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Inadequate Health Literacy in Patients with Arterial Vascular Disease

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WHAT THIS PAPER ADDS

Knowledge of the health literacy of the patient population is important in the context of supplying medical information, shared decision making, and improving care and health outcomes. Patients with arterial vascular disease are a large subset of the population visiting the vascular surgeon with specific characteristics that are associated with inadequate health literacy. This is the first large scale cross sectional study providing data about the prevalence of inadequate health literacy in patients with arterial vascular disease.

Objective: The aim was to identify the prevalence of inadequate health literacy in patients with arterial vascular disease. This was a cross sectional study.

Methods: Patients with arterial vascular disease visiting the outpatient clinic between January 5, 2015 and December 28, 2016, were randomly included and screened for inadequate health literacy with the Newest Vital Sign—Dutch (NVS-D), a validated health literacy assessment measure. A score of <4 out of six identified individuals with inadequate health literacy. Age, gender, highest education level, and reason for consultation were also registered. Data analysis was performed using Student's *t*-test or the Mann—Whitney *U* test and chi-square test. Logistic regression with backward elimination was applied to identify independent predictors.

Results: A total of 202 patients were included. The mean NVS-D score was 1.91 (SD ± 1.948, median 1). The prevalence of inadequate health literacy was 76.7%. A significantly higher prevalence of inadequate health literacy was found in patients ≥65 years ($p < .001$) and patients with a lower education level ($p < .001$). No significant difference was found between female/male patients ($p = .056$), nor between participants with peripheral arterial occlusive disease and abdominal aortic aneurysm ($p = .116$). Age (OR 1.060; 95% CI 1.017—1.104; $p = .005$) and education level (OR 0.164; 95% CI 0.078—0.346; $p < .001$) were identified as independent predictors of inadequate health literacy.

Conclusion: This study shows a prevalence of inadequate health literacy of 76.7% in patients with arterial vascular disease, with a significantly higher prevalence in patients ≥ 65 years and patients with a lower education level. The high prevalence of inadequate health literacy should be considered when information is provided, and suggests the need to further investigate the best methods to convey medical information to this group of vulnerable patients.

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INTRODUCTION

Despite modern education, low literacy skills are still a common problem in The Netherlands and other parts of Europe and the United States.[1–3] A recently published international survey, the PIAAC (Program for the International Assessment of Adult Competencies), shows that in The Netherlands 1.3 million adults between 18 and 65 years (approximately 30%) have low literacy skills.[1] The ability to write and read is an important condition for adequate health literacy.[4] Health literacy is defined as the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions. Every medical situation requires several generic or specific skills, so the term health literacy consists of different capabilities, for example reading and numeracy skills.[5]

Knowledge about the health literacy of a patient population is important in the context of providing medical information in a comprehensible way, shared decision making, and increasing patient satisfaction. Moreover, several studies have already shown that inadequate health literacy is consistently associated with poorer health outcomes and poorer use of healthcare services.[6,7] Also, different studies show evidence of the association between low health literacy and adverse clinical events and increased healthcare use in specific patient groups, such as patients

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with chronic kidney disease[8] and coronary artery disease.[9] Furthermore, a current meta-analysis revealed the importance of health literacy and the efficacy of health literacy interventions in adherence to medical treatment in chronic and acute illness.[10] Nevertheless to date, relatively little is known about health literacy among the general population in Europe.

Patients with arterial vascular disease are an important and specific subset of the population visiting the department of vascular surgery. Arterial vascular disease is linked to diabetes mellitus,[11] smoking,[12] ageing,[13] lower socio-economic status and lower education level.[14] Previous studies have shown that inadequate health literacy is associated with these factors as well.[15–18] The relationship between health literacy and ethnic/racial disparities on health outcomes remains rather limited and mixed.[19] The hypothesis is that inadequate health literacy may be a common problem in the group of patients with arterial vascular disease. There is no literature describing the extent of the problem of inadequate health literacy in patients with arterial vascular disease. Understanding this problem and its magnitude could influence the way information is provided. The aim of this study was to identify the prevalence of inadequate health literacy in patients with arterial vascular disease.

