

# Database Supported Long-term Management of Chronic Diseases – Data from the German Disease Management Programmes as a Source for Continuing Medical Education

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## ABSTRACT

Disease Management Programmes (DMPs) have been introduced by German Federal Government in 2002 to improve long-term care for patients with specific chronic diseases. Digitisation has been a requirement to reliably document patient data in DMPs. This report presents data from six DMPs in the German federal state of North Rhine-Westphalia. It demonstrates that high level long-term quality of care can be achieved and maintained. But beyond clinical purposes DMP data are also an invaluable source to supply content in CME.

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## KEYWORDS

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## Background

DMPs have been introduced by German Federal Government in 2002. They are based on concepts implemented in the US healthcare system. Their primary object is to improve the quality of care. DMPs are implemented to reduce oversupply, undersupply, and inappropriate care by means of a comprehensive, structured concept of long-term care of patients suffering from chronic diseases. Central to this concept is the development of so-called quality indicators, which are based on the corresponding clinical care guidelines. Another DMP core component is the continuous feedback on attainment rates for quality indicators calculated and issued for each practice participating in the DMPs. This has been achieved by feedback reports that are provided on a regular basis, and do not only show overall results for the region but also for the individual practice. Participation in the DMPs is voluntary for patients and practices. However, DMP examinations carried out are remunerated separately for the practices, and the health insurance companies receive an additional annual DMP lump sum for their DMP patients from the state health fund. In every DMP, patients have to meet a set of inclusion criteria to ensure that patients with a valid diagnosis only will be included. The DMPs are governed by the Federal Joint Committee (Gemeinsamer Bundesausschuss), which is made up of representatives from the medical profession, statutory health insurances and patients (for further details please refer to 1).

## DMPs: From 2010 to 2020

All data presented below have been collected in the federal state of North Rhine-Westphalia (NRW), which is the most populous German federal state (17.9 million inhabitants). The state area covers two subregions (North Rhine and Westphalia-Lippe), for which the data sets recorded are the same, but feedback reports show slight differences. In relation to nationwide documentation of DMP data, it can be assumed that at least with regard to the DMP diabetes type 2 data from NRW represent a dataset of approximately 25% of all DMP data from Germany.

Data will be reported for the six currently active DMPs (type 2, and type 1 diabetes, coronary artery disease, bronchial asthma, chronic obstructive pulmonary disease, and breast cancer).

### (A) Administrative issues

On average physicians participating in all five DMPs related to internal medicine treat 122 DMP patients per quarter of the year (Central Institute, unpublished data). This represents about 15% of all patients seen by a physician per quarter [1]. DMP documentation cumulatively amounts to 131 parameters for all five DMPs per quarter [2].

In the predigital era about 16–27% of all documentation forms were incorrectly filled, either incomplete or lacking plausibility, e.g. mentioning antidiabetic treatment without indicating an antidiabetic drug [3].

This changed when in 2008 electronic documentation became mandatory. Current rates of correctly filled documentation forms lie in the range of 98–99% with little change in the last 10 years (Table 1).

### (B) Patient numbers

A total of almost 1.7 million patients have been included in any DMP in NRW in 2020, of whom 97% already have a follow-up documentation. In the largest DMP for type 2 diabetes, the number of patients increased to almost 1 million between 2010 and 2020. This corresponds to an increase of 24%. The number of patients in the DMPs bronchial asthma and COPD also increased to a similar percentage. Only in the two DMPs, CAD and breast cancer, the increase has been somewhat less. The relatively largest increase in number of patients has been found in the DMP diabetes type 1 (Table 2).

### (C) Number of physicians participating in any of the DMPs

Overall, the total number of physicians participating in any DMP increased by 2.5% to slightly more than 12,000 between 2010 and 2020. However, there has been considerable variation between DMPs (Table 3).

### (D) Change in numbers of office visits

Between 2010 and 2020, total number of office visits documented in any DMP increased from about 5.3–6.3 million per year (Table 4). Since participation in a DMP includes a mandatory office visit once per quarter, total number of office visits roughly equals 4

times the number of DMP patients. Overall, increases in numbers of patients' visits have been proportional to the increase in numbers of patients included in the DMPs.

