The relationship between patient perception of healthcare provision by professionals and the self-care activity of patients with diabetes: Japanese subgroup analysis of the second Diabetes Attitudes, Wishes, and Needs (DAWN2) study

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Abstract Data for a subgroup of Japanese diabetes patients from the second Diabetes Attitudes, Wishes, and Needs (DAWN2) study were analyzed to investigate possible relationships between patient-perceived healthcare provision by healthcare professionals, patient self-care, and glycemic control, by focusing on the patient's perception. Patients answered a questionnaire that was originally developed and validated for the DAWN2 study. Questions on their perception of healthcare provision, duration of self-care activity during the past 7 days, and their last HbA_{1c} level were analyzed. Self-care activity for more than 5 days was regarded as good adherence. This analysis included 508 patients (81 type 1 and 427 type 2). Of the self-care activity, “taking physical activity” for both types of diabetes and “checking feet” for type 2 patients were implemented for longer among patients with the perception of equivalent care provision than among those without. Patients with perception of “examining feet” as healthcare provision also reported longer implementation of “following healthy diet”, “taking physical activity”, “testing blood sugar”, and “taking diabetes medications exactly” than those who did not; however, this trend was not observed for “testing blood sugar” among type 1 patients. HbA_{1c} level was significantly lower among type 2 patients with good adherence to “following healthy diet” and “taking physical activity”. Association may exist between patients' perceptions of diabetes care and improvement in

self-care activity, and between more engagement in self-care activity and better HbA_{1c} achievement as a treatment outcome. For better management, it is essential for healthcare professionals to provide care that patients can perceive.

Keywords Adherence · Diabetes mellitus · Healthcare professionals · Patient perception · Self-care

Introduction

In the management of diabetes mellitus, optimum glycemic control is essential for preventing long-term diabetic complications [1, 2]. In reality, however, this objective is elusive. Approximately 40–50 % of patients with diabetes fall short of the target glycemic level of HbA_{1c} <7.0 % [3, 4], despite the variety of effective treatments available. On the basis of studies reporting the association of glycemic control with treatment adherence [5], one possible reason may be that many patients find it difficult to adhere to the recommendations of their physician and other healthcare professionals [6–8]. With such patients left facing this seemingly devastating obstacle to optimum self-management, physicians' prescription of medication or diabetes care provision by healthcare professionals alone may not be sufficient. Effort should also be made to help such patients overcome the obstacles hampering their engagement with the correct self-care attitude for achieving optimum glycemic control.

When communicating with patients, however, there is a gap to be overcome between patients and their healthcare professionals. A variety of patient–healthcare professional gaps have been reported [9]. A gap may exist between actual care provision by the healthcare professionals and a

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patient's perception of the care provided, i.e., even though a healthcare professional actually provides healthcare services, their patient may be unaware of them. To overcome this type of patient–practitioner gap, understanding the patient's perception of the care provided is important. It is also necessary to reveal the relationships between the patient's perception of healthcare provision, self-management, and glycemic control; however, little is known about these relationships.

To examine perceptions of diabetes care among patients, their family members, and healthcare professionals, and the value of a patient-centered model of care and support for patients with diabetes, a cross-sectional survey, the second Diabetes Attitudes, Wishes, and Needs (DAWN2) study, was conducted in 2012 on more than 15,000 healthcare professionals, patients, and their family members in 17 countries including Japan [10–13]. The purpose of the DAWN2 study was to:

1. improve understanding of the unmet needs of patients with diabetes and their care-givers;
2. facilitate dialogue and collaboration among important interested parties to strengthen patient involvement and improve self-management; and
3. establish a cross-culturally validated multi-national survey enabling assessment and grading psychosocial and educational aspects of diabetes care delivery [10].

In this paper we report the analysis of a subgroup of Japanese patients with diabetes in the DAWN2 study. The analysis focuses on the perceptions of patients with diabetes, to enable us to evaluate the relationships between patient-perceived healthcare provision by their healthcare professionals, adherence to self-care, and glycemic control.

Materials and methods

Study design and survey process

DAWN2 was a multinational, interdisciplinary, and multi-stakeholder study conducted in 17 countries: Algeria, Canada, China, Denmark, France, Germany, India, Italy, Japan, Mexico, the Netherlands, Poland, Russian Federation, Spain, Turkey, the UK, and the USA. A total of 9040 patients with diabetes were included in the DAWN2 study.