METHODS

In this cross sectional study, patients with established peripheral arterial occlusive disease (PAOD) or an abdominal aortic aneurysm (AAA) were included between January 5, 2015 and December 28, 2016. The first cohort included the period between January 5, 2015 and January 16, 2015. In addition, a second cohort with unique patients was included spread over a period between April 21, 2016 and December 30, 2016, in order to create a larger and more representative sample. There was a total of 21 inclusion days in this aforementioned period of time. The researchers scheduled their inclusion dates without of the knowledge of the staff at the outpatient clinic. Moreover, patients were randomly selected by the researchers from a list of names at the outpatient clinic (without access to their medical charts or any other patient information). These precautions were taken in order to create a random sample. There was no formal randomisation.

All patients, both initial consults and follow up contacts, were visiting the outpatient clinic of the department of vascular surgery in a large Dutch teaching hospital. Exclusion criteria were a recent stroke (within 1 year), congenital or traumatic brain damage, and blindness or deafness. People who needed an interpreter to communicate were also excluded. After the appointment with their surgeon, patients were asked to participate in the study.

The diagnosis of arterial vascular disease in patients was established in accordance with the applicable (inter)national guidelines. Peripheral arterial occlusive disease was diagnosed in patients with an abnormal ankle brachial index in rest (<0.9) or a drop of the ankle brachial index of >0.15 during exercise. An abdominal aortic aneurysm was confirmed when there was focal dilatation of the blood vessel that was 50% larger than the normal aortic diameter on computed tomography angiography (CTA) or ultrasound.

The validated Dutch version of the widely used US and UK *Newest* Vital Sign (NVS),[20] the Newest Vital Sign—Dutch (NVS-D), was used as screening instrument. This short questionnaire consisted of six brief questions, which the patient had to answer orally. A score of <4 out of 6 identified individuals with inadequate health literacy, because this cut off point distinguished best between individuals with adequate versus inadequate health literacy.[21] The original (English) version of the Newest Vital Sign is shown in Fig. 1. Age, gender, highest education level, and reason for consultation were also ascertained as background characteristics. Finally, the medical charts of the patients were reviewed for smoking, diabetes, ischaemic heart disease, and hypertension as characteristics of the population.

The analysis of health literacy and NVS-D scores, in the context of the patient characteristics, was performed with the Student *t*-test if there was a normal distribution or the Mann—Whitney *U* test if there was no normal distribution. To determine if there was a normal distribution, the Kolmogorov—Smirnov test was used. If the outcome was a proportion, the chi-square test was performed or the Fisher exact test if appropriate. The level of significance applied was $p = .05$. In order to identify independent predictors for inadequate health literacy, a logistic regression with backward elimination was applied. Backward selection started with all of the variables (age, gender, education level, and reason for consultation; i.e., abdominal aortic aneurysm or peripheral arterial occlusive disease) in the model, and the variables were removed one by one as they were found to be insignificant in predicting the outcome. A backward selection (starting with all covariates) was performed with a significance level of $\alpha = 0.10$ for staying in the model; all factors significant at $p \leq .10$ were retained in the final model. The goodness of fit (Hosmer and Lemeshow test), adjusted odds ratios, and 95% confidence interval were calculated from the final logistic regression model. All analyses were performed using Statistical Package for Social Sciences (IBM SPSS Statistics for Windows, Armonk, NY; IBM Corp), version 23.0.