### (E) Change in attainment rates for selected quality goals of the DMP type 2 diabetes and CAD

Due to the large number of quality goals, contractually stipulated for all six DMPs, only a selection from two of the largest DMPs is presented below. A complete overview can be found in an interactive presentation at

[www.zi-dmp.de/dmp-atlas\\_nrw/](http://www.zi-dmp.de/dmp-atlas_nrw/) (in German only)

Since the Federal Joint Committee has frequently changed the definition of many of the quality indicators over the years, this interferes with longitudinal analysis of quality indicators. Thus, only those quality indicators of the respective DMPs have been considered below, which have not changed during the study period. Overall, in both DMPs a slight improvement in attainment rates can be demonstrated between 2010 and 2020 for most of the quality indicators. However, there is substantial variation ranging from +6.4% to –8.8% (Table 5).

## Discussion

Digitisation in health care has started a new era allowing for

- centralised, durable, and, ideally, interoperable documentation and storage of patient data in electronic health records [4–6]

**Table 1.** Percentage of valid DMP documentations.

DMP	2010	2020	Δ 2010/20
Type 2 diabetes	99.5	99.7	0.2
Type 1 diabetes	98.6	99.2	0.6
CAD	99.5	99.7	0.2
Bronchial asthma	99.4	99.7	0.3
COPD	99.5	99.8	0.3
Breast cancer	98.0	99.2	1.2
All	99.1	99.6	0.5

Figures in %; Δ 2010/20: difference 2010 vs. 2020 in %

**Table 2.** Number of DMP patients.

DMP	2010	2020	Δ 2010/20
Type 2 diabetes	803,974	998,063	24.1
Type 1 diabetes	37,159	61,963	66.8
CAD	415,908	453,437	9.0
Bronchial asthma	183,141	229,065	25.1
COPD	172,580	207,819	20.4
Breast cancer	35,001	37,540	7.3
All	1,430,345	1,697,599	18.7
All with FD	1,365,105	1,645,097	20.5

All: patients treated in several DMPs simultaneously are taken into account; FD: follow-up documentation; Δ 2010/20: difference 2010 vs. 2020 in %

**Table 3.** Number of DMP physicians.

DMP	2010	2020	Δ 2010/20
Type 2 diabetes	9,052	9,818	8.5
Type 1 diabetes	1,326	1,452	9.5
CAD	8,831	9,567	8.3
Bronchial asthma	7,598	8,864	16.7
COPD	7,075	8,355	18.1
Breast cancer	1,353	1,089	–19.5
All	11,782	12,081	2.5

All: physicians participating in several DMPs simultaneously are taken into account; Δ 2010/20: difference 2010 vs. 2020 in %

**Table 4.** Number of DMP office visits.

DMP	2010	2020	Δ 2010/20
Type 2 diabetes	2,696,771	3,245,214	20.3
Type 1 diabetes	119,863	196,486	63.9
CAD	1,369,828	1,472,325	7.5
Bronchial asthma	545,148	657,251	20.6
COPD	542,913	642,975	18.4
Breast cancer	64,139	66,008	2.9
Sum	5,338,662	6,280,259	17.6

