CrossMark

ORIGINAL ARTICLE

Trends over 8 years in quality of diabetes care: results of the AMD Annals continuous quality improvement initiative

**Maria Chiara Rossi · Riccardo Candido · Antonio Ceriello · Antonino Cimino ·
Paolo Di Bartolo · Carlo Giorda · Katherine Esposito · Giuseppe Lucisano ·
Marina Maggini · Edoardo Mannucci · Illidio Meloncelli · Antonio Nicolucci ·
Fabio Pellegrini · Marco Scardapane · Giacomo Vespasiani**

Abstract

Objective Quality of care monitoring is a key strategy for health policy. In Italy, the AMD Annals continuous monitoring and quality improvement initiative has been in place since 2006. Results after 8 years are now available.

Research design and methods Quality of diabetes care indicators during the years 2004–2011 were extracted from electronic medical records of 300 diabetes clinics. From 200,000 to 500,000 patients with type 2 diabetes were analyzed per year. Six process indicators, eight intermediate outcome indicators, seven indicators of treatment intensity/appropriateness, and a quality of care summary score (Q score) were evaluated. Previous studies documented that the risk of developing a new cardiovascular event was 80 % higher in patients with a Q score <15 and 20 % higher in those with a score between 15 and 25, as compared to those with a score >25.

Results The proportion of patients with HbA1c ≤7 %, LDL cholesterol <100 mg/dl, and blood pressure ≥140/90 mmHg increased by 4.8, 21.9, and 10.0 %, respectively. Process and treatment intensity/appropriateness indicators consistently improved. The proportion of patients with a Q score <15 decreased from 13.5 to 6.5 %, while those with a Q score >25 increased from 22.9 to 38.5 %.

Conclusions AMD Annals document the progress in quality of diabetes care. Longitudinal improvements in Q score can translate into less cardiovascular events, with

M. C. Rossi
AMD - Associazione Medici Diabetologi, Rome, Italy

M. C. Rossi (✉) · G. Lucisano · A. Nicolucci · F. Pellegrini ·
M. Scardapane
Laboratory of Clinical Epidemiology of Diabetes and Chronic
Diseases, Mario Negri Sud Foundation, Via Nazionale,
66030 Santa Maria Imbaro, CH, Italy
e-mail: mrossi@negrisud.it

R. Candido
Diabetes Centre, A.S.S. 1 Triestina, Trieste, Italy

A. Ceriello
Diabetes and Endocrinology, Insititut d'Investigacions
Biomèdiques August Pi i Sunyer,
Barcelona, Spain

A. Cimino
Diabetes Unit, Spedali Civili, Brescia, Italy

P. Di Bartolo
Diabetes Unit Provincia di Ravenna, A.Usl della Romagna,
Ravenna, Italy

C. Giorda
Diabetes and Metabolism Unit, ASL TO5, Chieri, Turin, Italy

K. Esposito
Department of Clinical and Experimental Medicine and Surgery,
Second University of Naples, Naples, Italy

M. Maggini
National Institute of Health, Rome, Italy

E. Mannucci
Diabetes Agency, Careggi Teaching Hospital, Florence, Italy

I. Meloncelli · G. Vespasiani
Diabetes Unit, Madonna del Soccorso Hospital,
S. Bendetto del Tronto, AP, Italy

evident clinical and economic implications. AMD Annals represent a physician-led effort not requiring allocation of extra-economic resources, which is easy to implement and deeply rooted in routine clinical practice. They are a potential case model for other healthcare systems.

Keywords Diabetes mellitus · Quality of care · Electronic medical records · Process measures · Outcome measures · Treatment intensity/appropriateness

Introduction

Many different projections of diabetes prevalence worldwide have been published in the last two decades [1–6], all univocally identifying type 2 diabetes as an epidemic and a major public health problem. It is estimated that diabetes prevalence ranges between 4 and 10 % in different continents and that 371 million people live with diabetes; by 2030, the number will have risen to 552 million [7]. If not adequately controlled from an early stage, diabetes increases the risk of micro- and macrovascular complications and death from other causes [8]. Life with diabetes is also commonly associated with psychosocial problems and poor quality of life [9]. Due to the problematic ratio between people with the disease and availability of resources, the sustainability and equity of access to care are at risk [10]. In fact, the estimated total economic cost of diagnosed diabetes in USA in 2012 was $245 billion and that has increased by 41 % from 2007 [11]. In Europe, current estimates for 2010 healthcare expenditure for diabetes are US$105 billion (10 % of total healthcare expenditure, US$2,046 per person) [12]. Hospitalizations for diabetes complications account for 50 % of the total yearly cost of the disease per patient [13]. All these data underline the burden that diabetes imposes on society and why it is important to optimize its management.

A number of treatments and practices have been proven to be effective in reducing the burden of diabetes care, and guidelines are disseminated to aid the clinicians in diagnosis and management of diabetes and its complications [14]. However, clinical practice often differs from guideline prescriptions and several studies have shown that the desired treatment goals for diabetes and cardiovascular risk factors are not achieved in a large proportion of individuals [15–17].

To improve the current care, monitoring of health and quality of care is recognized as a key strategy in adequate public health planning [18]. American and European organizations developed and applied measures to monitor quality of diabetes care and promote continuous quality improvement initiatives [18, 19]. Indicators of quality of care have been used in different countries to get a picture of the proportion of patients monitored or having reached the targets in specific healthcare settings in order to compare provider performance or to quantify performance incentives [15–22]. Less frequently, quality of care indicators was used to assess trends over time [23] or to evaluate the results of benchmarking activities [24].

In Italy, a continuous improvement effort implemented by a network of diabetes clinics has been in place since 2006 [25, 26]. The initiative, involving a wide network of diabetes outpatient clinics operating within the national healthcare system, allows the routine monitoring of a larger set of indicators compared to the aforementioned initiatives. The yearly evaluation of patterns of care, the dissemination of results, and their discussion with the participants was intended to improve diabetes care, both at the individual clinic level and overall. A first evaluation of the impact of the initiative was performed after 4 years [26], which documented that centers participating in the project since its first edition had improved more over time than centers joining the initiative in the following years. The aim of this paper was to report the results of the initiative after 8 years and discuss its clinical and broader implications.

Research design and methods

The Italian healthcare system

It is estimated that over 3.0 million citizens have known diabetes in Italy. Care for people with diabetes is mainly provided by a public network of about 600 diabetes clinics, delivering diagnostic confirmation, therapy, prevention, early diagnosis, and medical management of complications through regular patient follow-up by a dedicated specialist team. Most patients are referred to these care units by their GP, and care is free of charge.

The AMD Annals initiative

The Associazione Medici Diabetologi—AMD is an Italian scientific association of clinical diabetologists with the mission of exploring and improving the current diabetes care [27, 28]. The methodology of the AMD Annals initiative has been previously described [25, 26] (Table 1). Briefly, AMD identified a set of quality of care indicators to be used for benchmarking activities. Quality indicators include process measures evaluating diagnostic, preventive and therapeutic procedures performed by the participating centers, and outcome indicators measuring favorable and unfavorable modifications in the patient health status. Furthermore, the use of glucose-lowering, antihypertensive, and lipid-lowering drugs is evaluated.

Table 1 Main implementation steps of the AMD Annals initiative

Time	Activity
2002–2013	Definition of the "AMD quality indicators" and subsequent updates
2002–2008	Identification of the minimum data set including all the standardized and codified information needed for the calculation of the indicators (AMD Data File)
2004	Development and distribution of the software, compatible with different electronic medical record systems, enabling the automatic download of the AMD Data File from the data recorded during the routine clinical practice
2005	Creation of the network of diabetes centers adopting electronic medical record systems and with specialists willing to join in the initiative without allocation of extra-resources.
2006	Distribution of the software allowing participating centers to calculate their own indicators to be compared with those published in AMD Annals (benchmarking)
2006–2013	Annual publication of AMD Annals and sub-analyses. Results available on the Web site: http://www.infodiabetes.it/pages/annali_amd/

Participating centers share the same AMD software enabling the data extraction from different electronic medical records. Data are annually collected in a standardized format (AMD Data File) and centrally analyzed anonymously.

All the process and intermediate outcomes indicators are compared to reference values, or "gold standard," established by identifying the best performers. The gold standard for every indicator was represented for process and favorable outcome indicators by the 75° percentile of the ordered distribution of the results obtained in the centers and by the 25° percentile for the unfavorable outcomes. Results are publicized through the publication of the analyses (AMD Annals volumes) and in a dedicated page of the AMD Web site [16]. Using specific software, each center can calculate its own indicators and compare its performance with that of the best performers.

The initiative, started in 2006, is replicated on an annual basis, in order to provide a longitudinal picture of the quality of diabetes care provided.

Quality of care indicators

The number of quality indicators routinely measured in AMD Annals has been enlarged progressively across the years. Currently, six process, three favorable outcomes, five unfavorable outcomes, seven treatment intensity/appropriateness, and two overall quality of care indicators are considered in the yearly evaluations.

Process measures are expressed as percentages of patients monitored at least once during the previous 12 months for the following parameters: HbA1c, blood pressure (BP), lipid profile (LDL cholesterol or total and HDL cholesterol, and triglycerides), renal function, foot examination, and eye examination.

Intermediate outcome measures include the proportion of patients with satisfactory values as well as the percentage of those with unacceptably high values. Outcomes are considered satisfactory if HbA1c levels are ≤ 7.0 % (≤ 53 mmol/mol), BP values are $\leq 130/80$ mmHg, and LDL cholesterol (LDL-c) levels are <100 mg/dl. Unsatisfactory outcomes include HbA1c levels >8.0 %, BP values $\geq 140/90$ mmHg, LDL levels ≥ 130 mg/dl, presence of micro-/macro-albuminuria, and glomerular filtration rate (GFR) ≤ 60 ml/min. Although selected outcome indicators may not reflect the targets recommended for all patients, they have been chosen to provide a synthetic picture of the care provided to large numbers of patients over the years. In this respect, the initiative tends to put major emphasis on unsatisfactory outcomes as a lever for improvement.