The detailed design and survey process of the DAWN2 study have been reported elsewhere [10]. Briefly, adult patients (≥ 18 years) with type 1 or type 2 diabetes (diagnosed at least 12 months previously) were recruited [11]. The patients answered a questionnaire originally developed and validated for the DAWN2 study by the Global DAWN2 Survey Working Group.

This study was conducted in accordance with relevant ethical requirements, in accordance with regional and/or national and/or local guidelines relating to the conduct of non-interventional studies [10].

Questions analyzed

Questions about patient-perceived healthcare provision, self-care activity, and the last HbA_{1c} value were analyzed in this study (Table 1).

Questions about patient-perceived healthcare provision encompassed the following healthcare, if any, a patient might have recognized during the past 12 months: “measuring HbA_{1c} level”, “measuring blood pressure”, “measuring lipid profile/cholesterol”, “measuring weight”, “examining feet”, “asking if anxious or depressed”, “asking about the diet”, and “asking about physical activity”.

Level of self-care was measured by use of six questions from the Summary of Diabetes Self-care activity [14]. Patients were asked about the following self-care activity during the past 7 days: “following healthy diet”, “taking physical activity”, “testing blood sugar”, “testing blood sugar the number of times recommended by healthcare professional”, “checking feet”, and if applicable, (f) “taking diabetes medications exactly”. Patients answered this question by specifying the duration (0–7 days) for which they performed each activity. “Following healthy diet” was defined as following a healthy eating plan (e.g., not eating too much and limiting your intake of foods high in fat or sugar). “Taking physical activity” was defined as participating in at least 30 min of physical activity. The question “testing blood sugar the number of times recommended by healthcare professional” was not used for this analysis because it was similar to the question “testing blood sugar”. The item “testing blood sugar” was analyzed solely for patients with insulin therapy.

Patients also reported their last HbA_{1c} level, i.e. their average blood sugar level over the previous several months.

Statistical analysis

All data were summarized and compared for type of diabetes: type 1 and type 2 (referred to as type 1 and 2 patients, respectively). Patient-perceived healthcare provision was described as the proportion of the patients who perceived that healthcare was provided by healthcare professionals. Level of self-care was summarized descriptively as the proportion of patients with good adherence, defined as patient-reported self-care activity implementation for more than 5 days.

Table 1 Questions analyzed in this study**Question****Self-care activity**

The questions below ask you about your diabetes self-care activity during the past 7 days.

If you were sick during the past 7 days, please think back to the last 7 days that you were not sick.

On how many of the last 7 days...

1. Have you followed a healthy eating plan (e.g., not eating too much and limiting your intake of foods high in fat or sugar)?
2. Did you participate in at least 30 min of physical activity?
3. Did you test your blood sugar?
4. Did you test your blood sugar the number of times recommended by your healthcare provider?
5. Did you check your feet?
6. Did you take all your diabetes medications exactly as agreed with your healthcare professional?^a

Perception of healthcare provision

During the past 12 months, did anyone from your healthcare team do the following? Please select all that apply.

1. Measure your long-term blood sugar control level (this is a measure of your average blood sugar level over the past several months, and is also known as A1c)
2. Measure your blood pressure
3. Measure your lipid profile/cholesterol
4. Measure your weight
5. Examine your feet
6. Ask if you have been anxious or depressed
7. Ask about the types of foods you have been eating
8. Ask about the amount of physical activity you have been getting
9. None of these

Glycemic level

What was your last A1c value (this is a measure of your average blood sugar level over the past several months)?

^a Only those who used diabetic medications were asked this question

In an investigation of relationships between patient-perceived healthcare provision, self-care, and glycemic control, the duration for which patients implemented the self-care activity was first calculated and compared between patients stratified by perception of the corresponding care: with and without perception, by use of the Mann–Whitney *U* test. Second, HbA_{1c} level was calculated and compared between patients stratified by self-care level: good and poor adherence, by use of Student's *t* test.

All tests were two-tailed and statistical significance was set at 5 %. SAS System software (version 9.3 SAS Institute, Cary, NC, USA) was used.

