waren met buikklachten onder de voorwaarde dat het onbegrepen buikklachten waren, met andere woorden dat het ten tijde van het eerste consult onbekend was tot welke aandoening/ziekte de klachten te herleiden waren. Bovendien werd de studiepopulatie beperkt tot de vier grootste etnische groepen: Surinamers, Turken, Marokkanen en autochtone Nederlanders (N=205). De resultaten laten zien dat er etnische verschillen zijn in klachten die in het eerste consult gepresenteerd werden. Patiënten van allochtone herkomst presenteren zich vaker met pijnklachten en minder vaak met concrete klachten als diarree, meleana of rectaal bloedverlies. Ook vonden we etnische verschillen in het diagnostische proces van buikklachten. Bij allochtone patiënten werden tijdens het eerste consult meer diagnostische testen aangevraagd en waren meer consulten nodig om tot een diagnose te komen. De diagnose ‘Helicobacter infectie’ was de enige diagnose die vaker gesteld werd bij allochtone patiënten. Met betrekking tot andere diagnoses werden geen etnische verschillen aangetroffen. In de diagnostische procedures bij patiënten met buikklachten werden geen grote etnische verschillen aangetroffen. Onze conclusie is dat artsen sneller diagnostische testen afspreken als ze te maken hebben met patiënten van allochtone herkomst. Dit kan betekenen dat het voor artsen moeilijker is om bij allochtone patiënten een diagnose te stellen die alleen gebaseerd is op een anamnese dan bij autochtone Nederlandse patiënten.

Proefschrift deel II

In deel II van het proefschrift (hoofdstukken 4 t/m 6) beantwoorden we de onderzoeksvraag (V3) over etnische verschillen in de kwaliteit van zorg (uitkomsten en processen).

Hoofdstuk 4 bestaat uit een review artikel over etnische verschillen in sterfte, complicaties en kwaliteit van zorg bij diabetes patiënten. Om deze etnische verschillen te bestuderen hebben we een literatuurstudie verricht. We hebben daarin speciale aandacht besteed aan kwaliteit van zorg door te beoordelen of de kwaliteit van diabeteszorg verschilt tussen etnische groepen. We hebben 51 studies geïncludeerd, voornamelijk uitgevoerd in de Verenigde Staten en Engeland. We hebben vastgesteld dat diabetes patiënten van allochtone herkomst een hogere sterfte hebben en een hoger risico op het krijgen van complicaties als gevolg van de diabetes. Na rekening te houden met een andere verdeling van risicofactoren zoals roken, sociaal economische status, inkomen, opleiding in jaren en de BMI (body mass index) over de verschillende etnische groepen (in de statistiek is gecorrigeerd voor deze risicofactoren), verdwijnen de etnische verschillen in de meeste gevallen. Niettemin concluderen we dat 'blacks' en 'Hispanics' in de Verenigde Staten en Aziaten in Engeland een verhoogd risico hebben op ernstige nierproblemen als complicatie van diabetes. Bovendien hebben 'blacks' en 'Hispanics' in de Verenigde Staten een verhoogd risico op retinopatie. Verder constateren we dat uitkomsten van zorg als bloeddruk en het HbA1c-gehalte, slechter is onder de 'blacks' en ook onder 'Hispanics' lijkt daar sprake van te zijn. Eveneens stellen we vast dat er etnische verschillen in kwaliteit van zorg aanwezig zijn in de Verenigde Staten; dit betrof vooral de processen van zorg bij 'blacks'. Onze conclusie is dat etnische verschillen in kwaliteit van zorg een mogelijke bijdrage leveren aan de slechtere uitkomsten van diabetes bij sommige allochtone groepen.

De resultaten van de review waren de aanleiding om te onderzoeken of etnische verschillen in uitkomsten en kwaliteit van diabeteszorg ook in Nederland aanwezig zijn. Daarom is er een studie opgezet waarin de uitkomsten van poliklinische diabeteszorg zijn onderzocht en de rol van kwaliteit van zorg is beoordeeld (hoofdstukken 5 en 6).