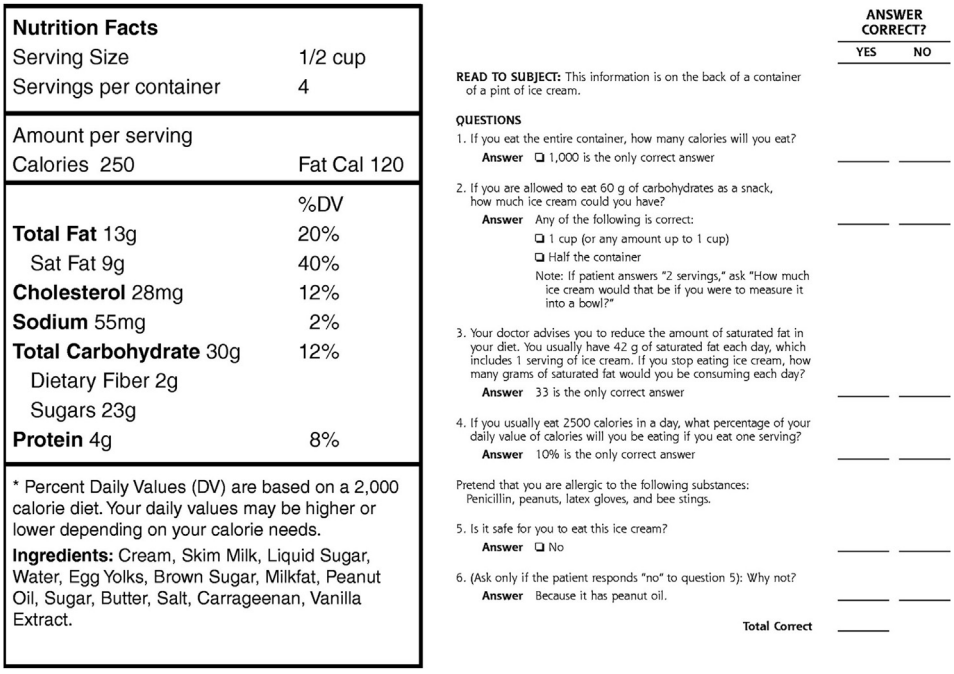
Ethics

The regional Medical Ethics Committee stated that this study did not require formal approval of the Netherlands Medical Research Involving Human Subjects Act. All potential respondents were informed about the aim of the study by a written form and orally, with implementation of interventions for patients with limited health literacy skills (see also the Discussion). The participation was voluntary. The potential respondents could opt out of the study at any time. By participating, respondents consented to the research procedure.

RESULTS

Patients

A total of 202 patients with arterial vascular disease were included. There were seven patients who declined



Nutrition Facts

Serving Size	1/2 cup
Servings per container	4
Amount per serving	
Calories 250	Fat Cal 120
	%DV
Total Fat 13g	20%
Sat Fat 9g	40%
Cholesterol 28mg	12%
Sodium 55mg	2%
Total Carbohydrate 30g	12%
Dietary Fiber 2g	
Sugars 23g	
Protein 4g	8%

* Percent Daily Values (DV) are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

Ingredients: Cream, Skim Milk, Liquid Sugar, Water, Egg Yolks, Brown Sugar, Milkfat, Peanut Oil, Sugar, Butter, Salt, Carrageenan, Vanilla Extract.

	ANSWER CORRECT? YES	NO
READ TO SUBJECT: This information is on the back of a container of a pint of ice cream.		
QUESTIONS		
1. If you eat the entire container, how many calories will you eat? **Answer** ❑ 1,000 is the only correct answer	_____	_____
2. If you are allowed to eat 60 g of carbohydrates as a snack, how much ice cream could you have? **Answer** Any of the following is correct: ❑ 1 cup (or any amount up to 1 cup) ❑ Half the container Note: If patient answers "2 servings," ask "How much ice cream would that be if you were to measure it into a bowl?"	_____	_____
3. Your doctor advises you to reduce the amount of saturated fat in your diet. You usually have 42 g of saturated fat each day, which includes 1 serving of ice cream. If you stop eating ice cream, how many grams of saturated fat would you be consuming each day? **Answer** 33 is the only correct answer	_____	_____
4. If you usually eat 2500 calories in a day, what percentage of your daily value of calories will you be eating if you eat one serving? **Answer** 10% is the only correct answer	_____	_____
Pretend that you are allergic to the following substances: Penicillin, peanuts, latex gloves, and bee stings.		
5. Is it safe for you to eat this ice cream? **Answer** ❑ No	_____	_____
6. (Ask only if the patient responds "no" to question 5): Why not? **Answer** Because it has peanut oil.	_____	_____
Total Correct	_____	