Results

Demographic and clinical characteristics are presented on the basis of diabetes type in Table 2. Of the 508 patients included, 81 (15.9 %) had type 1 diabetes mellitus. Males constituted 42.0 % of type 1 patients and 68.9 % of type 2 patients. Mean BMI was more than 25 kg/m² for type 2 diabetes mellitus patients. The duration of type 1 diabetes

mellitus was twice as long as that of type 2 diabetes. HbA_{1c} level was similar for the two groups, and relatively low.

Patient-perceived healthcare provision

Table 3 shows patient-perceived healthcare provision. More than 65 % of patients perceived the healthcare provisions “measuring HbA_{1c} level”, “measuring blood pressure”, “measuring lipid profile/cholesterol” and “measuring weight”. In contrast, “asking if anxious or depressed”, “asking about the diet”, and “asking about physical activity” were perceived by fewer than 35 % of patients.

Self-care activity level

The self-care activity implemented for the longest duration was “taking diabetes medications exactly” (mean ± SD: 6.5 ± 1.4 and 6.0 ± 2.2 days for type 1 and 2 patients, respectively) (Table 4). The proportion of patients with good adherence to this self-care activity was also largest among the self-care activity for both types of diabetes (90.1

Table 2 Demographics and characteristics of the patients included

	Type 1 (<i>n</i> = 81)	Type 2 (<i>n</i> = 427)	Overall (<i>n</i> = 508)
Age (years)	42.0 ± 9.4	56.3 ± 10.9	54.0 ± 11.9
Sex (<i>n</i> , %)			
Male	34 (42.0)	294 (68.9)	328 (64.6)
Female	47 (58.0)	133 (31.1)	180 (35.4)
BMI (kg/m ²)	22.5 ± 3.2	25.3 ± 6.2	24.8 ± 5.9
Duration of diabetes (years)	22.7 ± 10.4	10.5 ± 8.3	12.4 ± 9.7
HbA _{1c} (%)	6.8 ± 1.2	6.8 ± 1.4	6.8 ± 1.3
Current treatment (<i>n</i> , %)			
Diet and exercise only	–	72 (16.9)	72 (16.9)
Oral medication without insulin	–	178 (41.2)	178 (41.2)
Insulin with or without other medication	81 (100)	148 (34.7)	229 (45.1)
Other	–	29 (6.8)	29 (6.8)

Mean ± SD or *n* (%) are shown

Table 3 Healthcare provision perceived during the previous 12 months

Item	Type 1 (<i>n</i> = 81)	Type 2 (<i>n</i> = 427)	Overall (<i>n</i> = 508)
Measuring HbA _{1c} level	80 (98.8)	384 (89.9)	464 (91.3)
Measuring blood pressure	75 (92.6)	373 (87.4)	448 (88.2)
Measuring lipid profile/cholesterol	55 (67.9)	312 (73.1)	367 (72.2)
Measuring weight	67 (82.7)	298 (69.8)	365 (71.9)
Examining feet	11 (13.6)	69 (16.2)	80 (15.8)
Asking if anxious or depressed	13 (16.1)	49 (11.5)	62 (12.2)
Asking about the diet	14 (17.3)	130 (30.4)	144 (28.4)
Asking about physical activity	19 (23.5)	145 (34.0)	164 (32.3)

n (%) is shown

and 65.6 % for type 1 and 2 patients, respectively). The activity with the shortest duration and lowest adherence was “checking feet”.

“Following healthy diet” was implemented by 54.3 % of type 1 patients and 49.2 % of type 2 patients with good adherence for 4.5 ± 2.5 and 4.0 ± 2.6 days, respectively. The largest difference by diabetes type was found for “testing blood sugar” (duration (mean ± SD): 5.4 ± 2.5 vs. 5.0 ± 2.7 days; proportion of patients with good adherence: 72.8 vs. 65.5 % for type 1 vs. 2 patients, respectively). “Taking physical activity” and “checking feet” were performed more by type 2 than type 1 patients (“taking physical activity” for 2.7 ± 2.5 vs. 3.1 ± 2.7 days with 24.7 and 33.5 % good adherence; “checking feet” for 1.5 ± 2.3 vs. 1.4 ± 2.5 days with 12.4 vs. 16.2 % good adherence for type 1 vs. 2 patients, respectively).

