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BMJ Open

Evaluation of beliefs and representations of chronic treatments of patients hospitalized in medicine and vascular surgery

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Complete List of Authors:	Kotry, Dounia; University Hospital Centre Nantes, Saillard, Justine; CHU Nantes, Pharmacy Bonsergent, Marion; CHU Nantes, Pharmacy Benichou, Antoine; CHU Nantes, Internal Medicine Prot-Labarthe, Sonia; Nantes Université, Pharmacie; ECEVE HUON, Jean-François; University Hospital Centre Nantes, Clinical Pharmacy; University of Nantes, Faculty of Pharmacy, Clinical Pharmacy department
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4 1 **Evaluation of beliefs and representations of chronic treatments of**
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7 2 **patients hospitalized in medicine and vascular surgery**
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11 4 Dounia KOTRY¹, Justine SAILLARD¹, Marion BONSERGENT¹, Antoine BENICHO²,
12
13 5 Sonia PROT-LABARTHE³, Jean-François HUON⁴
14
15

16 6
17
18 7 **University degree:**
19
20 8

21 9 Dounia KOTRY, PharmD
22

23
24 10 Justine SAILLARD, PharmD
25

26 11 Marion BONSERGENT, PharmD
27

28
29 12 Antoine BENICHO, MD
30

31 13 Sonia PROT-LABARTHE, PharmD, PhD
32

33
34 14 Jean-François HUON, PharmD, PhD
35
36
37 15

38
39 16 **Affiliations:**
40

41 17 1. Nantes Université, CHU Nantes, Pharmacie, F-44000, France
42

43
44 18 2. Nantes Université, CHU Nantes, Médecine interne, F-44000, France
45

46 19 3. Nantes Université, CHU Nantes, Pharmacie, F-44000, France, Université Paris Cité,
47

48
49 20 INSERM, ECEVE, F-75010 Paris, France
50

51 21 4. Nantes Université, Univ Tours, CHU Nantes, CHU Tours, Pharmacie, INSERM, Methods
52

53
54 22 in Patients-centered outcomes and HEalth Research, SPHERE, F-44000 Nantes, France
55
56
57 23

58 24 **Corresponding author:**
59

60 25 Dounia KOTRY, dounia.kotry@gmail.fr

1
2
3
4 26 **Mails:**

5
6 27 Justine SAILLARD: justine.saillard@chu-nantes.fr

7
8 28 Marion BONSERGENT: marion.bonsergent@chu-nantes.fr

9
10
11 29 Antoine BENICHOU : antoine.benichou@chu-nantes.fr

12
13 30 Sonia PROT-LABARTHE : sonia.protlabarthe@chu-nantes.fr

14
15
16 31 Jean-François HUON: jeanfrancois.huon@chu-nantes.fr

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30 35 **Abstract**

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34 36 **Context:** Today, the involvement of patients in their care is essential. As the population ages

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37 37 and life expectancy increases, the number of patients with chronic diseases is increasing. In the

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40 38 medical and vascular surgery departments, patients are polymedicated and mostly suffer from

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43 39 several chronic diseases. Approximately 50% of patients with a chronic disease are not

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46 40 adherent. Among the factors that can influence therapeutic adherence are the beliefs and

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49 41 representations of patients.

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4 42 **Objectives:** To evaluate the beliefs and representations of chronic treatments in patients with
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7 43 multiple medications and hospitalized in a vascular medicine and surgery department, and to
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10 44 evaluate the compliance, the knowledge, and the importance patients attach to their treatments.
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13 45 **Design:** This was an observational, prospective and a single-center study.
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16 46 **Setting:** The study was conducted in a French tertiary hospital center of around 3000 beds in 9
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20 47 institutions.
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23 48 **Participants:** Hundred patients were included. Patients included had to be over 18 years of age,
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27 49 hospitalized in the surgical and vascular medicine department and polymedicated.
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30 50 **Methods:** Patient interviews were carried out in the department and were based on three hetero-
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34 51 questionnaires (a global questionnaire, the BMQ and the GIRERD).
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37 52 **Results:** Our study showed that patients perceived their treatments as beneficial rather than
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40 53 worrying. A correlation between compliance and beliefs was observed. "Non-compliant"
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44 54 patients had a more negative overall view of medication than "compliant" patients. The level of
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47 55 compliance and knowledge of our patients was low. Only 11% of the patients were "good
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50 56 observers", 16% of the patients could perfectly name their treatment and 36% knew all the
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54 57 indications.
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57 58 **Conclusion:** Knowledge of treatment representation and beliefs are central to understanding
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60 59 patient behaviour. Considering patients' representations will allow the identification of levers,