Figure 1. The (English) version of the Newest Vital Sign. The test consisted of a nutrition label and a question/score sheet about this nutrition label. In this research, the validated Dutch version (i.e., the Newest Vital Sign− Dutch) was used. Reprinted with permission from Quick Assessment of Literacy in Primary Care: The Newest Vital Sign, 3.6, 2005, Vol 3, No 6, Annals of Family Medicine Copyrights © 2005 American Academy of Family Physicians. All Rights Reserved.

participation. Table 1 shows the background characteristics of the participants. The mean age was 69.9 years (median 69 years) and 71.2% of the participants had an age of 65 years or older. A proportion of 60.4% of the included patients had a self reported highest education level of secondary school or lower (in this study defined as education level low). Eight patients did not report their highest education level. Peripheral arterial occlusive disease (PAOD) was by far the most frequent reason for consultation (72.8%).

Health literacy

The overall mean NVS-D score was 1.91 (SD $\pm$ 1.948, median 1). An overview of results on the NVS-D test is shown in Fig. 2. The cut off point to identify inadequate health literacy was a score of $<$4 out of 6 points on the NVS-D. A prevalence of inadequate health literacy of 76.7% was found.

Health literacy was further analysed in the context of the background characteristics of the study population. The results are displayed in Table 2. A significantly higher prevalence of inadequate health literacy ($p < .05$) was found in patients with an education level of secondary school or lower ($p < .001$) and in patients $\geq$ 65 years ($p < .001$). Moreover, the mean age of patients with inadequate health literacy was significantly higher than patients with adequate health literacy ($p < .001$). The prevalence of inadequate health literacy was higher in female patients and patients with peripheral arterial occlusive disease. Nevertheless, these differences were not significant ($p = .056$ and $p = .116$, respectively). By using logistic regression with backward elimination, age (OR 1.060; 95% CI 1.017—1.104) and education level (OR 0.164; 95% CI 0.078—0.346) were revealed as independent predictors ($p = .005$ and $p < .001$, respectively). This prediction model was estimated as fitting using the Hosmer—Lemeshow test ($p = .250$).

In addition, the mean NVS-D score of the different subgroups was compared. Table 3 shows an overview. There was a significant difference between the mean NVS-D of the group of patients $<$65 years versus patients $\geq$65 years ($p = .01$) and the cohort of patients with a lower education level versus patients with a higher education level ($p < .001$). For the subgroups gender and type of arterial disease, there was no significant difference in the mean scores on the NVS-D.

DISCUSSION

In this cross sectional study, over 200 patients with arterial vascular disease were randomly included. The screening for health literacy with the NVS-D shows a prevalence of inadequate health literacy of 76.7% in this population. This is the first large scale study with a prospective design that provides actual data on the prevalence of inadequate health literacy. It is essential to take these findings into account when informing patients with arterial vascular disease about their illness and treatment options in the context of informed consent (also for patient related research purposes) and shared decision making. Moreover, a recent study showed that patients with low and adequate health literacy are similarly interested to participate in medical decision making.[22] Other studies report improvement of

Table 1. Characteristics of the study participants.

Background characteristics	*n* (202)	%
Age, years		
<55	11	5.4
55–64	47	23.3
65–74	77	38.1
75–84	51	25.2
≥85	16	7.9
Gender		
Male	122	60.4
Female	80	39.6
Highest education level		
None	3	1.5
Elementary school	56	27.7
Secondary school	63	31.2
Intermediate vocational education	35	17.3
Higher vocational education	30	14.9
University	7	3.5
Unknown	8	4.0
Arterial disease		
Peripheral arterial occlusive disease	147	72.8
Abdominal aortic aneurysm	55	27.2
Smoking[a]		
Yes	97	48.0
No	105	52.0
Diabetes[b]		
Yes	59	29.2
No	143	70.8
Ischaemic heart disease[c]		
Yes	61	30.2
No	141	69.8
Hypertension[d]		
Yes	133	65.8
No	69	34.2

[a] The criterion for smoking was the use of tobacco products at the time of consultation.

[b] Diabetes mellitus was diagnosed conforming to (inter)national applicable standard: fasting plasma glucose ≥ 7.0 mmol/L (126 mg/dL) or 2 h plasma glucose ≥ 11.1 mmol/L (200 mg/dL).