We hebben allochtone en autochtone patiënten geselecteerd onder de voorwaarden dat 1) de klinische diagnose Diabetes Mellitus (type 1 of 2) bij ze gesteld is en dat ze op het moment van deelname minimaal één jaar onder behandeling stonden van een diabetes specialist en 2) ze ofwel van Nederlandse herkomst zijn of van Turkse of Marokkaanse herkomst.

Alle Turkse en Marokkaanse patiënten die aan die inclusie criteria voldeden zijn uitgenodigd voor een interview. Van de 129 patiënten, hebben 51 Turkse en 51 Marokkaanse patiënten ingestemd tot deelname (respons 79%). Voor elke patiënt van allochtone herkomst werd een autochtone patiënt uit het Ziekenhuis Informatie Systeem geselecteerd. Het geslacht moest hetzelfde zijn als die van de patiënt van Turkse of Marokkaanse herkomst en wat betreft leeftijd en sociaal economische status (gebaseerd op het gemiddelde huishoudinkomen op buurtniveau) is de patiënt gekozen die het minst afweek van de reeds deelnemende allochtone patiënt. Dit leverde een steekproef op van 204 patiënten (51 Turkse, 51 Marokkaanse en 102 Nederlandse). Geoefende interviewers, met dezelfde etnische herkomst als de patiënt, hebben interviews afgenomen (middels een gestandaardiseerde vragenlijst) onder zowel de allochtone als de autochtone patiënten. Vervolgens zijn van alle patiënten de medische dossiers beoordeeld en zijn data als bloeddruk, medicatie etcetera uit dossiers verzameld. Belangrijke uitkomstmaten van diabeteszorg zijn onder andere het HbA1c (gemiddelde glucosewaarde over een langere periode), het vetgehalte (lipidengehalte) en de bloeddruk. Hogere waarden hiervan zijn slechter voor de patiënt, omdat ze daardoor een verhoogd risico hebben op complicaties van diabetes. Hogere waarden kunnen het gevolg zijn van meerdere oorzaken. Hogere HbA1c waarden kunnen bijvoorbeeld ontstaan als patiënten zich onvoldoende aan dieetvoorschriften houden of als ze begeleiding krijgen die ontoereikend is. De uitkomsten van diabetes blijken significant te verschillen, allochtone patiënten hebben gemiddeld hogere HbA1c- en lipide waarden. Turkse en Marokkaanse patiënten hebben meer dan twee keer zoveel risico op een HbA1c waarde van boven de 8.5 % en verhoogde lipiden in vergelijking tot autochtone Nederlanders, met als gevolg dat ze een hoger risico op complicaties van diabetes hebben. We hebben onderzocht of de gevonden verschillen verklaard kunnen worden door kwaliteit in zorg, acculturatie of door zelfmanagement en de determinanten daarvan.

Hoofdstuk 5 gaat over de bijdrage van kwaliteit van diabeteszorg en acculturatie aan etnische verschillen in HbA1c- en lipidewaarden. Om de kwaliteit van zorg te bepalen is vastgesteld of de arts / diabetes specialist de diagnostische testen uitvoert bij de patiënt zoals voorgeschreven wordt in de diabetes richtlijnen (o.a. meten van de bloeddruk, controle glucose gehalte, controle lipiden, navragen rookgedrag en adviezen daaromtrent) binnen een gestelde periode. Gebaseerd op de antwoorden uit het interview zijn de allochtone patiënten verdeeld over vier verschillende acculturatiegroepen:

- assimilatie: er is sprake van een positieve houding ten opzichte van de nieuwe cultuur, terwijl er weinig identificatie meer is met de oorspronkelijke cultuur;
- integratie: er is sprake van een positieve houding ten opzichte van zowel de oorspronkelijk cultuur als de nieuwe cultuur;
- separatie: er is sprake van een positieve houding ten opzichte van de oorspronkelijke cultuur en een negatieve houding ten opzichte van de nieuwe cultuur;
- marginalisatie: beide culturen, zowel de nieuwe als de oorspronkelijke, worden afgewezen.