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4 60 and the development of actions and educational tools adapted to improve their adherence, their
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7 61 knowledge and therefore their drug management.
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10 62 Data availability statement: Data are available upon reasonable request
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17 64 **Strengths and limitations of this study**

- 21 65 • This study aimed to explore the representation and beliefs of chronic treatments in
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24 66 patients with multiple medications and cardiac pathologies in a vascular medicine and
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28 67 surgery department, which, to our knowledge, has not been previously investigated.
- 31 68 • One hundred patients were included in the study, providing a comprehensive sample of
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35 69 the patient population.
- 38 70 • However, it is important to note that this is a single-center study, which may limit the
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41 71 generalizability of the findings to other settings. Future research in other centers is
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45 72 needed to ensure the transferability of results.
- 48 73 • Moreover, the evaluation of knowledge in this study may have been impacted by the
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51 74 hospitalization of the patients. The environment of the hospital and the stress of being
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55 75 hospitalized may have affected patients' true understanding of their treatment.
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77 **Introduction**

78 According to the World Health Organization (WHO), a chronic disease is a long-term condition
79 that usually progresses slowly and requires long-term treatment and care. It is also characterized
80 by its impact on the quality of life of patients. Twenty million French people are affected by a
81 chronic disease (1). They represent 77% of all diseases, the most important of which are
82 cardiovascular, cerebral, respiratory, metabolic and cancerous diseases (2). Today, the
83 prevalence of chronic diseases is rising sharply and can be explained by the aging of the
84 population and the increase in life expectancy. They are therefore among the most common
85 health care problems, with a major impact on public health and the economy (3).

86 In vascular medicine and surgery, the majority of patients have one or more chronic diseases
87 and are polymedicated (4). Polymedication is defined as "the administration of many drugs
88 simultaneously or the administration of an excessive number of drugs" (5,6). Furthermore, all
89 chronic diseases require long-term management with an investment by both healthcare
90 professionals and the patient. For this, a good level of information on the disease and treatments
91 is necessary for the patient to avoid the risks of poor compliance. According to the WHO, 50%
92 of patients do not adhere to their chronic treatment, even though this adherence is essential for
93 the control of the chronic disease. Indeed, loss of adherence to treatment leads to a decrease in

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3 94 therapeutic efficacy and exposes the patient to complications of their disease and to therapeutic
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7 95 failure (7).
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10 96 Among the factors that influence therapeutic adherence, can be found the representations of
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13 97 treatments (8). This refers to each individual's knowledge, explanations and ideas about his
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17 98 disease. Representations are linked to the patient's behaviour, cultural, social and family
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20 99 background, education, professional activity, etc. (9). They have multiple origins and varies
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24 100 from one individual to another. Today, the representation of the disease, but also of treatments,
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27 101 is central to understanding the behaviour of patients in their health care journey.
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30 102 Representations and beliefs have been studied in certain chronic diseases, notably HIV,
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33 103 diabetes, hypertension, asthma, etc. (9-12).
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37 104 However, to our knowledge, they have not been studied in the medical and vascular surgery
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40 105 fields, when it comes to hospitalized patients with multiple medications.
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44 106 The main objective of this study was to evaluate the beliefs and representations of chronic
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47 107 treatments in multi-medicated patients hospitalized in surgery and vascular medicine. Secondly,
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50 108 the patients' knowledge of their treatments, the importance given by the patient to each of their
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54 109 treatment and the medication compliance were assessed.
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58 110 **Material and methods**

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4 111 This was an observational, prospective, single-center study conducted in a French tertiary
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7 112 hospital center of around 3000 beds in 9 institutions.

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10 113 Patients included had to be over 18 years of age and hospitalized in the surgical and vascular
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13 114 medicine department, which comprises 28 beds. Drawing on literature data (5) and the
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17 115 experience of our medication reconciliation activity, the threshold of five medications as a
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20 116 reference to designate polymedicated patients was established.