[c] Ischaemic heart disease was registered in case of angina pectoris or (an episode of) myocardial ischaemia.

[d] Hypertension was defined as a systolic blood pressure of 140 mmHg or more or a diastolic blood pressure of 90 mmHg or more.

patient satisfaction and more favourable health outcomes if clearer medical information is provided.[23,24]

These findings imply the need to look at the medical information supply for patients with arterial vascular disease in a critical way. Recently, a large study was performed with the aim of determining the prevalence of limited health literacy among pharmacy visitors in The Netherlands. Almost 1000 adult participants were included and the NVS-D was also used to identify inadequate health literacy. This study found a prevalence of limited health literacy skills of 52%.[25] In comparison with the prevalence of 76.7% in this population of patients with arterial disease, this only emphasises the need to further investigate the best methods to convey (medical) information.

In the literature, some research has already been performed to discover interventions for patients with inadequate health literacy. A recent large systematic review of Sheridan et al.[26] reviewed 38 studies and focused on the effectiveness of interventions for those with low health literacy. Some examples are presenting essential information concisely or first on the paper, presenting information so that a higher number is better (i.e. a higher number indicating better quality)[27] and the addition of a verbal narrative in instructional videos.[28] Intensive mixed strategy interventions focusing on self management led, in some of the included studies, to better use of health care services.[29–34] Still, it can be difficult to integrate these self management interventions in daily practice. Next to these promising results, not all interventions with intuitive appeal are necessarily successful. For instance, four included randomised controlled trials and one other prospective study evaluated the effects of substituting diverse media for print and found contradictory results. For example, Meade et al.[35] found no differences between written and videotaped information. In contrast, Murphy et al.[36] described that providing information by video alone may have limited benefits, while Bryant et al.[38] noticed a significant difference in favour of multimedia versions of patient information.[35–39]

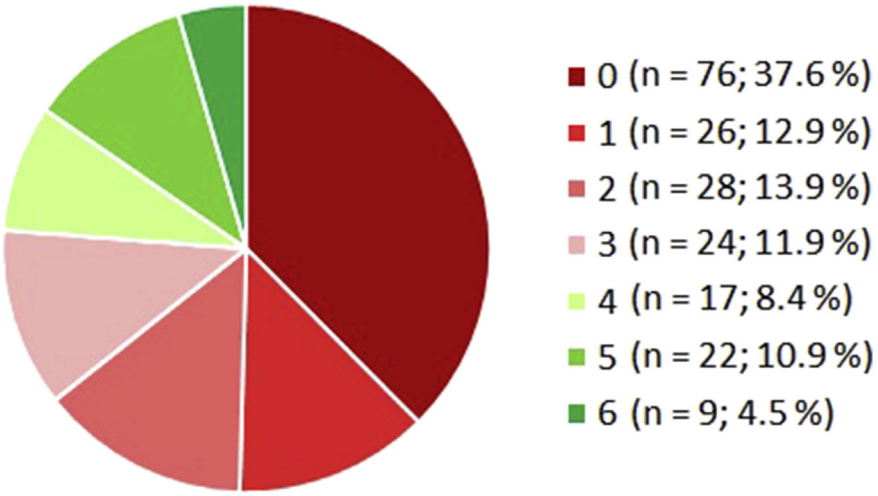


Figure 2. Scores on the Newest Vital Sign — Dutch.

Table 2. Health literacy in the context of patient characteristics.

	Inadequate Health Literacy		Adequate Health Literacy		*p*
	n	%	n	%	
Total patients	155	76.7	47	23.3	
Gender					
Male	88	72.1	34	27.9	.056
Female	67	83.8	13	16.3	
Age, mean, years (±SD)	71.2 (±9.404)		65.6 (±9.046)		< **.001**
Range	45–95		41–89		
< 65 years	35	60.3	23	39.7	< **.001**
≥ 65 years	120	83.3	24	16.7	
Education					
Low	108	88.5	14	11.5	< **.001**
High	40	55.6	32	44.4	
Arterial disease					
Peripheral arterial occlusive disease	117	79.6	30	20.4	.116
Abdominal aortic aneurysm	38	69.1	17	30.9	

The education level was unknown in eight patients.
Bold *p* values are significant differences ($p < .05$).