De etnische verschillen die gevonden zijn in diabeteszorg worden niet verklaard door verschillen in kwaliteit van zorg die aan allochtone patiënten geleverd wordt. Opleidingsverschillen tussen allochtone en autochtone patiënten verklaren wel een deel van de etnische verschillen in HbA1c- en lipide waarden. Door rekening te houden met de opleidingsverschillen (in de statistische analyses te corrigeren voor opleidingsniveau) nemen de etnische verschillen in HbA1c en lipiden met 30% af. Turkse en Marokkaanse patiënten die beter geïntegreerd zijn in de Nederlandse samenleving hebben dezelfde uitkomsten van diabeteszorg als Turkse en Marokkaanse patiënten die minder goed geïntegreerd zijn. De conclusie is dat allochtone patiënten in vergelijking tot autochtone Nederlandse patiënten vaker suboptimale HbA1c- en lipide waarden hebben, waardoor ze een hoger risico hebben op het krijgen van complicaties als gevolg van diabetes mellitus. We concluderen ook dat gedeeltelijke integratie in de Nederlandse samenleving van eerste generatie allochtonen niet stelselmatig tot betere uitkomsten van diabeteszorg leidt.

In hoofdstuk 6 is de rol van zelfmanagementgedrag en de determinanten van dat gedrag onderzocht op de bijdrage die ze leveren in de verklaring van etnische verschillen in HbA1c- en lipide waarden. Patiënten met diabetes hebben te maken met de planning en uitvoering van preventieve of therapeutische zelfzorgactiviteiten om de ziekte in te passen in het dagelijks leven en met de gevolgen van de ziekte om te gaan. Dit brengt een complex takenpakket (zelfmanagement) met zich mee dat zich vooral op vier domeinen afspeelt: het opvolgen van dieet adviezen, voldoende in beweging zijn, medicatie toedienen en monitoren van bloedglucose. Ondersteuning van zelfmanagement is een onmisbare taak in diabeteszorg, omdat adequate zelfmanagement tot betere glucose-, metabolische-, bloeddruk- en gewicht controle leidt. Dit zijn stuk voor stuk belangrijke voorspellers van het optreden van complicaties van diabetes. Via vragenlijstonderzoek zijn de vier genoemde domeinen van zelfmanagementgedrag gemeten. Daarnaast zijn de determinanten van zelfmanagementgedrag beoordeeld zoals afgeleid van het Attitudes- Social support – self-Efficacy model (ASE) en van de ‘Personal Models and Barriers’ (PMB). We hebben geen verband gevonden tussen zelfmanagement en de uitkomsten van diabeteszorg (HbA1c en lipiden). De afwezigheid van het verband tussen zelfmanagement en uitkomsten is waarschijnlijk ontstaan door responsbias. Het lijkt er namelijk op dat de patiënten, zowel de autochtone als allochtone, in dit onderzoek beter zelfmanagementgedrag gerapporteerd hebben dan dat ze in werkelijkheid vertonen. Bij patiënten met een lage sociaal economische status – betreft alle patiënten in deze studie – in vergelijking tot mensen met een hoge sociaal economische status, bestaat vaker een verschil tussen gerapporteerd gedrag en gedrag dat ze werkelijk vertonen. De determinanten *oordeel over de ernst van diabetes* en *sociale ondersteuning met betrekking tot zelfmanagement van diabetes* verklaren gezamenlijk 47% van de etnische verschillen in lipiden. De determinant *self-efficacy* verklaart 18% van de etnische verschillen in HbA1c. Voor de diabeteszorg betekent dit dat het versterken van de self-efficacy van patiënten de glucosecontrole gunstig beïnvloedt en dat etnische verschillen als gevolg daarvan afnemen.