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23 117 Patients who were unable to participate in an interview because of cognitive impairment or
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27 118 language barrier were not included. All patients underwent a medication review on admission
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30 119 to the vascular medicine and surgery department to obtain a complete record of their usual
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34 120 treatment. The patient inclusion period was from early March 2022 to late June 2022. All
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37 121 participants provided consent.

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40 122 The study was based on three hetero-questionnaires completed during the patient's
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44 123 hospitalization.

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47 124 1/ a global questionnaire regarding the patient's sociodemographic data, their usual treatments
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50 125 identified by the conciliation and their medication management, the information received about
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54 126 his treatments, the knowledge he had of his treatments (name and indication) as well as the
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57 127 importance he gave to each medication (scored from 1 to 10).

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4 128 2/ the BMQ (Belief Medical Questionnaire). It allows for the evaluation of different specific
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7 129 dimensions of patients' beliefs about their medical treatments. It consists of 18 items divided
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10 130 into two parts: specific beliefs (patients' representations of their medical prescriptions - 10
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13 131 items) and general beliefs (beliefs in medicine in general - 8 items). A 5-point Likert scale was
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17 132 used for the responses. For each question, a total score was calculated by adding the item scores.
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20 133 Each specific belief could get a score between 5 and 25, and each general belief a score between
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23 134 4 and 20. The higher the scores, the more important the beliefs are. For specific beliefs, a
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27 135 differential score is calculated by subtracting the specific concern from the specific need. A
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30 136 score greater than 0 means that the perceived need for treatment is greater than the concerns.
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34 137 The validated French version of this questionnaire was used (10).
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37 138 3/ the validated GIRERD medication adherence questionnaire, composed of 6 items (13).
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40 139 The interviews were conducted by the first author.
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44 140 A descriptive analysis was performed on the variables of the whole population by calculating
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47 141 mean, standard deviation, minimum, maximum, median and quartiles according to whether the
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51 142 variables were normal or not. Categorical variables were described by the numbers and
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54 143 percentages of each modality. For the analysis of correlations between two categorical
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57 144 variables, a Chi-2 test was performed. To test the association between a qualitative variable and
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60 145 a quantitative variable, a Student's t test, ANOVA, Wilcoxon test, or Kruskal-Wallis test were

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4 146 used, depending on the number of modalities of the qualitative variable and the normality of
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7 147 the quantitative variable. All analyses were performed using SAS® version 9.4 software.
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10 148 This study was approved by the local ethics committee (Groupe Nantais d’Ethique dans le
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13 149 Domaine de la Santé) on June 22th 2022 (GNEDS 20220622).
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151 **Results**

152 **Characteristics of the patients and their treatments**

153 Over the period, three hundred sixty five patients underwent a medication reconciliation. Of the
154 patients eligible and available at the time of service, one hundred patients were included in the
155 study. All patients completed the study and were analyzed. The characteristics of the patients
156 and their treatments are presented in *Table 1*. Patients reported being treated for an estimated
157 period of 19.4(± 12.4) years. On average, 9.4 (± 3.6) drugs were prescribed simultaneously,
158 mostly for cardiovascular (32%), digestive (19.8%) or neurological (18%) diseases. The
159 majority of patients were informed about their treatments by a doctor, but more than a quarter
160 (27%) felt the need for more information.

161 Women felt that they received less information about drugs from healthcare professionals than
162 men (48.4% vs. 71.0%, p = 0.0292).

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5 164 **Beliefs**

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8 165 The results of the BMQ questionnaire for the population are presented in *Figure 1* and the BMQ
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11 166 score values are detailed in *Table 2*. Overall, patients said that their medication helped them not
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15 167 to feel worse, that without it they would be sicker or that their life would be impossible. They
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18 168 were aware that their future life depended on taking them. However, almost one in three patients
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21 169 felt that doctors were too trusting of medication, and that they would prescribe less if they had
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25 170 more time. They wondered about poor tolerance and possible addiction to certain medications.
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28 171 The BMQ scores clearly show that the balance of benefits and risks perceived by the patients
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31 172 is clearly in favor of taking the treatments for 96% of them.