Indicators of treatment intensity/appropriateness take into consideration the use of pharmacologic treatments in relation to the level of the clinical parameters: no insulin therapy despite HbA1c >9.0 %, (>75 mmol/mol), no lipid-lowering agents despite LDL-c ≥ 130 mg/dl, no antihypertensive treatment despite BP $\geq 140/90$ mmHg, no ACE inhibitors (ACE-I) and/or angiotensin receptor blockers (ARBs) despite micro-/macroalbuminuria, HbA1c >9.0 % (>75 mmol/mol) in spite of insulin treatment, LDL-c ≥ 130 mg/dl in spite of lipid-lowering treatment, and BP $\geq 140/90$ mmHg in spite of antihypertensive treatment.

Finally, a quality of care summary score (Q score) is calculated. The Q score has been developed and validated in two previous studies (14–15) and integrated in the AMD Annals initiative since the 2009 edition [29]. The score is based on a combination of process and outcome indicators relative to HbA1c, blood pressure, LDL cholesterol, and microalbuminuria. The score ranges between 0 and 40; the higher the score, the better the quality of care (supplementary Table 1).

Sample selection and data analyses

Clinical data collected during the years 2004–2011 were extracted from electronic medical records of participating diabetes clinics. Patients with diagnosis of type 2 diabetes were selected, and quality of care indicators was evaluated yearly.

In case of multiple records collected during the same year for the same patient, the last available value was included in the quality of care profiling. Denominators for the different quality indicators vary according to the

availability of the information in the index year. No missing imputation was performed.

Microalbuminuria was defined as albumin excretion rate ≥20 mcg/min, albumin/creatinine ratio >2.5 (men) or >3.5 (women) mg/mmol, or microalbuminuria >30 mg/l. GFR was calculated with the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) formula [30].

Classes of drugs were identified according to their Anatomical Therapeutic Chemical Classification System (ATC) codes.

Statistical analyses

Patients' characteristics were described as mean and standard deviation or frequencies. Quality indicators during 8 years are expressed as crude percentages. Absolute (% in 2011–% in 2004) and relative variations (% in 2011–% in 2004)/(% in 2004) in each patient characteristic and quality of care indicator over 8 years have also been estimated. We performed a statistical analysis to evaluate whether temporal trend for each indicator was statistically significant. Generalized hierarchical models for repeated measures were applied to take into consideration the multilevel nature of data (clusterized by center and by patient, repeated by year).

Results

Overall, 300 diabetes clinics extracted their clinical database with information collected in the years 2004–2011. The number of centers using an electronic medical record system increased over the years from 180 in 2004 to 300 in 2011, providing clinical information on 200,000 to 500,000 individuals with type 2 diabetes every year. Table 2 shows patient characteristics across the years. A slightly larger proportion of men were recorded every year. Mean age of the population and diabetes duration slightly increased over 8 years.

Table 3 shows the quality of care indicators by year and their 2004–2011 absolute and relative variations. All process indicators showed trends of improvements; the most relevant results refer to lipid profile monitoring, which increased by 16.6 % from 2004 to 2011, corresponding to a relative increase of 29.0 %. For retinopathy and foot monitoring, we documented absolute changes of 8.8 and 6.1 %, respectively, corresponding to 37.5 and 72.5 % relative increases. Relevant improvements were observed for all favorable and unfavorable outcomes, with the exception of the percentages of patients with renal function impairment. In fact, we found a small increase in the proportion of patients with reduced GFR and stable percentages of patients with micro/macroalbuminuria. Table 3

also shows substantial improvements for all intensity/appropriateness indicators. The significant improvement of quality indicators across the years is reflected by a marked variation in the Q score, with a progressive reduction of patients with a score <15 and an even more pronounced increase in the proportion of those with a score over 25. All p values were of <0.001.

A sub-analysis only including the 180 centers with data available for the whole period (from 2004 to 2011) confirmed this picture, showing completely overlapping results.

Another sub-analysis performed after the exclusion of people with a recent diagnosis of diabetes also confirmed the results (data not shown).

Conclusions

The 8-year follow-up of the AMD Annals shows a relevant improvement in quality of care for diabetes in Italy from 2004 to 2011. As the organizational network of diabetes clinics was not substantially modified during this period, the observed improvement cannot be attributed to an increased allocation of resources. It is possible that systematic control of quality of care through regular collection of data from clinical data has contributed to a greater adherence to standards of care. After the positive results of a pilot small-scale experience [24], this analysis confirms, on a much larger scale, the potential long-term benefits of a continuous quality improvement initiative, based on the monitoring of process, intermediate outcome, and treatment intensity/appropriateness measures.

After 8 years from the launch of the initiative, half of the diabetes clinics in Italy participate in AMD Annals initiative, caring for over one-sixth of all diagnosed patients, enabling a systematic and representative annual monitoring of quality of care provided by specialists.

In the USA, the process and outcomes measures established in the Diabetes Quality Improvement Program (DQIP) have been widely adopted for performance assessment in Medicare and Medicaid health plans by some government agencies, such as the Veterans Health Administration (VHA) and the Center for Medicare and Medicaid Services (CMS), and in payment programs such as the Physician Quality Reporting System (PQRS) [31]. The widest initiative of monitoring of quality of care in USA is represented by the National Health and Nutrition Examination Survey (NHANES) and the Behavioural Risk Factors Surveillance System (BRFSS), which described trends of five process indicators, seven preventive practices, and three scores of risk complications across 20 years (1999–2010) on a range of 11,000 to 60,000 individuals analyzed every year. Nevertheless, data were self-reported

Table 2 Patients characteristics by year

	2004 (%)	2005 (%)	2006 (%)	2007 (%)	2008 (%)	2009 (%)	2010 (%)	2011 (%)	2004–2011 Absolute variation (%)	2004–2011 Relative variation (%)
Number of participating diabetes clinics	180	198	214	235	251	266	286	300		
Number of patients with T2DM seen by diabetes clinics during the year	239,638	270,589	316,768	369,503	411,777	452,224	494,166	532,651		
Percentage of first visits (%)	13.0	13.0	14.2	13.4	12.2	11.5	12.6	12.0	−1.0	−7.7
Patient characteristics										
Males (%)	53.3	53.7	53.9	54.1	54.3	54.6	54.7	54.9	+1.6	+3.0
Age (years)	65.2 ± 11.5	65.4 ± 11.5	65.8 ± 11.5	66.1 ± 11.4	66.4 ± 11.4	66.8 ± 11.4	67.1 ± 11.4	67.4 ± 11.5	+2.2	+3.4
Age classes										
<65.0	46.1	44.5	43.3	42.6	41.7	40.3	39.9	39.3	−6.8	−14.8
65.0–74.9	34.0	34.6	34.6	34.5	34.8	34.8	34.1	33.4	−0.6	−1.8
≥75.0	19.9	20.9	22.1	22.9	23.6	24.9	26.0	27.3	+7.4	+37.2
Smokers (%)	16.8	16.9	17.1	17.3	17.2	17.0	16.9	17.0	+0.2	+1.2
Diabetes duration (years)	10.1 ± 9.1	10.2 ± 9.2	10.3 ± 9.3	10.4 ± 9.3	10.4 ± 9.4	10.4 ± 9.4	10.5 ± 9.4	10.7 ± 9.4	+0.6	+5.9
Diabetes duration classes (%)										
≤2	22.6	16.2	16.2	21.9	21.8	15.8	15.6	20.5	−2.1	−9.3
2–5	17.7	17.9	22.7	16.4	16.3	17.2	22.3	15.8	−1.9	−10.7
5–10	21.0	23.5	18.6	22.6	22.9	24.0	17.3	21.8	+0.8	+3.8
>10	38.7	42.4	42.6	39.0	39.0	43.1	44.8	41.8	+3.1	+8.0
HbA1c (%)	7.7 ± 1.6	7.7 ± 1.6	7.6 ± 1.6	7.5 ± 1.6	7.5 ± 1.5	7.5 ± 1.5	7.5 ± 1.5	7.5 ± 1.5	−0.2	−2.6
BMI (kg/m²)	29.3 ± 5.0	29.3 ± 5.1	29.4 ± 5.1	29.5 ± 5.2	29.5 ± 5.2	29.6 ± 5.2	29.6 ± 5.3	29.6 ± 5.3	+0.3	+1.0
Total cholesterol (mg/dl)	203.7 ± 41.6	199.3 ± 41.3	194.8 ± 41.0	191.6 ± 40.8	188.9 ± 41.0	188.3 ± 41.3	184.5 ± 41.1	181.8 ± 40.8	−21.9	−10.8
HDL cholesterol (mg/dl)	51.7 ± 13.7	51.7 ± 13.9	52.1 ± 13.9	50.4 ± 13.6	49.9 ± 13.7	49.5 ± 13.7	49.9 ± 13.8	49.8 ± 13.9	−1.9	−3.7
LDL cholesterol (mg/dl)	122.0 ± 34.5	118.4 ± 34.6	114.4 ± 34.6	112.6 ± 34.3	110.3 ± 34.3	109.6 ± 34.5	106.5 ± 34.3	104.3 ± 34.2	−17.7	−14.5
Triglycerides (mg/dl)	155.8 ± 125.0	153.3 ± 123.0	150.8 ± 119.8	149.2 ± 116.0	149.1 ± 113.4	148.7 ± 109.8	142.9 ± 103.3	141.5 ± 102.3	−14.3	−9.2
Systolic blood pressure (mmHg)	142.1 ± 19.6	142.1 ± 19.6	141.3 ± 19.5	140.0 ± 19.3	139.7 ± 19.3	139.0 ± 19.0	138.2 ± 19.0	137.5 ± 18.7	−4.6	−3.2
Diastolic blood pressure (mmHg)	81.2 ± 9.7	81.1 ± 10.0	80.8 ± 9.9	80.0 ± 9.8	79.6 ± 9.8	79.1 ± 9.8	78.5 ± 9.7	78.2 ± 9.7	−3.0	−3.7

Table 2 continued

Diabetes treatment (%)	2004 (%)	2005 (%)	2006 (%)	2007 (%)	2008 (%)	2009 (%)	2010 (%)	2011 (%)	2004–2011 Absolute variation (%)	2004–2011 Relative variation (%)
Diet and lifestyle	10.1	9.8	9.3	8.9	8.0	7.1	6.6	6.2	−3.9	−38.6
Oral agents	64.3	63.7	63.7	62.6	62.4	62.3	62.3	62.3	−2.0	−3.1
Oral agents + insulin	11.5	12.0	12.2	13.0	13.8	14.7	15.3	15.9	+4.4	+38.3
Insulin	14.0	14.5	14.8	15.6	15.8	15.9	15.8	15.6	+1.6	+11.4
Lipid-lowering agents (%)	15.9	20.5	26.1	31.8	36.1	40.0	43.4	45.0	+29.1	+183.0
Antihypertensive treatment (%)	32.2	37.4	43.7	49.9	54.2	56.6	59.5	60.4	+28.2	+87.6
≥2 Antihypertensive agents (%)	17.4	20.6	24.5	28.4	31.3	33.1	35.1	35.7	+18.3	+105.2
Aspirin (%)	12.6	16.2	19.6	22.6	25.2	26.9	28.4	29.0	+16.4	+130.2

by the patients, being based on an annual household interview and on data collection in mobile examination centers.