An article by Hironaka et al.[40] explored strategies to improve patient–provider communication for clinicians who care for people with limited health literacy. In the context of verbal communication, some suggestions are communication using plain language, avoiding jargon, limiting the items discussed during a consultation and the use of multiple forms of communication (such as a combination of pictures, written, and oral information). Another recent study showed that spoken animation is the best way to communicate complex information to patients with low health literacy skills.[41] Although some advances have been made in the field of discovering methods for effective information supply for patients with low health literacy in the last decade, further well-designed research should be performed in order to discover the best method of information supply and to support evidence for the current strategies. Preferably, research should also focus on specific patient populations, like patients with arterial vascular disease because of the high prevalence of the problem in this subset of patients.

The current study has several strengths, besides the previously mentioned prospective study design. Firstly, over 200 patients were included. The participation was minimally invasive and took only about 5 min for patients, so there were only few patients who declined participation. Secondly, only three well instructed researchers screened for health literacy with the NVS-D in all patients and there were no missing data (except the education level of 8 patients). Finally, the analysis of the differences in inadequate health literacy in the context of age and education level showed the same association as stated in previous studies in the general population.[17,18]

Table 3. Mean NVS-D scores in relation to patient subgroups.

	Mean NVS-D score (±SD)	*p*
Gender		
Male	2.16 (2.074)	.061
Female	1.53 (1.676)	
Age		
<65 years	2.64 (2.108)	**.01**
≥65 years	1.62 (1.805)	
Education		
Low	1.29 (1.582)	**< .001**
High	3.07 (1.974)	
Arterial disease		
Peripheral arterial occlusive disease	1.78 (1.842)	.218
Abdominal aortic aneurysm	2.27 (2.181)	

Bold *p* values are significant differences ($p < .05$).

A limitation of this study is the screening instrument used, the NVS-D. The NVS-D could not differentiate the degree of inadequate health literacy. It indicates only if a patient has adequate or inadequate health literacy. Also, it measures the objective health literacy and does not give any information regarding the subjective health literacy: knowledge about the self reported confidence or possible difficulties with understanding information patients encounter in the health care setting. The available Dutch test for subjective health literacy is a version of the Set of Brief Screening Questions (SBSQ).[42] However, the Dutch version of the SBSQ was not validated at the time of this research.[43] In addition, the NVS-D itself does have some limitations in identifying health literacy. By using the cut off point <4 to identify inadequate health literacy, the NVS-D would correctly identify 80% of those with adequate health literacy and 56% of those with inadequate health literacy in Dutch patients. Nevertheless, only very few Dutch screening instruments for health literacy are available and the mentioned cut off scores were determined as the most optimal by the receiver operating characteristics (ROC) in the validation study.[21] Furthermore, a short Dutch screening tool for illiteracy is not available. That information could have given more insight into the interpretation of inadequate health literacy in this patient population.

Another possible confounding factor was the timing of the test. The participants completed the NVS-D after their appointment with the vascular surgeon. In this way, the study did not interfere with the schedule at the outpatient

clinic and patients did not have to come to the hospital at another time to complete the test. The timing of the test after the appointment may have had a negative effect on the concentration and motivation of the patients, influencing the scores on the NVS-D negatively. On the other hand, this is the moment in the consultation where medical information is usually given to the patient and therefore represents the regular mindset of patients within the information process.

Finally, it is important to consider that low literacy skills and illiteracy are still taboo subjects.[44] A lot of people with inadequate literacy skills are embarrassed about this problem and will try to avoid difficult situations in which they can be confronted with it. In this way, the social taboo undoubtedly has an influence on research into the field of health literacy.

CONCLUSION

This study shows a prevalence of inadequate health literacy of 76.7% in patients with arterial vascular disease, with a significantly higher prevalence in the subgroups of patients $\geq$65 years and patients with a lower education level. The high prevalence of inadequate health literacy should be considered when information is provided and suggests the need to further investigate the best methods to convey medical information to this group of vulnerable patients.

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CONFLICT OF INTEREST

None.

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