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38 174 The more medications patients took, the more they believed in the importance of their treatment
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41 175 ($r= 0.27$, $p= 0.0064$). Women believed more in the harm of treatments ($p= 0.0352$) and in the
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44 176 overuse of drugs than men ($p= 0.0170$)

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48 177 **Compliance**

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51 178 The responses to the GIRERD questionnaire are presented in *Table 3*. Only 11% of patients had
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54 179 good compliance with their treatments according to the questionnaire score. One in 10 was
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58 180 considered totally non-compliant.

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4 181 The more compliant patients were, the more they believed in the importance of their medication
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7 182 (p = 0.0039).
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10 183 No significant correlation was found between the level of compliance and age (p = 0.50), level
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13 184 of education (p = 0.52) or number of medications (p = 0.0733).
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19 186 **Knowledge**
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23 187 On average, patients were able to name 49.3% of their treatments. Sixteen percent of patients
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26 188 could name all of their treatments, while 11% of patients could not name any of their treatments.
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29 189 On average, patients knew 73.1% of the indications for all their usual treatments. When 32
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32 190 patients were able to name all the indications of their medication, 3 patients could not name
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36 191 any.
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39 192 Several correlations were found, notably between age and patient knowledge (*Supplemental*
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42 193 *Table*), but also with educational level. Indeed, patients with higher education knew more about
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46 194 the indications of their treatments (mean= 85.1±22.8) than patients with no education (mean=
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49 195 40.9±29.4) (p = 0.0017).
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53 196 The least cited drug classes were anti-histamines for systemic use (28.6%), analgesics (26.8%),
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56 197 anti-anemic preparations (24.0%) and ophthalmic drugs (20%).
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4 198 Among the most prescribed drug classes, the most cited were anti-thrombotics (64.7%), beta-
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7 199 blockers (55.9%), drugs acting on the renin angiotensin system (49.3%) and anti-diabetics
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10 200 (46.8%).

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13 201 The drug classes with the highest rate of incorrect indications were cardiology drugs (60%),
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16 202 anti-anemic preparations (48%), diuretics (47.5%), beta-blockers (45.8%) and lipid-lowering
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19 203 drugs (45%).

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23 204 When patients were asked about their treatments, a large proportion did not spontaneously
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26 205 mention the drugs they took "if needed", in particular analgesics such as paracetamol or
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29 206 symptomatic drugs such as antihistamines.

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33 207 A comparison between beliefs, compliance and knowledge was made. The results obtained are
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36 208 detailed in *Table 4*. For patients with low compliance, the more they knew the indications of
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39 209 their treatments, the less they feared their harmfulness. And the more they knew how to name
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42 210 treatments, the less they feared overuse.

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50 212 **Importance ratings**
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53 213 Fourteen patients were unable to rate the importance of their treatment because they felt that all
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56 214 their medications were equally important.
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4 215 Out of the most prescribed drug classes, two had a median importance score of less than 6:
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7 216 nasal preparations (3 prescriptions, median score 5.0) and constipation medications (13
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10 217 prescriptions, median score 5.5). Those with the highest importance scores were antidiabetics
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13 218 (62 prescriptions, median score 9.5), immunosuppressants (10 prescriptions, median score 10),
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17 219 and antithrombotics (116 prescriptions, median score 9).
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20 220 Symptomatic medications scored high in importance. Analgesics (82 prescriptions),
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23 221 antihistamines (14 prescriptions), and medications for acid-related disorders (52 prescriptions)
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27 222 all received a median score of 8.
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30 223 There was no significant correlation between median patient ratings and compliance ($r = -0.13$,
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33 224 $p = 0.3623$).
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42 226 **Discussion**