In Europe, cross-sectional evaluations of quality of care were performed starting from the Swedish national patient register, from electronic clinical records of primary care units in Spain or in the context of pay-for-performance initiatives in UK [20–22]. Furthermore, in 2009, the European Core Indicators in Diabetes (EUCID) project aimed to create a reporting platform for the indicators using the existing data from European countries. National surveys, administrative data, and a clinical database of primary and secondary care were put together for a comprehensive description of patterns of diabetes care in Europe. Nevertheless, the information collected for the EUCID project was not homogeneous among the different countries in terms of data availability and representativeness [32].

The AMD Annals initiative allows the annual evaluation of 23 indicators by extracting a standard set of data from electronic clinical records of the participating centers. The initiative is promoted by healthcare professionals and perceived as a normal component of everyday practice, without extra-financial incentives, but only through a physician-led effort, made possible by the commitment of the specialists involved.

Over 8 years, improvements in most of the indicators have been documented, process and intermediate outcome measures consistently improved, in parallel with a more intense and appropriate use of pharmacologic treatments. Nevertheless, room for improvement still exists. The analysis of process indicators shows that the level of performance is consistently higher for some parameters, such as HbA1c, blood pressure, and lipid monitoring, while others such as foot and eye examination still require greater attention. Furthermore, one-quarter of patients still have HbA1c levels >8 %, one-fifth have LDL cholesterol levels ≥130 mg/dl, and one in two has blood pressure levels ≥140/80 mmHg. Therefore, further efforts are needed to reduce the gap between clinical practice and clinical recommendations. As underlined in previous papers, the best performers approach is a key element of the initiative, since clinicians are not faced with theoretical standards, which are often perceived as unrealistic in their structural and organizational setting, but rather with the performance of centers operating in the same healthcare system, under similar conditions.

While the importance and scientific soundness of final outcomes (i.e., diabetes complications) go uncontested, their definition was not sufficiently standardized to allow their monitoring; in fact, open text was generally used to describe the presence and the severity of the complications, hampering the ability to extract the necessary information

Table 3 Quality indicators of diabetes care by year

	2004 (%)	2005 (%)	2006 (%)	2007 (%)	2008 (%)	2009 (%)	2010 (%)	2011 (%)	2004–2011 Absolute variation (%)	2004–2011 Relative variation (%)
Process indicators										
HbA1c	89.5	89.8	90.4	90.8	91.2	91.9	92.2	92.3	+2.8	+3.1
Lipid profile	57.2	60.9	64.2	68.4	70.3	72.4	73.1	73.8	+16.6	+29.0
Blood pressure	75.2	75.1	77.1	77.1	78.2	77.5	77.1	77.8	+2.6	+3.5
Renal function	39.9	40.5	39.5	38.2	38.9	40.9	42.0	44.1	+4.2	+10.5
Foot examination	8.7	10.8	12.1	13.7	15.0	14.7	14.9	14.9	+6.2	+71.3
Eye examination	23.5	25.4	29.5	32.7	33.2	32.7	33.2	32.3	+8.8	+37.4
Favorable outcome indicators										
HbA1c ≤7.0 % (≤53 mmol/mol)	39.0	39.9	40.9	44.6	44.2	43.6	43.6	43.8	+4.8	+12.3
LDL-c <100 mg/dl	26.2	30.2	34.9	37.3	40.1	41.4	45.4	48.1	+21.9	+83.6
BP <130/80 mmHg	31.6	31.5	33.2	36.1	36.8	38.0	40.3	41.6	+10	+31.6
Unfavorable outcome indicators										
HbA1c >8.0 % (>64 mmol/mol)	34.9	33.3	32.2	28.9	28.7	28.2	27.6	27.2	−7.7	−22.1
LDL-c ≥130 mg/dl	39.6	35.6	31.2	29.2	26.9	26.4	23.5	21.7	−17.9	−45.2
BP ≥140/90 mmHg	64.0	63.7	61.9	58.9	58.2	56.6	54.4	52.9	−11.1	−17.3
GFR ≤60 ml/min	21.5	22.2	22.8	23.8	23.3	24.1	23.8	23.8	+2.3	+10.7
Microalbuminuria	39.1	38.8	38.4	36.0	35.5	35.8	37.4	38.8	−0.3	−0.8
Indicators of treatment intensity/appropriateness										
No insulin despite HbA1c >9.0 % (>75 mmol/mol)	54.6	51.6	50.2	46.0	44.8	42.9	41.0	40.5	−14.1	−25.8
No lipid-lowering agents despite LDL-c ≥130 mg/dl	79.5	73.8	69.2	65.3	62.2	59.6	57.8	57.5	−22.0	−27.7
No antihypertensive treatments despite BP ≥140/90 mmHg	60.4	55.4	48.2	40.7	36.6	32.9	30.3	30.2	−30.2	−50.0
No ACE-I and/or ARBs despite micro-/macroalbuminuria	15.2	13.4	10.6	7.9	7.0	6.9	6.7	7.0	−8.2	−53.9
HbA1c >9.0 % (>75 mmol/mol) in spite of insulin treatment	34.7	32.7	31.4	28.2	27.4	26.3	25.7	25.7	−9.0	−25.9
LDL-c ≥130 mg/dl in spite of lipid-lowering treatment	39.7	36.2	30.2	27.3	24.4	23.3	20.1	18.1	−21.6	−54.4
BP ≥140/90 mmHg in spite of antihypertensive treatment	70.4	68.2	66.3	63.7	62.6	61.3	58.5	56.8	−13.6	−19.3
Overall quality of care										
Q score <15	13.5	12.3	11.0	9.3	8.5	8.1	7.6	7.5	−6.0	−44.4
Q score >25	22.9	24.9	27.6	31.3	33.6	35.5	37.9	38.5	+15.6	+68.1

p for temporal trend <0.001 for all indicators

from electronic medical records. However, in previous studies [33, 34], our score of overall quality of care (Q score) documented a close relationship between quality of diabetes care and long-term outcomes. In fact, the risk of developing a new cardiovascular event was 80 % higher in patients with a score <15 and 20 % higher in those with a score between 15 and 25, as compared to those with a score >25. Therefore, it is plausible that longitudinal improvements in Q score can be translated into less cardiovascular events, with evident clinical and economic implications. In

addition, a specific cost-effectiveness analysis was performed [35]: The AMD Annals initiative was associated with improvements in mean discounted life expectancy and quality-adjusted life expectancy compared to conventional management. While treatment costs were higher in the AMD initiative, this was offset by savings as a result of reduced incidence, and therefore treatment, of diabetes-related complications. The AMD Annals initiative was found to be cost saving over patient lifetimes compared to conventional management.

The AMD Annals initiative has strengths and limitations. The main strength is the sample size and the data source, largely representative of the quality of diabetes care provided by specialists in Italy. The computerized management of data extraction from electronic clinical electronic records allows an easy evaluation of many indicators, which can be periodically revised and updated in accordance with new evidence and scientific debate [31]. However, limitations include as follows: 1. the design is not randomized; therefore, it is not possible to establish whether other factors may have played a role in the registered improvements. These factors are not mutually exclusive and could be interactive, such as better team care, increased patient awareness, better decision support and clinical practice guidelines, more general attention to risk factor control, and changes in eating and smoking habits in the population; 2. the initiative describes the care provided by specialists, and no information is available for people followed exclusively by their GPs. In addition, no information is available for diabetes clinics which do not participate in the initiative. 3. It should be considered that, for some indicators (e.g., microalbuminuria, fundoscopy), the analysis is based on recorded data, generally available in the follow-up visit following the prescription; this means that if a patient is correctly prescribed a diagnostic procedure for screening of a complication, but fails to comply with the prescription, or to share with the diabetes care team the results, the prescription of the procedure is not detected. Therefore, the analysis could underestimate the actual adherence of diabetes specialists to standards of care. 4. Due to the very large sample size, even trivial differences are statistically significant, so that data need to be evaluated for their clinical relevance, in addition to their statistical significance.

In conclusion, AMD Annals are a well-established, physician-led monitoring, and continuous improvement initiative in Italy, which is easy to implement and deeply rooted in routine clinical practice. It can be used as a tool for clinical governance and for the implementation of specific improvement strategies. The initiative has been proven to be effective and cost saving, thus representing a case model to be used as an inspiration for other healthcare systems.

Appendix: AMD Annals 2012 Study Group

Editorial Board (in alphabetical order)

Adolfo Arcangeli—Prato, Antonino Cimino—Brescia, Paolo Di Bartolo—Ravenna, Danila Fava—Roma, Augusto Lovagnini-Scher—Cusano Milanino (MI), Alberto Marangoni—Bassano Del Grappa (VI), Illidio Meloncelli—S. Benedetto del Tronto (AP), Maria Franca Mulas—Oristano, Antonio Nicolucci, Santa Maria Imbaro (CH), Andrea Nogara—Chioggia, Fabio Pellegrini, Santa Maria Imbaro (CH), Maria Chiara Rossi—Santa Maria Imbaro (CH), Salvatore Turco—Napoli, Giacomo Vespasiani—S. Benedetto del Tronto (AP).

Statistical analysis

Antonio Nicolucci, Maria Chiara Rossi, Fabio Pellegrini, Giuseppe Lucisano, Basilio Pintaudi, Marco Scardapane, Riccarda Memmo, Elena Pellicciotta, Fondazione Mario Negri Sud, Santa Maria Imbaro (CH).