In hoofdstuk 7 worden de belangrijkste resultaten van dit proefschrift samengevat en de positieve en negatieve aspecten van de methodologische benadering en de data daaruit op een rij gezet. Daarnaast wordt de betekenis van de gevonden etnische verschillen in de processen en uitkomsten van poliklinische zorg bediscussieerd. De hogere cijfers in zorggebruik onder allochtone patiënten van de polikliniek Inwendige Geneeskunde kan volgens ons worden toegeschreven aan de hogere incidentie en prevalentie van ziekten als diabetes, leveraandoeningen en buikklachten. Er is waarschijnlijk vaker sprake van misverstanden bij de redenen van medische consultatie onder allochtone patiënten of de redenen worden als niet adequaat door artsen ervaren. Ook zijn diagnostische processen bij allochtone patiënten gecompliceerder door onder andere taalbarrières, andere ziekte opvattingen en andere uitingen van pijn of andere symptomen. Dit zou kunnen leiden tot meer onduidelijke of vage klachten en allochtone patiënten zouden dan vaker in de categorie ‘geen diagnose’ eindigen. Wij vonden echter het tegenovergestelde: minder allochtone patiënten kwamen met onduidelijke of vage klachten naar de polikliniek en vergeleken met autochtone Nederlandse patiënten hadden ze minder risico om ‘geen diagnose’ te krijgen. Het niet aansluiten van de oorspronkelijke verwijsreden op de diagnose die gesteld wordt komt onder allochtone en autochtone Nederlandse patiënten even vaak voor. Dit duidt er ons inziens op dat gezondheidsklachten die niet in de tweedelijns gezondheidszorg thuishoren effectief door huisartsen eruit gefilterd worden. Dat betekent dan ook dat inaccurate verwijzingen naar de polikliniek niet de reden zijn van het verhoogde zorggebruik van de polikliniek Inwendige Geneeskunde door allochtone patiënten. Omdat we alleen kleine etnische verschillen in het diagnostische proces bij buikklachten hebben aangetoond, zijn we van mening dat er geen aanpassingen nodig zijn in diagnostische processen van poliklinische zorg. Bij allochtone patiënten zijn meer diagnostische testen aangevraagd tijdens of direct na het eerste consult en ook waren meer consulten nodig om tot een diagnose te komen. Deze uitkomsten kunnen een gevolg zijn van meer onzekerheid onder artsen wanneer ze patiënten van allochtone herkomst moeten diagnosticeren. Wat betreft verschillen in uitkomsten van diabeteszorg hebben we geen bewijs dat een hoger niveau van acculturatie betere uitkomsten van diabetes geeft onder Turkse en Marokkaanse patiënten in Nederland. Daarom vinden we het voor de toekomst niet vanzelfsprekend dat diabetes uitkomsten bij Turkse en Marokkaanse patiënten, die beter geïntegreerd raken in Nederland, stelselmatig gaan verbeteren. We benadrukken het belang van programma’s voor de verbetering van uitkomsten van diabeteszorg voor alle Turkse en Marokkaanse patiënten, onafhankelijk van hun integratieniveau. De grootste uitdaging voor professionals in diabeteszorg is het verbeteren van zelfmanagementgedrag bij diabetespatiënten met een lage sociaal economische status op een manier dat deze patiënten niet alleen overtuigd zijn van therapietrouw, maar dat ze dat ook daadwerkelijk zijn in de dagelijkse praktijk van het diabetesregime. Daartoe is het noodzakelijk om goed te begrijpen hoe diabetespatiënten met een lage sociaal economische status denken over aanbevolen diabetesgedrag en welk beeld ze daarvan hebben, omdat blijkt dat hun idee van aanbevolen gedrag niet altijd overeenstemt met de werkelijk gegeven aanbevelingen. Wat de etnische verschillen in uitkomsten van diabeteszorg betreft adviseren we om de self-efficacy van patiënten te versterken. Een hogere mate van self-efficacy bevordert de HbA1c controle en resulteert in een afname van de etnische verschillen. Dat betekent dat diabeteszorg zich meer zou moeten richten op interventies die de self-efficacy bevorderen onder allochtone patiëntengroepen. Tot slot geven we het advies om de etniciteit van patiënten in diabeteszorg centraal te stellen, bijvoorbeeld door in richtlijnen rekening te houden met etniciteit van patiënten. Daar is eerst onderzoek voor nodig naar bijvoorbeeld de effectiviteit van etnisch specifieke richtlijnen.

DANK JE WEL!