Documented DMP office visits; Δ 2010/20: difference 2010 vs. 2020 in %

**Table 5.** Attainment rates (%) achieved for selected quality indicators of the DMPs type 2 diabetes and CAD.

Type 2 Diabetes	2010			2020			Δ 2010 vs. 2020
	all	IQR		all	IQR		
		25%	75%		25%	75%	
HbA1c target achieved	56.7	37.5	70.1	61.7	46.8	76.3	5.0
HbA1c ≤ 8,5%	89.7	85.9	93.6	90.4	87.7	94.0	0.7
Prevention of hypoglycaemia	99.6	100.0	100.0	99.6	99.6	100.0	0.0
Prevention of hospital admission	99.7	100.0	100.0	99.8	100.0	100.0	0.1
Blood pressure < 140/90 mmHg	56.1	41.2	65.3	56.8	43.5	66.7	0.7
Diabetes training <sup>1</sup>	52.3	33.3	62.2	53.2	39.5	62.1	0.9
Hypertension training <sup>1</sup>	37.0	0.0	43.0	42.2	14.3	50.0	5.2
Screening for diabetic retinopathy	75.5	60.6	95.5	66.7	48.2	89.9	-8.8
Check of kidney function	94.8	97.4	100.0	89.3	90.6	100.0	-5.5
Prescription of metformin	85.1	78.8	92.9	89.7	85.7	95.4	4.6
Prescription of antiplatelet drug	70.7	59.1	84.8	73.0	63.2	86.5	2.3
CAD							
Blood pressure < 140/90 mmHg	64.8	51.7	75.5	63.1	50.0	74.4	-1.7
Current non-smokers	88.8	84.5	94.4	85.7	81.3	91.7	-3.1
Prescription of antiplatelet drug	82.4	78.6	95.8	83.0	79.2	96.4	0.6
Prescription of a beta blocker	78.6	72.9	89.4	77.9	72.9	86.2	-0.7
Prescription of a statin	71.3	64.8	88.5	77.3	72.0	91.8	6.0
Hypertension training <sup>1</sup>	40.2	0.0	48.6	43.9	0.0	50.0	3.7
Diabetes training <sup>1</sup>	41.7	0.0	50.0	48.1	0.0	66.7	6.4
Asymptomatic with regard to angina pectoris <sup>2</sup>	93.1	93.3	100.0	93.9	94.6	100.0	0.8

1: Training recommended to patient carried out within twelve months, optional indicator in NRW; 2: Indicator exists since 2015; IQR: interquartile range of practices which take care of ≥ 10 patients in at least one of both DMPs (please note: This means that the 25% limit value can be higher than the group total)

- continuous monitoring of individual patients' physiologic data, e.g. by wearable sensors [7]
- support of care by digital devices like apps [8] or other information services [9]
- big data to feed artificial intelligence [10] etc.

Last but not least regulators hope that digitisation will help to save costs in the health-care sector [11].

Although in general digitisation in Germany lags behind what other nations have already achieved [12–14], the DMPs demonstrate the potential of digitisation to facilitate not only documentation but also long-term management of chronic diseases.

This includes CME organised as a closed loop, perpetuum mobile like model. In this system needs are defined by gaps in diagnosis or treatment, as documented in the DMP database. Content may then be tailored to these needs, and outcomes can be monitored by DMP documentation, etc [16].

Thus, physicians have not only been informed about treatment results in their patients by regular feedback reports, but DMP data have also been presented in regional CME conferences (e.g. 16).

Furthermore, DMP data have also yielded insights relevant to methodology used for needs assessment in CME [15,17].

The following limitations must be taken into account:

- The patients' role needs to be defined in this system of regular feedback, beyond giving informed consent at the time of inscription [18].

- DMPs have not only to serve medical and/or scientific interests, but have primarily been designed for administrative purposes. This has led to numerous changes in definitions of e.g. quality goals making long-term analysis difficult.
- To develop the full beneficial effect of digitisation, ideally, the entire workflow needs to be digitised, what is currently not the case in ambulatory health care in Germany [19].
- In general, the value of databases of this type critically depends on the validity of the diagnostic procedures leading to inclusion of patients [20].
- The data presented here relate to only one federal state in Germany and may thus not be representative for Germany as a whole.
- Although the DMPs themselves may be considered as an intervention [15] DMP data should be considered as essentially observational.

In conclusion, DMP data demonstrate that high level long-term management of chronic diseases can be achieved and maintained. Though digitisation is a mandatory prerequisite to set up a DMP substantial human and financial resources are still needed to keep the system running. Beyond administrative purposes DMP data are an invaluable source for "closed loop" CME activities, designed to ultimately improve community health [21].

## Disclosure Statement

No potential conflict of interest was reported by the author(s).

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