Regional Tutors (in alphabetical order by region)

La Penna G, Paciotti V,– Abruzzo; Venezia A—Basilicata; Armentano G, Giovannini C—Calabria; Armentano V, Laudato M, Turco S—Campania; Laffi G, Monesi M—Emilia Romagna; Felace G, Tortul C—Friuli Venezia Giulia; Santantonio G, Suraci C—Lazio; Ghisoni G, Raffa M—Liguria; Genovese S, Lovagnini-Scher CA, Mangone I, Richini D, Rocca A—Lombardia; Garrapa G, Tortato E—Marche; Vitale C—Molise; Comoglio M, Fornengo R—Piemonte; De Cosmo S, Gentile FM—Puglia; Gigante A, Mastinu F—Sardegna; Di Benedetto A, Saitta G—Sicilia; Calabrese M, Orsini P—Toscana; De Blasi G, Romanelli T—Trentino Alto Adige; Cicioni G, Pocciati S—Umbria; Marangoni A, Nogara A—Veneto.

Participating centers (in alphabetical order by town)

Marilena Lanero, Carla Bergonzini, Maria Grazia Bertero, Alba Rapetti, Gabriella Martini, Monica Tornaghi—Acqui Terme (AL); Antonino Pipitone, Lucio Bellinetti, Gemma Frigato, Daniela Santipolo—Adria (RO); Massimo Boaretto, Luisa Parmesan, Barbara Conte, Iva Manfroi, Fanny

Soccol, Nadia Cumina—Agordo (BL); Annamaria Nuzzi, Elisabetta Benedusi Pagliano, Emanuele Fraticelli, Paola Viberti, Antonietta Pasquero—Alba (CN); Adalberto Pagano, Enrico Papini, Marco Chianelli, Filomena Graziano, Irene Misischi, Lucilla Petrucci, Roberta Rinaldi, Stefania Silvagni—Albano Laziale (RM); Maura Rosco—Alberobello (BA); Egle Ansaldi, Francesco Malvicino, Maurizia Battezzati, Paolo Maresca, Marcella Balbo, Clara Palenzona—Alessandria; Giovanni Cicioni, Stefania Venturi—Amelia (TR); Valentino Cherubini, Antonio Iannilli, Martina Biagioni, Chiara Giorgetti, Maria Cristina Alessandrelli, Alessandra Cesaretti, Anna Maria Paparusso—Ancona; Massimo Boemi, Rosa Anna Rabini, Gabriele Brandoni, Federica D'Angelo—Ancona; Maria Luigia De Cicco, Federica Giampetruzzi, Filomena Loconte, Simona Maldera, Stefania Annese, Palma Di Corato, Daniela Strippoli, Tiziana Rizzi—Andria (BAT); Giulio Doveri, Emma Lillaz, Antonio Ciccarelli, Salvatore Giardina, Roberta Courthoud, Paola Mararia, Elisa Pascale, Silvana Flou—Aosta; Grazia Pia Ricciardi, Paola Di Masa—Aprilia (LT); Guido Vitalone, Donatella Setti, Giuseppe Piticchio, Patrizia Contrini, Camilla Mazzola—Arco (TN); Paola Ponzani, Valeria Ghigliotti, Andrea Corsi—Arenzano (GE); Vincenzo Mazzini, Marina Orlandi, Maria Cristina Pollace—Argenta (FE); Stefano Fazion, Maria Luisa Spina, Cinzia Francesconi—Asola (MN); Vincenzo Trosini, Roberto Berardinucci, Katia Dolcetti, Paola Colleluori, Emanuela Cannarsa, Valeria Montanari, Paolo Di Berardino—Atri (TE); Mario Velussi—Aurisina (TS); Vincenzo Paciotti, Pasquale Alfidi, Bruno Verdecchia, Luigina Baliva, Alessia Di Pietro, Giovanna Franchi, Patrizia Luce—Avezzano (AQ); Simona Flora Maldera, Mariangela Manicone, Daniela Strippoli, Ida Console, Rossella Caringella, Anna Leonardini, Michele Giardino, Giuseppe Stornelli, Cristina Palmiotto,Gianluca Besozzi, Daniela Di Marzo, Adriana Lategola,Alessandra Marcotrigiano, Paolo Sciascia—Bari; Alberto Marangoni, Alessandro Pianta, Maria Ferrari, Sara Balzano, Gianpietro Beltranello—Bassano Del Grappa (VI); Massimo Boaretto, Concetta Nadia Aricò, Corradina Alagona, Laura Cervo, Silvia Rossa, Rosella Zanon—Belluno; Franco Travaglino, Rita Graziella Guarnieri—Biella; Maura Rosco, Maria Concetta Di Pace—Bisceglie (BAT); Gilberto Laffi, Silvio Giangiulio, Michele Grimaldi, Giovanna Santacroce, Fernanda Cerrelli, Rita Manini, Adolfo Ciavarella—Bologna; Stefano Zucchini, Claudia Balsamo, Mirella Scipione, Giulio Maltoni, Alessandra Rollo—Bologna; Bruno Fattor, Tiziano Monauni, Florian Amor, Dalia Crazzolara, Gerhard Orion, Michela Cristini, Sylvia Lintner,Johanna Eisath—Bolzano; Laura Chiappini, Sandra Alberti—Bondeno (FE); Stefano Garavelli, Teresa Calari, Paola Marini—Borgo Valsugana (TN); Marco Buschini, Daniela Bonfiglioli, Damiano Mones—Borgomanero (NO); Aldo

Giuseppe Morea, Lucia Bondesan, Sandro Perbellini—Bovolone (VR); Emanuele Fraticelli, Mauro Ravera—Bra (CN); Antonino Cimino, Umberto Valentini, Angela Girelli, Liliana Rocca, Barbara Agosti, Emanuela Zarra—Brescia; Gianfranco De Blasi, Michael Bergmann, Franz Plaickner, Alessandra Ferro Ingaglio, Irmgard Pradi, Marianne Piok, Rosmarie Unterkircher, Marion Pichler—Bressanone (BZ); Giuseppina Palamà, Patrizia Palma, Claudia Pisanello, Antonio Trinchera—Brindisi; Brigitte Viehweider—Brunico (BZ); Mauro Giovanni Schiesaro, Giovanni Vita, Beatrice Cenci, Laura Pizzamiglio—Bussolengo (VR); Francesca Spanu, Sandro Cocco, Rasangela Maria Pilosu, Pier Paolo Contini—Cagliari; Giampiero Piras, Roberto Seguro, Marco Songini—Cagliari; Marco Stabilini, Fabrizio Lombardini, Salvatorina Mura, Paola Sulis, Aldo Caddori—Cagliari; Maria Giulia Cartechini, Natalia Busciantella Ricci, Giacoma Agostinelli—Camerino (MC); Antimo Aiello, Maria Rosaria Cristofaro, Lorenzo Cocco, Simonetta Di Vincenzo, Fiorentina D'Amico, Vittoria Di Iorio, Franca Di Ponte, Graziella Giancola, Emanuela Mazzola, Vittoria Niro, Lina Notartomaso, Carmela Sabetta—Campobasso; Annamaria Nuzzi, Claudia Ballauri—Canale (CN); Sergio Casati, Daniela Tettamanzi, Margherita Casartelli, Cosimo Prete, Emanuela Gatti, Luisa Marzorati, Tiziana Cairoli—Cantù (CO); Annelisa Lesina, Francesco Romeo, Carlo Bruno Giorda,—Carmagnola (TO); Anna Vittoria Ciardullo, Daniela Piani, Angela Deroma, Ewa Grazyna Maciejewska, Veronica Baccini—Carpi (MO); Elisabetta Straface—Casalbordino (CH); Giuseppe Pozzuoli, Mario Laudato, Maria Barone—Caserta; Sergio Tondini, Flavia Borgoni—Castel del Piano (GR); Juliette Grosso, Loredana Rossi, Carla Scarsellato, Antonietta Sciulli, Federica De Marco—Castel di Sangro (AQ); Stefano Fazion, Maria Luisa Spina, Cinzia Francesconi—Castel Goffredo (MN); Loris Confortin, Narciso Marin, Mario Lamonica, Elisa Rossi, Anna Pisacane, Vanessa Cavasin—Castelfranco Veneto (TV); Stefano Genovese, Fabiana Locatelli, Valeria Valdes, Flavia Moratti, Valentina Fuso—Castellanza (VA); Giordano Filippi, Monica Camporesi, Mirca Gherardi—Castelnovo Ne' Monti (RE); Sergio Gallana, Gloria Buganza, Adriana Valentini, Ilaria Cera—Castiglione delle Stiviere (MN); Salvatore Gialdino, Rossella Franchino—Castrovillari (CS); Vito Borzì, Concetta Gatta, Riccardo Rapisardi, Salvatore Strano, Maria Calabrò—Catania; Luigi Puccio, Raffaella Vero—Catanzaro; Giuseppe Cheluci, Susy Martucci, Anna Simoncelli, Maria Pia Giammoema, Bruna Seber, Mauro Lozzer, Sonia Andolfatto—Cavalese (TN); Gemma Frigato—Cavarzere (VE); Vincenzo Starnone, Andrea Del Buono, Anna Maria Terracciano, Egidio Gamba—Cellole (CE); Vincenzo Maria Monda, Paola Ramponi, Sandra Alberti, Elisabetta Maccaferri, Flavia Busi—Cento (FE); Francesco Castro, Antonello