Johan Mackenbach, voor mij ben je een groot leermeester. Gedurende het promotietraject vond ik je soms streng, maar ik heb vooral ontzettend veel van je geleerd en je hebt me blijvend weten te stimuleren. Steven Lamberts, je begeleidde mij als tweede promotor in dit project. Naast je inbreng, heeft je steevaste vertrouwen in een goede afloop me geholpen. Aart Bootsma, als geen ander ken je de medische praktijk van diabetes en buikklachten. Je adviezen sneden hout en waren onmisbaar. Inez Joung, jij verdient de grootste dank, want zonder jouw steun en inbreng was dit proefschrift er niet gekomen. Met groot geduld heb je me door het traject heen geleid, je was altijd bereid om me te adviseren. Ik heb een rotsvast vertrouwen in je en vind je een bijzonder mens.

De diabetesverpleegkundigen Bo en Hanneke, dank jullie wel voor inhoudelijke adviezen. De poliassistenten van de inwendige polikliniek, jullie hebben een jaar lang alle nieuwe patiënten geregistreerd. Ik moest weliswaar praten als brugman om het gedaan te krijgen, maar de respons is om trots op te zijn. Studenten van de medische faculteit: Jeroen, Pascal, Emma, Jan, Gwendolien, Yvette, Vincent, jullie hebben geassisteerd bij de dataverzameling. Dankzij jullie weet ik dat moderne GSM toestellen veel blitser zijn dan de ouderwetse koelkasten. Haluk Arslan, je snor vond ik bij onze eerste ontmoeting indrukwekkend. Nog meer ben ik onder de indruk van de hoge respons die jij (met je vrouw Leila en alle andere interviewers) hebt bereikt onder een groep patiënten die zich lastig bij onderzoek laten betrekken, chapeau! Piet Burger (Piet Cos noemde ik je vaak per ongeluk) van het Centrum Onderzoek en Statistiek (COS) in Rotterdam, dank je voor alle data van de inwoners uit Rotterdam en omliggende gemeenten. Ineke Vogel, je statistische ondersteuning is voor mij van onmisbare waarde geweest. Irina Stirbu, thanks for the cooperation, it was stimulating to share my data with you and to have discussions about the results. Katrina Giskes, your corrections in my English were rather essential. I never believed your words 'the corrections were only cosmetic'. Thanks a lot!

Zonder gezelligheid ben ik niet in mijn element, alle MGZ collegae wil ik bedanken voor de leuke momenten, zoals praatjes in de wandelgangen of in de keuken. Mona Richter, jou noem ik speciaal, omdat je niet aflatende enthousiasme in begroetingen mij altijd goed doet. Mannen van de automatisering en dames van het secretariaat, in het bijzonder Else van de Engel, bedankt voor jullie ondersteuning. Casper Looman en Gerard Borsboom, in het begin vond ik jullie een soort marsmannetjes, maar ik leerde jullie methodologische en statistische taal steeds beter begrijpen. De gangbewoners maakten het prettig leefbaar op de 20ste. Gillende buurvrouwen Fanny Janssen en Astrid Vrakking, sympathieke buurman Frank Pierik, lieve kamergenoot Carlijn, het was goed vertoeven met jullie. Een gang verder trof ik Hein Raat en Ida Korfage, ik liep graag bij jullie binnen. Ida, we hebben ons contact buiten de muren van MGZ voortgezet. Onze eerste gezamenlijk actie was de operacursus van Erasmus Cultuur.

Er is mij veel aan gelegen om samen te blijven optrekken. Marja Stuifbergen en Vivian Bos, als ex-kamergenoten op MGZ zijn jullie me dierbaar geworden. Laten we vooral in beweging blijven door te wandelen, maar een dag luieren in de sauna met jullie is ook erg aantrekkelijk. Collegae bij Stichting Consument & Veiligheid en het RIVM (VTV-Mensen), ik dank jullie voor de aandacht die jullie aan mij en aan de voortgang van het proefschrift gaven.

Alle mensen om mij heen dank ik voor hun belangstelling en aanmoediging. De volgende mensen noem ik daarbij speciaal. Kievitdwarsstraatbewoners, de grote en de kleine, maken het leven erg gezellig in de straat. Ik hoop nog lang de helft van HennyLoes uit te maken en vanaf nu zullen jullie me nog vaker de ramen zien wassen. Vrienden uit allerlei windstreken en tijdzones bij wie ik altijd terechtkan voor een avondje uit of een dagje weg. De HBO-V vriendinnen, laten we tot in lengte van dagen naar 'Emst' gaan. Ex-collegae van Intensive Care 1 uit het voormalige AZU, ik blijf graag met jullie gillen bij de open haard in Houten. Frank van Dorsten, je bent een trouwe vriend, ik geniet altijd van de muzikale avonden waaraan jij zelf actief deelneemt.