Relationships between patient-perceived healthcare provision and level of self-care

Table 5 shows the duration (number of days in the last week) of self-care activity by patients with and without perception of the corresponding healthcare provision.

Duration of “checking feet” was significantly longer among type 2 patients who perceived “examining feet” as a healthcare provision than among those who did not (2.1 ± 2.9 vs. 1.3 ± 2.4 days (mean ± SD) for those with and without the perception, respectively; *P* = 0.0016). For “following healthy diet”, the duration did not differ by perception of “asking about the diet” for either diabetes type (*P* = 0.3816 and 0.1592 for type 1 and 2 patients, respectively). The duration of “taking physical activity” was longer for both type 1 and type 2 diabetes patients with the perception of “asking about physical activity” than for those without this perception (type 1 patients 3.8 ± 2.9 vs. 2.3 ± 2.3; type 2 patients 4.2 ± 2.5 vs. 2.6 ± 2.6 days for those with and without the perception, respectively), with a significant difference for the type 2 patients (*P* < 0.0001).

The duration of “following healthy diet”, “taking physical activity”, “testing blood sugar”, and “taking diabetes medications exactly” was further calculated for patients with and without the perception of “examining feet” as a healthcare provision (Table 6). For type 2 patients, the duration of each of these activities was longer among those with the perception, with significant differences for “following a healthy diet” and “testing blood

Table 4 Diabetes self-care activity: duration (days) of self-care activity implementation during the previous 7 days, and proportion of good adherence

Item	Type 1 (<i>n</i> = 81)		Type 2 (<i>n</i> = 427)		Overall (<i>n</i> = 508)	
	Days (mean ± SD)	Good adherence ^a <i>n</i> (%)	Days (mean ± SD)	Good adherence ^a <i>n</i> (%)	Days (mean ± SD)	Good adherence ^a <i>n</i> (%)
Following healthy diet ^b	4.5 ± 2.5	44 (54.3)	4.0 ± 2.6	210 (49.2)	4.1 ± 2.6	254 (50.0)
Taking physical activity ^c	2.7 ± 2.5	20 (24.7)	3.1 ± 2.7	143 (33.5)	3.1 ± 2.6	163 (32.1)
Testing blood sugar ^d	5.4 ± 2.5	59 (72.8)	5.0 ± 2.7 ^e	97 (65.5)	5.2 ± 2.6 ^f	156 (68.1)
Checking feet	1.5 ± 2.3	10 (12.4)	1.4 ± 2.5	69 (16.2)	1.4 ± 2.5	79 (15.6)
Taking diabetes medications exactly	6.5 ± 1.4	73 (90.1)	6.0 ± 2.2 ^g	280 (65.6)	6.1 ± 2.0 ^h	353 (69.5)

SD standard deviation

^a Good adherence was defined as implementation of self-care activity for at least 5 days^b Following healthy diet was defined as following a healthy eating plan (i.e., not eating too much and limiting intake of foods high in fat or sugar)^c Taking physical activity was defined as participating in at least 30 min of physical activity^d “Testing blood sugar” was analyzed solely for patients with insulin therapy^e *n* = 148^f *n* = 229^g *n* = 327^h *n* = 408**Table 5** Days of self-care activity stratified by perception of healthcare provision

Type 1 (<i>n</i> = 81)				Type 2 (<i>n</i> = 427)			Overall (<i>n</i> = 508)		
	<i>n</i>	Days (mean ± SD)	<i>P</i> value	<i>n</i>	Days (mean ± SD)	<i>P</i> value	<i>n</i>	Days (mean ± SD)	<i>P</i> value
Checking feet									
Examining feet									
Yes	11	1.5 ± 2.8	0.5255	69	2.1 ± 2.9	0.0016	80	2.0 ± 2.9	0.0106
No	70	1.5 ± 2.2		358	1.3 ± 2.4		428	1.3 ± 2.4	
Following healthy diet									
Asking about the diet									
Yes	14	4.0 ± 2.5	0.3816	130	4.4 ± 2.5	0.1592	144	4.3 ± 2.5	0.3707
No	67	4.6 ± 2.5		297	3.9 ± 2.7		364	4.0 ± 2.7	
Taking physical activity									
Asking about physical activity									
Yes	19	3.8 ± 2.9	0.0820	145	4.2 ± 2.5	<0.0001	164	4.2 ± 2.5	<0.0001
No	62	2.3 ± 2.3		282	2.6 ± 2.6		344	2.5 ± 2.5	

P values were calculated by use of the Mann–Whitney *U* test

SD standard deviation

sugar”. Except for “testing blood sugar”, duration was longer for type 1 patients with the perception than for those without.