Guaglianone, Concezione Maccari—Cetraro (CS); Laura Corsi, Giorgio Versari, Maria Rosaria Falivene, Nicoletta Boletto, Simona Corsi, Marisa Delucchi, Simonetta Gasperi, Bruna Ferrari—Chiavari (GE); Carla Origlia, Lisa Marafetti, Carlo Bruno Giorda—Chieri (TO); Ester Vitacolonna, Livia Lina Cavuto, Federica Fraticelli, Matteo D'Angelo—Chieti; Loredana di Nisio, Filomena Simonetti—Chieti; Andrea Nogara, Gianni Ballarin, Angelo Boscolo Bariga, Silvia Di Benedetto—Chioggia (VE); Anna Maria Chiambretti, Riccardo Fornengo, Lidia Di Vito, Maria Divina Pascuzzo, Paola Urli, Monica Albertone, Primo Bassani, Carla Bellaluna, Maria Bonacci, Iolanda Bosso, Daniela Cortale, Vanda De Michelis, Margherita Di Gennaro, Vilma Magliano, Silvia Nieddu, Antonia Stranisci—Chivasso (TO); Alberto Rocca, Paola Galli, Annunziata De Blasi, Monica Castellan, Cristina Cavenaghi, Maria Iagulli—Cinisello Balsamo (MI); Virginia Trinelli, Francesco Caraffa, Daniela Gallo—Ciriè (TO); Roberto Norgiolini, Roberta Celleno, Corrado Campanelli, Daniela Biccheri, Cinzia Bondi, Giuseppa Dadi—Città di Castello (PG); Graziano Santantonio, Luciano Massa, Alessandra Zappaterreno, Lina Lottatori, Elisa Costanzo, Nicoletta Pistola—Civitavecchia (RM); Paolo Ziller, Federica Portolan, Giuseppe Pasolini—Cles (TN); Valerio Di Chiara, Maria Luisa Grata, Elisabetta Bergami, Soccorsa Ciannillo, Navia Curzola—Codigoro (FE); Luigi Capretti, Guglielmina Speroni, Luciano Fugazza—Codogno (LO); Cinzia Massafra—Cologno Monzese (MI); Maria Cristina Cimicchi, Carlo Percudani, Tiziana Risolo, Paola Saccò, Manuela Mori—Colorno (PR); Valerio Di Chiara, Maria Luisa Grata, Elisabetta Bergami, Soccorsa Ciannillo, Navia Curzola—Comacchio (FE); Gian Luigi Gidoni Guarnieri, Diana Piccolo, Franca Giacon, Mariolina Scarpel, Clementina Bravin, Elena De Noni, Vanda Daniotti—Conegliano (TV); Giuseppe Panebianco, Federica Tadiotto, Virgilio Da Tos, Michele D'Ambrosio, Monica Faoncella, Marj Zogno, Cristina Lunardi, Patrizia Crivellaro, Loretta Trivellato—Conselve (PD); Dario Pellizzola, Maria Antonella Zampini, Emanuela Frezzati, Maria Elvira Raminelli, Elena Mari—Copparo (FE); Dario Gaiti, Giuseppina Chierici, Silvia Pilla, Bruna Milli, Monica Camporesi, Paola Caretta, Valeria Vezzani, Melita Copelli—Correggio (RE); Alfonso Longobucco—Cosenza; Patrizia Ruggeri, Sergio Di Lembo, Elisa Carrai, Amalia Degli Innocenti, Lucia Manini, Romano Persico, Cristiana Rossi—Cremona; Enrico Gabellieri, Daniela Sansone, Maria Stella Sbriglia, Giuseppina Comba, Giovanni Valesano, Stefania Bertello, Luisella Ballatore, Salvatore Oleandri—Cuneo; Giampaolo Magro, Francesco Tassone, Donatella Gaviglio—Cuneo; Giuseppe Marelli, Veronica Vilei, Paolo Rumi, Laura Bellato, Mara Fedeli, Antonella Merlini, Giuseppina Pinelli—Desio (MB); Giuseppe Marin, Maria Luisa Contin, Angela De

Cata, Anna Patalano, Paola Parlato, Jessica Jacovacci—Dolo (VE); Giuseppe Placentino, Vittoria Zizzari, Sofia Pellanda, Luisa Folchi, Anna Lorenzini—Domodossola (VB); Donata Richini, Stefano Molinari, Chiara Inversini, Roberto Strazzieri, Paolo Stofler, Marco Andreoli, Simona Fornaro—Esine (BS); Giuseppe Panebianco, Federica Tadiotto, Virgilio Da Tos, Michele D'Ambrosio, Monica Faoncella, Marj Zogno, Cristina Lunardi, Patrizia Crivellaro, Loretta Trivellato—Este (PD); Maria Simona Termine, Paolo Di Bartolo—Faenza (RA); Luisella Cotti, Gabriella Garrapa—Fano (PU); Ferruccio D'Incau, Patrizia Lagomanzini, Paola Conte, Fiorina Todesco—Feltre (BL); Paolo Foglini, Elena Tortato, Paola Pantanetti, Sandra Di Marco, Rossana Maricotti, Claudio Bedetta—Fermo; Franco Tomasi, Marcello Monesi, Roberto Graziani, Lucia Penna, Fausto Beretta, Chiara Zamboni—Ferrara; Antonella Guberti, Davide Dazzi, Nicoletta Orlandi—Fidenza (PR); Luca Lione, Gigi Bocchio, Edmondo Bosco, Gianmario Massazza,—Finale Ligure, Loano, Pietra Ligure (SV); Sergio Pocciati—Foligno (PG); Elisa Forte, Concettina Marrocco, Antonella Griffo, Roberta Moschetta—Fondi (LT); Tuccinardi Franco, Francesco De Meo, Elisa Forte, Antonietta Coppola, Raffaele Vallefuoco, Pina Pirolozzi, Vincenzo Placitelli—Gaeta (LT); Arturo Mastropasqua, Paolo Marenco—Garbagnate Milanese (MI); Claudio Taboga, Barbara Catone—Gemona del Friuli (UD); Alberto Aglialoro, Giovanni Careddu, Roberta Guido, Maurizio Patrone, Madina Dagnino, Adelina Massara, Margherita Zecchini, Andrea Corsi—Genova; Micaela Battistini, Francesca Fabbri, Vilma Campora, Patrizia Carosla, Silvana Chinigò, Andrea Corsi—Genova; Guglielmo Ghisoni, Francesca Fabbri, Marina Torresani, Roberto Crovetto, Andrea Corsi—Genova; Giorgio Luciano Viviani, Arianna Durante, Francesca Pais, Vittorio Lilliu—Genova; Maura Rosco, Cornelia Mzzaraco—Gioia del Colle (BA); Ercole D'Ugo, Mariarosaria Squadrone, Tommaso Amenduni, Maria M Iovannisci, Flora Potente, Teresa Delle Donne, Concetta Massa, Luigi Della Penna—Gissi (CH); Silvestro De Berardinis, Ilde Guarnieri, Marina Splendiani, Rosanna Di Giuseppe, Susanna Lupidii, Rosanna Ruggieri, Sabrina D'Antonio, Antonella Valorosi—Giulianova (TE); Barbara Brunato, Roberta Assaloni, Rosalia Loro, Sandro Bucciol, Raimonda Muraro, Roberto Da Ros, Carla Tortul—Gorizia; Maura Rosco, Chiara Lavacca—Gravina (BA); Fabrizio Quadri, Gigliola Sabbatini, Laura Sambuco, Clorinda Santacroce—Grosseto; Giuseppina Chierici, Silvia Pilla, Bruna Milli, Melita Copelli, Lorella Bertelli, Pietro Zanichelli, Simona Bodecchi, Susanna Rovesti—Guastalla (RE); Cecilia Marino, Augusta Micheletti, Annarita Petrelli; Valentina Pasquini—Gubbio (PG); Angelo Corda, Luisa Pisano, Giacomo Guaita, Cinzia Deias, Paola Marino, Giuseppa Cuccu, Tina Poggi, Arianna Marceddu, Susanna Diana—Iglesias (CI);