Leonie Eshuis, Bart van Hasselt en de drie niet-meer-zo-kleine van Hasseltjes, dank voor alle afleiding. Onze avonden, doorgaans met hoge alcoholpercentages in het bloed, hebben altijd weer een verrassende afloop. Paul Putters, Margreet Berrevoets, Sem en Annouk. Wij zijn na ruim 16 jaren zo vertrouwd met elkaar geraakt, beetje familiegevoel geeft dat. Ik ben blij dat Paul tijdens de verdediging naast me staat. Claar Mooij, Frank Woonings, Bas, Reneé en Daniël. We hebben het altijd ontzettend leuk met elkaar, met of zonder vuurwerk. Jullie zijn niet weg te denken uit mijn leven. En mijn schoonfamilie, in het bijzonder mem; moai dat jimme der binne. Jitske Hofstra (en Jan in herinnering), jullie betrokkenheid bij mijn promotie en hardloopprestaties zijn altijd groot geweest. Met Jitske gaan we het glas heffen op mijn promotie en Jan 'je bent erbij hoor'. Janna Groen en Tom Bischot, ik kom inmiddels al jaren bij jullie over de vloer, dat is altijd een feestje voor mij. Janna, je hebt mij geleerd dat je tien dingen tegelijk kunt doen zonder aandacht te verliezen en laat mij genieten van je warmte.

Marijke Span, Gijs en Job Lanting. Gijs en Job, jullie zijn mijn –inmiddels- grote neven waar ik enorm trots op ben en heel veel van houd. Dat is natuurlijk om wie jullie zijn, gewoon toffe gozers, maar ook omdat ik jullie vader, mijn grote broer Karel, in jullie blijf zien. Marijke, 'schone zus', je hebt een belangrijke plek in mijn leven. Na alles wat we meegemaakt hebben voelt het goed dat jij op deze bijzondere dag naast mij staat als steun en toeverlaat.

Pa en ma. Jullie hebben de basis gelegd van wie ik ben en hebben me altijd de ruimte gegeven om me te ontwikkelen. Ik weet dat jullie ontzettend trots op me zijn. Op mijn beurt ben ik trots op jullie, vooral op de manier waarop jullie in staat zijn positief verder te leven zonder Karel.

Henny, lieve lieve Henny. Je bent voor mij de belangrijkste persoon op aarde. Het leven met jou ervaar ik als 'walking in fields of gold'.

CURRICULUM VITAE

Loes Lanting werd geboren op 11 april 1966 te Groningen. In 1985 behaalde zij het atheneum diploma aan het Heymans-College in Groningen. Na het afronden van het HBO-Verpleegkunde te Groningen werkte zij een paar jaar als verpleegkundige in het toenmalige Academisch Ziekenhuis Groningen. In dat ziekenhuis specialiseerde zij zich als Intensive Care verpleegkundige. Daarna heeft ze gedurende negen jaar als IC-verpleegkundige op de Intensive Care Interne Geneeskunde van het Universitair Medisch Centrum Utrecht gewerkt. In 2000 behaalde zij haar doctoraal gezondheidswetenschappen aan de Universiteit Maastricht. Van 2001 tot 2005 werkte zij als onderzoeker op de afdeling Maatschappelijke Gezondheidszorg, Erasmus Medisch Centrum Rotterdam. Hier heeft zij het onderzoek uitgevoerd dat in dit proefschrift beschreven staat. Sinds 2005 is zij in dienst van Stichting Consument en Veiligheid in Amsterdam. Van daaruit is ze gedetacheerd bij het Rijksinstituut voor Volksgezondheid en Milieu (centrum Volksgezondheid Toekomst Verkenningen) in Bilthoven met als hoofdtaak het schrijven van een rapport over letsels in Nederland en de mogelijkheden tot preventie.