Relationships between self-care level and glycemic control

Figure 1 shows the HbA_{1c} level as a function of adherence to self-care activity. For patients with good adherence to

“following healthy diet” and “taking physical activity”, HbA_{1c} level tended to be lower, with significant differences for the type 2 patients.

HbA_{1c} level was slightly lower for those with good adherence to “testing blood sugar” and “taking diabetes medications exactly” among the type 1 patients. Among the type 2 patients HbA_{1c} level was significantly higher for those with good adherence to both activities. An opposite trend of HbA_{1c} level was observed for type 1 and 2 patients

Table 6 Mean duration (days) of self-management activity by those with the perception of “examining feet” as a healthcare provision

Self-management activity	Foot examination (PWD perception)	Type 1 (<i>n</i> = 81)	<i>P</i> value	Type 2 (<i>n</i> = 427)	<i>P</i> value	Overall (<i>n</i> = 508)	<i>P</i> value
Following healthy diet	Yes	11 5.2 ± 2.4	0.3103	69 5.2 ± 2.3	<0.0001	80 5.2 ± 2.3	<0.0001
	No	70 4.4 ± 2.5		358 3.8 ± 2.7		428 3.9 ± 2.6	
Taking physical activity	Yes	11 3.5 ± 2.8	0.2164	69 3.4 ± 2.9	0.4185	80 3.4 ± 2.9	0.2162
	No	70 2.5 ± 2.5		358 3.1 ± 2.6		428 3.0 ± 2.6	
Testing blood sugar	Yes	11 4.5 ± 3.2	0.1835	69 3.0 ± 3.3	0.0057	80 3.2 ± 3.3	0.0787
	No	70 5.5 ± 2.4		358 1.9 ± 2.8		428 2.5 ± 3.0	
Taking diabetes medications exactly	Yes	11 6.9 ± 0.3	0.3056	63 ^a 6.4 ± 1.7	0.0845	74 ^b 6.5 ± 1.6	0.0677
	No	70 6.5 ± 1.4		264 ^a 5.9 ± 2.2		334 ^b 6.0 ± 2.1	

PWD people with diabetes

n and mean ± SD are shown. *P* values were calculated using the *t* test

^a *n* = 327

^b *n* = 408

Fig. 1 Mean HbA_{1c} as a function of adherence to self-care activity. **a** Good adherence was defined as implementation of self-care activity for at least 5 days. **P* < 0.05 (Student's *t* test)

with good adherence to “checking feet”, although the difference was not significant for either type of diabetes.

Discussion

In this study we investigated the relationships between patient-perceived healthcare provision by their healthcare professionals, patient self-care, and glycemic control. An important aspect of this study was the focus on patient perception rather than on actual provision of care. Understanding the perception of care may lead to empowering of patients to adhere to diligent self-care and to lead them to successful diabetes management.

Data for the subgroup of Japanese patients with diabetes in the DAWN2 study suggested that the care provided to

them might be rather focused on an objective biomedical approach, irrespective of the care the healthcare professionals actually provided. The national ranking of the 17 participating countries in the DAWN2 study highlighted this trend in Japan, which ranked highest for measurement of HbA_{1c} level, but lowest for examining feet, asking if anxious or depressed, and asking about the diet [11]. Because the self-management of diabetes requires daunting effort and substantial changes to the patient's daily life, it is important and beneficial to ask patients about their success in pursuing their treatment objective, or problems in maintaining self-care activity, or any problems encountered in everyday life [15]. In the clinic, strict time constraints may prevent physicians from addressing emotional problems, which are regarded as likely to prolong visit time. However, studies reported that better patient–physician

communication [16] or empathetic attitudes [17, 18] may help patients improve different outcomes, including adherence to self-management and clinical outcomes, and even shorten visit time [19]. Thus, healthcare professionals should be encouraged to address patient's emotional concerns during the visit.