Giuliana Baldassarri, Anna Vacirca—Imola; Maria Antonietta Fois, Valentina Maria Cambuli, Ada Pilia, Rosa Pilia, Giuliana Cao—Isili (CA); Mauro Giovanni Schiesaro, Giovanni Vita, Daniele Bonato, Katia Poletto—Isola della Scala (VR); Stefania Deiana, Francesca Scanu—Ittiri (SS); Giorgio Trevisan—Jesolo (VE); Rossella Iannarelli, Enrico Storelli, Alessandra Sperandio,Filomena Sciarretta, Romana Cialfi—L'Aquila; Alberto Zappa, Stefano Carro, Laura Dreini, Sonia Valesi, Giovanna Cinguetti, Roberta Parentini, Alessandra Guazzetti, Cristina Pennucci—La Spezia; Ercole D'Ugo, Daniela Antenucci, Anita Minnucci, Angela Bosco, Giovanna Angelicola, Angela Di Federico, Giuseppina Di Marco, Rosanna Fresco, Claudia Di Florio—Lanciano (CH); Diletta Ugolotti, Clelia Di Seclì, Ilaria Boselli, Tiziana Cadossi—Langhirano (PR); Albino Massidda, Gisella Meloni, Claudia Putzu, Carlo Cozzi—Lanusei (NU); Raffaella Buzzetti, Camillo Gnessi, Gaetano Leto, Chiara Foffi, Laura Cipolloni, Chiara Venditti, Chiara Moretti, Angela Carlone—Latina; Aldo Giuseppe Morea, Lucia Bondesan, Sandro Perbellini—Legnago (VR); Aurora Valicenti, Stefania Bertoli, Sabrina Cosimi, Sandra Bianchini—Lido di Camaiore (LU); Stefano Genovese, Valeria Valdes, Dina Miele—Limbiate (MB); Graziano Di Cianni, Paola Orsini, Anna Turco, Cristina Lencioni, Chiara Goretti, Claudia Sannino, Paolo Lemmi—Livorno; Maura Rosco—Locorotondo (BA); Alberto di Carlo, Ilaria Casadidio, Ilaria Cuccuru, Laura Maria Chiara Giorgi, Alba Galli, Marzia Piacentini, Elisa Del Bianco, Chiara Russo, Piera Baroni, Antonella Salvini, Vito Michele Cassano—Lucca; Piero Melandri, Paolo Di Bartolo—Lugo (RA); Gabriele Maolo, Barbara Polenta, Nadia Piccinini—Macerata; Maria Maddalena Atzeni, Cristina Porru—Macomer (NU); Cesare Vincenti, Paola Mega, Enza Magurano, Nicola Pastore, Antonella Cananiello—Maglie (LE); Giuliano Gaspardo, Elettra Brussa Toi, Ciro Antonio Francescutto, Luisa Angeli, Lorena Ronchese—Maniago (PN); Stefano Fazion, Francesca Saggiani, Linneo Enzo Mantovani, Adriana Forapani, Raffaella Antoniazzi, Paola Cristianini, Rita Mazzali, Elena Pierobon—Mantova; Salvatore Turco, Anna Amelia Turco, Maria Teresa Fernicola, Giuseppe Cudemo, Giovanna Taglialatela—Marano di Napoli (NA); Luigi Sciangula, Alessandra Ciucci, Myriam Gandolfo, Baldassarre Grassa, Adele Tono, Rosalia De Marco, Emanuela Simona Olivo, Elisa Bellini—Mariano Comense (CO); Antonino Lo Presti, Antonietta Maria Scarpitta—Marsala (TP); Maria Adelaide Dolci, Fabio Baccetti, Giovanna Gregori, Mary Mori—Massa (MS); Alessandro de Palma, Massimo Alessandri, Paola Sarenari, Cecilia Panni, Ornella Vagnetti, Carla Petri—Massa Marittima (Gr); Angelo Venezia, Roberto Morea, Giuseppe Lagonigro, Giovanni Copeta, Valeria Iannucci, Vittoria Milano, Maria Trupo—Matera; Alberto Casartelli, Giampaolo Scollo—Menaggio (CO); Paolo Emilio Marchetto, Andreas Lochmann, Gianpiero Incelli, Simon Rauch, Anita Stadler, Sonja Breitenberger, Maria Magdalena Steiger, Maria Anna Gamper, Manuela Holzner—Merano (BZ); Claudio, Lambiase, Teresa Di Vece, Maurizio D'Aniello, Luigi Gargiulo, Anna Vitale, Massimo Fezza, Carmela Giordano, Flora Leo—Mercato S. Severino (SA); Antonino Di Benedetto, Domenico Cucinotta, Giacoma Di Vieste, Basilio Pintaudi, Giuseppina Russo—Messina; Giovanni Saitta—Messina; Manuela Moise—Mestre (VE); Lucilla D Monti, Emanuele Bosi—Milano; Nicoletta Musacchio, Annalisa Giancaterini, Augusto Lovagnini Scher, Ilaria Ciullo, Laura Pessina, Silvia Maino, Rosanna Gaiofatto—Milano; Giampaolo Testori, Pietro A Rampini, Nadia Cerutti, Paola S Morpurgo, Giacomo Bonino, Francesca Morreale—Milano; Alfredo Zocca, Barbara Aiello, Maurizio Picca—Milano; Loris Bortolato, Alessandra Cosma, Giuseppe Donà—Mirano (VE); Giuseppe Campobasso—Modugno (BA); Francesco Mario Gentile, Giovanna Mazzotta—Mola di Bari (BA); Marco Comoglio, Roberta Manti, Carlo Bruno Giorda—Moncalieri (TO); Carla Tortul, Roberto Da Ros, Raimonda Muraro, Silvana Carlucci, Lorena Narduzzi, Laura Stanic, Elisabetta Bain, Anna Martignon, Monique Pellegrin—Monfalcone (GO); Giuseppe Panebianco, Federica Tadiotto, Virgilio Da Tos, Michele D'Ambrosio, Monica Faoncella, Marj Zogno, Cristina Lunardi, Patrizia Crivellaro, Loretta Trivellato—Monselice (PD); Giuseppe Panebianco, Federica Tadiotto, Virgilio Da Tos, Michele D'Ambrosio, Monica Faoncella, Marj Zogno, cristina lunardi, Patrizia crivellaro, Loretta Trivellato—Montagnana (PD); Antonio Volpi, Anna Coracina, Anna Maria Cospite—Montebelluna (TV); Valeria Manicardi, Massimo Michelini, Lorenzo Finardi, Francesca Borghi, Elisa Manicardi, Rosa Trianni—Montecchio Emilia (RE); Simonetta Lombardi, Michele Iaccarino, Silvana Costa, Chiara Tommasi, Sabrina Cozza, Federica Marini, Isabella Mecenero, Stefania Massignani—Montecchio Maggiore (VI); Marco Giorgio Baroni, Efisio Cossu, Elena Loy, Marta Tuveri—Moserrato (CA); Paola Pisanu—Muravera (ca); Vincenzo Armentano, Oreste Egione, Sergio Galdieri, Anna Velotti, Gemma Annicelli, Francesco De Lillo, Antonino Azzolina—Napoli; Giuseppe Cozzolino—Napoli; Angelo Foglia, Giovanna Monfregola—Napoli; Adriano Gatti, Raffaele Giannettino, Michele Bonavita, Eugenio Creso—Napoli; Sandro Gentile, Giuseppina Guarino, Giampiero Marino, Adele Esposito—Napoli; Nicolangelo Iazzetta, Adriana Cammarota—Napoli; Nicolangelo Iazzetta, Claudio Giannattasio—Napoli; Salvatore Turco, Ciro Iovine, Anna Amelia Turco, Gabriele Riccardi—Napoli; Luciano Zenari, Lorenzo Bertolini, Claudia Sorgato, Francesca Grippaldi—Negrar (VR); Mauro Stroppiana, Silvia Abate, Natalia Carbone, Iolanda Feccia, Gian Carla Gaggero, Rosa Popolizio, Roberta Severino—Nizza

Monferrato (AT); Marco Strazzabosco, Elisabetta Brun, Maria Simoncini, Chiara Alberta Mesturino, Francesco Zen—Noventa Vicentina (VI); Giovanni Paolo Carlesi, Simona Garrone—Novi Ligure (AL); Alfonso Gigante, Anna Maria Cicalò, Rossella Cau, Concetta Clausi—Nuoro; Agostino Paccagnella, Maria Sambataro, Edward Kiwanuka, Tiziana Citro, Barbara Almoto, Eros Bagolin, Daniela Pizzolato, Alessandra Mauri—Oderzo (TV); Alberto Manconi, Giancarlo Tonolo, Giovanni Domenico, Filigheddu, Angela Assunta Pinna, Antonello Carboni, Maria Filippina Angius, Lucia Canu, Sara Cherchi—Olbia (OT); Silvia Calebich, Cinzia Burlotti, Alfonso Piccoli—Ome (BS); Giuseppe Saglietti—Omegna (VB); Sergio Cabras, Barbara Figus, Ignazia Oppo—Oristano; Francesco Mastinu, Maria Franca Mulas, Gianfranco Madau, Marina Cossu, Simonetta Zoccheddu, Marilena Atzeni, Gabriele Idda, Monica Obinu—Oristano; Giovanni Cicioni, Chiara Di Loreto, Massimo Bracaccia—Orvieto (TR); Mario Balsanelli, Mauro Fetonti, Paola Sambo—Ostia (RM); Tommasina Sorrentino, Andrea Del Buono, Iole Gaeta, Angelo Annunziata, Pietro Cannavale, Nunziata Di Palma, Carolina Federico—Ottaviano (NA); Elio Secchi, Maria Antonietta Angotzi, Salvatore Loddoni, Irene Brundu, Franca Careddu, Antonietta Becciu, Gabriella Piras—Ozieri (SS); Giuseppe Torchio, Adolfo Carlo Alberto Bianchi, Gian Battista Colucci, Patrizia Palumbo, Barbara Saviori—Paderno Dugnano (MI); Angelo Avogaro, Daniela Bruttomesso, Cristina Crepaldi, Giampaolo Fadini, Gabriella Guarnieri, Saula de Kreutzenberg, Alberto Maran, Monica Vedovato—Padova; Annunziata Lapolla, Rosanna Toniato, Giuseppe Bax, Barbara Bonsembiante, Claudio Cardone, Maria Grazia Dalfrà, Alessandra Gallo, Michela Masin, Francesco Piarulli, Antonino Pipitone, Giovanni Sartore—Padova; Francesco D'Agati, Lorenza Patrizia Cipolla, Antonella Biondo—Palermo; Maria Antonella Fulantelli—Palermo; Daniela Gioia, Michela Conti—Palermo; Giuseppe Mattina, Lorenza Patrizia Cipolla—Palermo; Giuseppe Mattina, Maria Vaccaro, Iana Costa—Palermo; Giovanni Ridola—Palermo; Giovanni Grossi, Fiorella De Berardinis, Rosanna Piro, Anna Semaforico, Assunta Montalto—Paola (CS); Maria Cristina Cimicchi, Diletta Ugolotti, Daina Filippi, Marina Ferrari—Parma; Sergio Michele Tardio, Maria Cristina Calderini, Maria Grazia Magotti, Laura Franzini, Raffaele Napolitano—Parma; Ivana Zavaroni, Alessandra Dei Cas, Elisa Usberti, Valentina Ridolfi, Monica Antonini, Michela Marina, Elisabetta Marchesi, Nadia Anelli—Parma; Paola Del Sindaco, Enio Picchio, Gianluigi Guercini, Laura Piastrella, Massimo Arcelli—Perugia; Adriano Spalluto, Luigi Maggiulli, Massimo Badiali—Pesaro; Giuliana La Penna, Agostino Consoli—Pescara; Roberto Anichini, Lucia Loredana Merluzzo, Elena Ceccanti, Alessia Lazzarini, Milva Lazzeretti, Irene Howard, Secondina Viti, Alice Magiar—

Pescia (PT); Anna Rosa Bogazzi, Giovanna Bendinelli, Massimo Rivelli, Cristina Vietti—Pianezza (TO); Lucia Briatore, Giacomo Calvo, Brunella Falco—Pietra Ligure (SV); Carlo Antona, Daniele De Vido—Pieve di Cadore (BL); Alessandro Ozzello, Enrico Pergolizzi, Daniela Gaia, Paola Gennari, Giuliana Micali—Pinerolo (TO); Valerio Gherardini, Leonardo Moretti, Francesca Iovine, Chiara Goretti, Monica Bientinesi, Luciana Landi—Piombino (LI); Roberto Miccoli, Cristina Bianchi, Giuseppe Penno, Francesca Venditti, Stefano Del Prato—Pisa; Roberto Anichini, Alessandra De Bellis, Anna Tedeschi, Lisetta Butelli, Rossella Picciafuochi, Manola Gioffredi, Roberto Gori, Tiziana Bruschi, Raffaella Malagoli—Pistoia; Roberto Giubbolini, Sfefania Machetti, Susanna Sansi Roasamaria Grisanti—Poggibonsi (SI); Emilia Martedì, Francesco Nappo—Portici (NA); Gaetana Cossu, Pietro Deliperi—Porto Torres (SS); Cristiano Fongher, Anna Gnan—Porto Viro (RO); Giovanna Villani, Claudia Cancro, Stefano Anelli—Portoferraio (LI); Massimo Moretti, Milena Zanon, Anna Battiston, Anna Del Bianco, Michela Signorato—Portogruaro (RO); Vincenzo Mazzini, Marina Orlandi, Maria Cristina Pollace—Portomaggiore (FE); Armando Zampino, Rosa Sinisi, Maria Natale, Giuseppe Citro—Potenza; Maria Calabrese, Lucia Ianni, Monica Lorenzetti, Angela Marsocci, Sandra Guizzotti, Ida Innocenti, Annalia Noci, Ahoua Sagnon, Romina Fioravanti, Paola Mestrini—Prato; Giosuè Ghilardi, Patrizia Fiorina—Priario (BG); Salvatore Turco, Antongiulio Faggiano, Giovanna Donnarumma, Nicola Tafuri, Mariella Andretti, Barbara Tramontano—Quarto (NA); Francesco Cabasino, Fernando Farci, Alberto Atzori, Mariangela Ghiani, Irene Siotto, Marianna Sedda, Alì Manis, Carmela Loddo, Ilaria Loddo, Lucia Pisano, Paola Seguro, Annamaria Cuomo, Lucilla Orlando, Giovanni Battista Olanda—Quartu S'Elena (CA); Michelina Massenzo—Quattromiglia di Rende (CS); Achiropita Pucci, Barbara Greco—Quattromiglia di Rende (CS); Paolo Di Bartolo, Cipriana Sardu—Ravenna; Giovanni Careddu, Raffaella Costa, Vilma Campora, Laura Anselmi, Andrea Corsi—Recco (GE); Celestino Giovannini—Reggio Calabria; Domenico Mannino, Emira Dal Moro, Maurizio Postorino, Eugenio Alessi—Reggio Calabria; Giovanni Perrone, Francesca Corazziere, Irene La Puzza—Reggio Calabria; Pier Francesco Tripodi, Angela Mirto, Sergio Grasso, Giulia Zerbi-Cama, Antonella Giampaolo—Reggio Calabria; Valeria Manicardi, Prisco Sborbone, Eliana Gardini, Elisa Manicardi, Clelia Di Seclì, Patrizia Marrino, Rosa Trianni, Marina Greci—Reggio Emilia; Emilio Rastelli, Claudia Rastelli—Riccione (RN); Basilio Battisti, Anna Rita Aleandri, Maria Virginia Guidi, Rosaria Faraglia, Verena Lilli—Rieti; Rocco Bulzomì—Roma; Francesco Chiaramonte, Renato Giordano, Maria Giuseppina Migneco, Mauro Rossini, Natalia Visalli, Daniela Danna, Silvana

Baldassarra, Romina Ralli, Samanta Roma, Orietta Pannozzo, Alessandra Cignetti, Bruna Facchiani, Claudia Righini—Roma; Mariano Pio D'Accinni, Donatella Paolucci, Anna D'Ubaldi, Maria Teresa D'Angelo, Manuela Fratini, Giovanni Masaro, Marco Pietrantoni, Roberta La Rosa—Roma; Maria Giuliano, Maria Grazia Pennafina, Pasquale Di Perna—Roma; Sergio Leotta, Concetta Suraci, Natalia Visalli, Roberto Gagliardi, Lucia Fontana, Maria Altomare, Silvia Carletti, Santina Abbruzzese, Letizia Bruschi, Roberta Lancione—Roma; Sebastiano Filetti, Susanna Morano, Marcella Santilli, Elisabetta Mandosi, Mara Fallarino, Marco Rossetti—Roma; Fabio Piergiovanni, Fiorella Massimiani, Angela Simonetta, Danila Fava, Fulvia De Luca, Giuliana Leacche, Teresa Giampietro, Rossella Guarino—Roma; Maurizio Poggi, Anna Penza, Francesca Piccirilli, Roberta Pisano, Annamaria Prioletta, Caterina Saponara—Roma; Raffaele Scalpone, Fabrizia Toscanella, Alessandro Scoppola, Lorena Mancini—Roma; Claudio Tubili, Lelio Morviducci, Maria Rosaria Nardone, Paola Fratoni—Roma; Daniela Cappelloni, Lina Lardieri, Alessandro Urbani, Tiziana Santucci, Gabriella del Monte, Irene Pellegrino, Franca Rauseo, Patrizia Alini—Roma; Giuseppe Armentano, Maria Grazia Restuccia, Giuseppe Vatrano—Rossano (CS); Renzo Girardello, Renzo Gennaro, Lorena De Moliner, Annalisa Mattuzzi, Katja Speese,Elena Bettini, Fabiola Frisinghelli, Monica Falqui—Rovereto (TN); Giacomo Vespasiani, Illidio Meloncelli, Lina Clementi, Marianna Galetta, Valentina Marconi—S. Benedetto del Tronto (AP); Paolo Bordin, Maurizio Sacandi, Laura Perale, Luciana Dotto, Roberto Da Ros, Nella Pupin, Elena Rosso, Fabiola Zamparo—S. Daniele del Friuli (UD); Silvestre Cervone, Matteo Pontonio, Lucia De Angelis—S. Marco in Lamis (FG); Manola Nicoletti, Nazzareno Trojan, Tiziano Croatto, Rita Centis—S. Vito al Tagliamento (PN); Patrizia Li Volsi, Elisa Levis, Giorgio Zanette—Sacile (PN); Carmela Vinci, Milena Zanon, Loredana Geretto, Cristina Toffolo, Maria Grazia Furlan—San Donà di Piave (VE); Vincenzo Sica, Raffaella Derai, Marina Armeni, Anna Bruna Urraci, Letizia Carreras, Elisabetta Cossu, Simonetta Mamusa, Maria Antonietta Pisano—San Gavino Monreale (VS); Salvatore De Cosmo, Anna Rauseo—San Giovanni Rotondo (FG); Marco Strazzabosco, Elisabetta Brun, Maria Simoncini, Chiara Alberta Mesturino, Francesco Zen—Sandrigo (VI); Roberto Sturaro, Maurizio Raffa, Federico Quattrocchi—Sanremo (IM); Anna Carbone, Cristina Gnocchi, Maria Rosa Anelli, Ester Fontana, Giuliana Alfoli—Sant' Angelo Lodigiano (LO); Maura Rosco, Giovanni Labarile—Santeramo (BA); Fabrizia Caucci—Sassari; Luca Lione, Dino Dessì—Savona; Mario Monachesi, Giovanni Carta, Mara Boschetti, Enrica Ceresola, Emanuela Venier—Savona; Stefano De Riu, Umberto Amelia—Scafati (SA); Francesco Calcaterra, Fedele

Cataldi, Marina Miola—Schio (VI); Silvana Manfrini, Silvia Rilli, Gessica Tinti—Senigallia (AN); Alessio Lai, Barbara Locci, Donatella Putzu—Senorbi (CA); Stefano Genovese, Loredana Bucciarelli, Maurizio Rondinelli, Monica Bulgheroni—Sesto S. Giovanni (MI); Stefano Gonnelli, Alice Cadirni, Italo Tanganelli—Siena; Karl Egger, Kerstin hofmann, Margareth Tanner, Heidrun Hohenegger—Silandro (BZ); Cristina Porru, Angela Canneddu, Mercedes Porcu—Siniscola (NU); Vittoria Sesta, Franca Daidone—Siracusa; Luigi Vincis, Viviana Orlandi, Cinzia Pilloni, Rossana Farci, Ilaria Pelligra, Giuseppina Renier—Sirai—Carbonia (CI); Marco Mameli, Elvira Devigus, Anna Pala—Sorgono (NU); Giuseppe Felace, Ida Fumagalli, Paola Tosoni, Daniela Ovan, Silvia Giacomello, Nada Peressini, Fiorella Rossi—Spilimbergo (PN); Carlo Lalli, Mafalda Agliani, Maria Luisa Picchio, Maura Scarponi, Ludovico De Pascalis, Erika Bonucci—Spoleto (PG); Francesco Malci, Anita De Ciocchis, Chiara Moscatelli—Subiaco (RM); Barbara Macerola, Angelina Mandarino, Sandra Incani—Sulmona (AQ); Silvano Davì, Maria Ausilia Caccavale, Simona Borla, Marina Pognant Gros—Susa (TO); Ennio Lattanzi, Concettina Piersanti, Anna Piersanti, Irene Spinelli, Gabriella Quaranta, Silvia D'Ascanio—Teramo; Lorenzo De Candia—Terlizzi (BA); Antimo Aiello, Pietro Di Caro, Fabrizia Flocco, Agnese Franco, Maria Antonietta Lezzi, Anna Meo, Antonella Meo, Alfredo Puntillo, Giovanna Scarpina, Marco Tagliaferri, Celeste Vitale—Termoli (CB); Giovanni Cicioni, Maria Grazia Massarelli, Stefania Venturi—Terni; Augusto Travaglini, Patrizia Draghi—Terni; Elisa Forte, Lucilla Tamburro, Catia Palmacci, Maria Palma Abbate—Terracina (LT); Stefania Deiana, Francesca Scanu—Thiesi (SS); Paolo Pomante—Tocco da Casauria (PE); Alberto Bruno, Paolo Cavallo Perin, Ezio Ghigo, Massimo Porta, Paola Scuntero, Rosanna Arcari, Silvana Bertaina, Simona Bo, Fabio Broglio, Graziella Bruno, Mariella Degiovanni, Paolo Fornengo, Giorgio Grassi, Valeria Inglese, Mauro Maccario, Giorgio Maghenzani, Saverio Marena, Valentino Martina, Pietro Passera, Gianluca Ruiu, Milena Tagliabue, Maria Zanone—Torino; Aurora Grassi, Alberto Mormile, Anna Maria Ingaramo, Pietro Demurtas—Torino; Luca Monge, Gian Mario Boffano, Katia Macrì, Paola Maio—Torino; Luca Richiardi, Alessandra Clerico—Torino; Cesare Dossena, Simona Bosoni—Tortona (AL); Francesca Novara, Daniela Mancuso, Francesca Cipro—Trapani; Paolo Acler, Tiziana Romanelli, Sandro Inchiostro, Massimo Orrasch, Cristina Faes, Silvia Clementi, Franca Endrizzi, Ilaria Nicolao—Trento; Carlo Antonio Bossi, Giancarla Meregalli, Annalisa Balini, Denise Berzi, Anna Pulcina—Treviglio (BG); Agostino Paccagnella, Maria Sambataro, Edward Kiwanuka, Tiziana Citro, Barbara Almoto, Eros Bagolin, Daniela Pizzolato, Alessandra Mauri—Treviso; Riccardo Candido, Elena Manca,