In our study, a largest proportion of patients (approx. 70 %) strongly adhered to taking diabetes medications exactly as discussed with healthcare professionals. In comparison of the results of self-care activity by diabetes type, adherence to healthy diet, glycemic level testing, and medication prescription was notably higher for the type 1 patients. This is possibly owing to their history of diabetes from childhood and/or young adulthood, which may contribute to their recognition of the need to manage and treat their disease, and to increase the likelihood of incorporating these activities into their daily lives.

The activity with the lowest adherence was “checking feet”, which may reflect the overall low perception of this procedure as treatment by healthcare professionals. Nevertheless, type 2 patients adherence to checking their feet as a self-care activity was higher when they perceived healthcare professionals as providing this service. Our results have shown that improving patients' perceptions of examining their feet as treatment might lead to their changing their behavior on foot care.

The perception of examining feet as healthcare treatment also favorably affected type 2 patients self-care activity. A foot examination generally accompanies a variety of procedures, and inevitably requires a specific amount of time. Longer consultation is reported to be positively associated with patient satisfaction and enablement [20]. Moreover, palpation facilitates a level of intimacy that encourages the development of the complex patient–practitioner relationship [21]. These may have led to increased adherence to a variety of self-care activity. The results of this study suggest that providing patients with adequate care, so patients feel they are being cared for, may be beneficial in motivating patients to adhere to self-care activity. Even though the length of foot examinations may conflict with the limited time of healthcare professionals, examining patients' feet may promote self-caring attitudes. Because successful diabetes management depends on the patients themselves, this more attentive approach may be of importance.

In investigation of the relationship between the patient's perception of healthcare provision other than examining feet (e.g. asking about the diet and physical activity) and adherence to self-care activity (e.g. following healthy diet, taking physical activity), patients with type 2 diabetes tended to be more adherent to these activities when they perceived provision of equivalent care. Asking about physical activity was found to be possibly associated with

greater adherence to the equivalent self-care activity for both disease types. In addition, for both types of diabetes, good adherence to a healthy diet and physical activity is likely to be associated with an improved glycemic level. Considering this link between asking about physical activity and patient adherence to physical activity, simply asking about physical activity may help patients attain better glycemic levels.

However, a relationship between self-care and glycemic control was not observed in this study, and the results were inconsistent with those from previous studies reporting a positive association between self-management and glycemic levels [22]. Also, in this study, HbA_{1c} levels for type 2 patients were significantly higher for those with good adherence to prescription medication for those without good adherence. This is in contrast with the findings of previous studies that high adherence to medication is directly associated with improved biomedical measures [5, 6]. The cross-sectional design of this study leaves the possibility that patients with poor glycemic levels were confronted at their consultations, and this may have compelled them to adhere more strictly to their prescription for improvement. Another possible explanation is that some patients reporting frequent self-care activity in the last 7 days might not be so active, but rather felt coerced into engaging in self-care activity. “Coerced change”, i.e., changes in self-care behavior owing to external pressure, is reported not to last very long [23]. Because the questionnaire used in this study does not provide information about long-term adherence to self-care activity, the self-care implementation of these less active patients may have been sporadic, leading to results inconsistent within this study or with those from previous studies.

Interpretation of these results requires consideration on some points. First, this study evaluated the patients' perception of healthcare provision, and not actual provision, thus our study could not differentiate whether patients' low perception of some items reflect health practitioners' inertia or patients' misperception of provided care. Second, this study was cross-sectional, and, thus, may not allow inference of causal relationships. For instance, it can not be inferred whether the perception of a particular healthcare provision encouraged patients to engage in self-care activity or engagement in a self-care activity raised awareness of the equivalent care and thus enabled them to perceive the care provision well. Future studies which overcome these limitations are warranted.

Conclusion

We found that patients with diabetes perceived certain types of diabetes care as being provided insufficiently. The findings of this analysis suggest that patients perception of

diabetes care provision was associated with practicing some self-care activities, and patients with good adherence to diet and physical activity were more likely to achieve better HbA_{1c} as a treatment outcome. For better management, it is essential for healthcare professionals to provide care that patients can perceive. Healthcare professionals may be able to help patients achieve successful treatment by giving patients a feeling of being cared for through attentive care provision.

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Human rights This study was conducted in accordance with relevant ethical requirements, following regional and/or national and/or local guidelines relating to the conduct of non-interventional studies. Informed consent was obtained from all patients before inclusion in the study.

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