Alessandra Petrucco, Elisabetta Caroli, Elisabetta Tommasi, Giuseppe Jagodnik, Nevia Daris, Rossella Alberti, Katja Tercelj, Elisabetta Presti, Sarah Perini, Elisa Del Forno—Trieste; Maria Antonietta Pellegrini, Laura Tonutti, Giorgio Venturini,Sandra Agus, Franco Grimaldi—Udine; Mauro Andreani, Federica Turchi, Maurizio Sudano, Gigliola Martinelli, Stefania Lani—Urbino (PU); Francesca Innelli, Piera Grammaldo, Angelo Vistocco—Vallo della Lucania (SA); Silvio Sposito, Renzo Rongioletti, Maria Candidi—Velletri (RM); Anna Rosa Bogazzi, Giovanna Bendinelli, Massimo Rivelli, Cristina Vietti—Venaria Reale (TO); Ermanno Moro, Antonella Senesi—Venezia; Giuseppe Saglietti, Giuseppe Placentino, Antonella Schellino—Verbania Pallanza (VB); Roberto Mingardi, Luciano Lora, Cristina Stocchiero, Rachele Reitano, Mee Jung Mattarello, Giovanni Ronzani, Silvia Pegoraro, Matteo Rolandi, Veronica Baggio, Elisa Rancan—Vicenza; Marco Strazzabosco, Elisabetta Brun, Maria Simoncini, Chiara Alberta Mesturino, Francesco Zen—Vicenza; Mauro Giovanni Schiesaro, Giovanni Vita, Beatrice Cenci, Vania ampostrini, Ilaria Basso, Augusta Turrini—Villafranca Veronese (VR); Paola Pisanu—Villasimius (CA); Ida Mangone, Enrico Cazzaniga, Giovanni Sifarelli—Vimercate (MB); Claudio Grande, Claudia Arnaldi, Paolo Fiorentini, Enrico Capotorti, Angela Del Prete—Viterbo; Umberto Iannaccone, Mauro Ragonese, Caterina Scoponi, Laura Tilaro, Silvia Pelliccioni, Rossana Slongo, Emanuela Vita—Viterbo; Arcangela Garofalo, Filippo Vitale, Giuseppina Saggio, Biagia Campanella—Vittoria (RG); Andrea Del Buono, Tommasina Sorrentino, Teresa Borrelli, Mariarosaria Matrecano—Volla (NA); Aldo Giuseppe Morea, Lucia Bondesan, Sandro Perbellini—Zevio (VR).

References

1. Wild S, Roglic G, Green A, Sicree R, King H (2004) Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Diabetes Care 27:1047–1053

2. King H, Aubert RE, Herman WH (1998) Global burden of diabetes, 1995–2025: prevalence, numerical estimates, and projections. Diabetes Care 21:1414–1431

3. Narayan KM, Gregg EW, Fagot-Campagna A, Engelgau MM, Vinicor F (2000) Diabetes—a common, growing, serious, costly, and potentially preventable public health problem. Diabetes Res Clin Pract 50(Suppl 2):S77–S84

4. Shaw JE, Sicree RA, Zimmet PZ (2010) Global estimates of the prevalence of diabetes for 2010 and 2030. Diabetes Res Clin Pract 87:4–14

5. Zimmet P, Alberti KG, Shaw J (2001) Global and societal implications of the diabetes epidemic. Nature 414:782–787

6. Fagot-Campagna A, Bourdel-Marchasson I, Simon D (2005) Burden of diabetes in an aging population: prevalence, incidence, mortality, characteristics and quality of care. Diabetes Metab 2:5S35–5S52

7. International Diabetes Federation (2013) IDF Diabetes Atlas, 6th edn. International Diabetes Federation, Brussels. http://www.idf.org/diabetesatlas

8. Holman RR, Paul SK, Bethel MA, Matthews DR, Neil HA (2008) 10-year follow-up of intensive glucose control in type 2 diabetes. N Engl J Med 359:1577–1589

9. Peyrot M, Rubin RR, Lauritzen T, Snoek FJ, Matthews DR, Skovlund SE (2005) Psychosocial problems and barriers to improved diabetes management: results of the Cross-National Diabetes Attitudes, Wishes and Needs (DAWN) Study. Diabet Med 22:1379–1385

10. Huang ES, Basu A, O'Grady M, Capretta JC (2009) Projecting the future diabetes population size and related costs for the US. Diabetes Care 32:2225–2229

11. American Diabetes Association (2013) Economic costs of diabetes in the U.S. In 2012. Diabetes Care 36:1033–1046

12. Giorda CB, Manicardi V, Diago Cabezudo J (2011) The impact of diabetes mellitus on healthcare costs in Italy. Expert Rev Pharmacoecon Outcomes Res 11:709–719

13. Jönsson B, CODE-2 Advisory Board (2002) Revealing the cost of Type II diabetes in Europe. Diabetologia 45:S5–S12

14. American Diabetes Association (2013) Standards of medical care in diabetes—2013. Diabetes Care 36(Suppl 1):S11–S66

15. Beaton SJ, Nag SS, Gunter MJ, Gleeson JM, Sajjan SS, Alexander CM (2004) Adequacy of glycemic, lipid, and blood pressure management for patients with diabetes in a managed care setting. Diabetes Care 27:694–698

16. Mangione CM, Gerzoff RB, Williamson DF, Steers WN, Kerr EA, for TRIAD Study Group et al (2006) The association between quality of care and the intensity of diabetes disease management programs. Ann Intern Med 145:107–116

17. De Berardis G, Pellegrini F, Franciosi M, Belfiglio M, Di Nardo B, Greenfield S, for the QuED Study et al (2004) Quality of care and outcomes in type 2 diabetic patients: a comparison between general practice and diabetes clinics. Diabetes Care 27:398–406

18. Fleming BB, Greenfield S, Engelgau MM, Pogach LM, Clauser SB, Parrott MA (2001) The Diabetes Quality Improvement Project: moving science into health policy to gain an edge on the diabetes epidemic. Diabetes Care 24:1815–1820

19. Nicolucci A, Greenfield S, Mattke S (2006) Selecting indicators for the quality of diabetes care at the health systems level in OECD countries. Int J Qual Health Care 18(Suppl 1):26–30

20. Ekström N, Miftaraj M, Svensson AM, Andersson Sundell K, Cederholm J, Zethelius B et al (2012) Glucose-lowering treatment and clinical results in 163121 patients with type 2 diabetes: an observational study from the Swedish national diabetes register. Diabetes Obes Metab 14:717–726

21. Vinagre I, Mata-Cases M, Hermosilla E, Morros R, Fina F, Rosell M et al (2012) Control of glycemia and cardiovascular risk factors in patients with type 2 diabetes in primary care in Catalonia (Spain). Diabetes Care 35:774–779

22. Guthrie B, Emslie-Smith A, Morris AD (2009) Which people with Type 2 diabetes achieve good control of intermediate outcomes? Population database study in a UK region. Diabet Med 26:1269–1276

23. Ali MK, Bullard KM, Saaddine JB, Cowie CC, Imperatore G, Gregg EW (2013) Achievement of goals in U.S. diabetes care, 1999–2010. N Engl J Med 368:1613–1624

24. Club Diabete Sicili@ (2008) Five-year impact of a continuous quality improvement effort implemented by a network of diabetes outpatient clinics. Diabetes Care 31:57–62

25. Rossi MC, Nicolucci A, Arcangeli A, Cimino A, De Bigontina G, Giorda C, For the Associazione Medici Diabetologi Annals Study Group et al (2008) Baseline quality-of-care data from a quality-

improvement program implemented by a network of diabetes outpatient clinics. Diabetes Care 31:2166–2168

26. Nicolucci A, Rossi MC, Arcangeli A, Cimino A, de Bigontina G, Fava D, For AMD-Annals Study Group et al (2010) Four-year impact of a continuous quality improvement effort implemented by a network of diabetes outpatient clinics: the AMD-Annals initiative. Diabet Med 27:1041–1048

27. Giorda CB, Mulas MF, Manicardi V, Suraci C, Guida P, Marafetti L, Nada E, Gentile S (2013) Factors associated with a rapid normalization of HbA1c in newly diagnosed type 2 diabetes patients seen in a specialist setting. Acta Diabetol 50:81–87

28. Suraci C, Mulas F, Rossi MC, Gentile S, Giorda CB (2012) Management of newly diagnosed patients with type 2 diabetes: what are the attitudes of physicians? A SUBITO!AMD survey on the early diabetes treatment in Italy. Acta Diabetol 49:429–433

29. Annals AMD (Associazione Medici Diabetologi). http://www.infodiabetes.it/pages/annali_amd/

30. Earley A, Miskulin D, Lamb EJ, Levey AS, Uhlig K (2012) Estimating equations for glomerular filtration rate in the era of creatinine standardization: a systematic review. Ann Intern Med 156:785–795

31. O'Connor PJ, Bodkin NL, Fradkin J, Glasgow RE, Greenfield S, Gregg E et al (2011) Diabetes performance measures: current status and future directions. Diabetes Care 34:1651–1659

32. EUCID-Health & Consumer Protection Directorate-General. Final report European Core Indicators in Diabetes project. http://ec.europa.eu/health/ph_projects/2005/action1/docs/action1_2005_frep_11_en.pdf

33. De Berardis G, Pellegrini F, Franciosi M, Belfiglio M, Di Nardo B, Greenfield S, For the QuED (Quality of Care and Outcomes in Type 2 Diabetes) Study Group et al (2008) Quality of diabetes care predicts the development of cardiovascular events: results of the QuED study. Nutr Metab Cardiovasc Dis 18:57–65

34. Rossi MC, Lucisano G, Comaschi M, Coscelli C, Cucinotta D, Di Blasi P, For the AMD-QUASAR Study Group et al (2011) Quality of diabetes care predicts the development of cardiovascular events: results of the AMD-QUASAR study. Diabetes Care 34:347–352

35. Giorda CB, Nicolucci A, Pellegrini F, Kristiansen CK, Hunt B, Valentine WJ et al (2014) Improving quality of care in people with type 2 diabetes through the Associazione Medici Diabetologi-annals initiative: a long-term cost-effectiveness analysis. Diabet Med 31:615–623