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48 227 Our study showed that patients perceived their treatments as beneficial rather than worrying. A
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51 228 correlation between compliance and beliefs was observed. "Non-compliant" patients had a more
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54 229 negative overall view of medication than "compliant" patients. The level of compliance and
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4 230 knowledge of our patients was low. Only 11% of the patients were "good observers", 16% of
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7 231 the patients could perfectly name their treatment and 36% knew all the indications.
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13 233 In recent years, several studies assessed treatment representations and their influence on
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16 234 medication adherence. However, to our knowledge, this study is the first to assess patients'
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19 235 beliefs about their chronic treatment in relation to their knowledge and adherence in a vascular
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22 236 medicine and surgery department.
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27 237 Our results regarding the importance attributed by patients to their chronic medication are
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30 238 consistent with the data found in the literature. French studies have evaluated the representation
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33 239 of treatments in chronic pathologies, particularly in asthma (12), diabetes and HIV (10), and
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36 240 bronchopulmonary cancer (14). All these studies have highlighted the importance that patients
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39 241 attach to their medication. Thus, patients perceive their treatment as beneficial rather than
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42 242 worrisome. Indeed, in our study, 77% of patients were not worried about taking medication and
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45 243 76% were not disturbed by medication in their daily lives.
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53 245 Several studies have shown a correlation between patients' representations of their treatment
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56 246 and the level of compliance. Horne *et al.* demonstrated this link for each of the chronic
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59 247 pathologies studied via the BMQ questionnaire in 324 patients. These were also patients with
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4 248 various chronic diseases (asthma, oncology, cardiac and renal diseases). Indeed, the "need"
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7 249 score was correlated with good compliance and the "concern" score was related to poor
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10 250 compliance in each of the diseases studied (11). Our results could not show a significant
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13 251 correlation but a trend towards the same result. Conducting disease specific analyses on a larger
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17 252 group in our setting could confirm this trend.

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20 253 A French study also investigated the correlations between beliefs and compliance in patients
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23 254 with chronic diseases in general practices (15). Of the 265 patients included in the study, 40.8%
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27 255 had good compliance, 53.2% were "moderately compliant" and 6% were "non-compliant". In
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30 256 our study, only 11% of patients were "good compliant". This can be explained by a significant
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33 257 difference in the average number of medications taken by patients. In their study, patients had
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37 258 an average of 3.6 ± 2.6 medications, almost three times less than in our study. One of the 6
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40 259 questions of the GIRERD questionnaire related to the amount of medication to be taken: "Do
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43 260 you think you have too many pills to take" and 67% of our patients answered "yes". This may
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47 261 explain the low rate of "good compliance".

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50 262 Deat *et al.* highlighted a significant relation correlation between the degree of compliance and
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53 263 the BMQ scores "concerns", "harmfulness" and "overuse", supporting the trend shown in our
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57 264 study. The absence of a statistical significance could be explained by an important difference
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60 265 in the number of patients in each compliant group. Only ten patients were "non-adherent".

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4 266 Regarding the concerns of "non-adherent" patients, our results are consistent with their study:
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7 267 patients were more concerned with their treatment, which may have an impact on compliance.
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10 268 Fall *et al.* conducted a study in diabetic and HIV patients (10). A disease-specific analysis
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13 269 showed significant correlations between adherence and the necessity and worry scales. Thus,
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17 270 negative beliefs were predictive of poor adherence. Non-adherent patients would therefore have
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20 271 a more negative overall view of medication than adherent patients.
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24 272 According to the study by Huon *et al.* (16), the average number of medications taken by the
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27 273 elderly is 8 in the 70–80-year-olds, 9.61 in the 80–90-year-olds, 9.92 in the 90–100-year-olds
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30 274 and 8.11 for the over 100-year-olds. Overall, the increase in medication use varies as the
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34 275 population ages. Our patients, with an average age of 70.8 years, took an average of 9.7
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37 276 medications. Unfortunately, the higher the number of medications, the higher the risk of
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40 277 forgetting or not taking the treatments (17). This high number of medications also has a role in
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44 278 patients' knowledge and beliefs. Our results showed that the more medications patients took,
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47 279 the less they knew about their names and indications. These results confirm those found in the
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50 280 literature (18).
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54 281 One study showed that knowledge of drug indications varied according to ATC class. Indeed,
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57 282 the drug classes for which the indication was not known were cardiovascular drugs (12%),
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60 283 asthma drugs (5%) and estrogen therapies (5%) (19). In our study, we also noted that the

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4 284 indications for cardiovascular drugs were the least known. Indeed, patients hospitalized in the
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7 285 vascular medicine department have many cardiology medications. It is therefore essential that
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10 286 caregivers take sufficient time with patients to educate and involve them in their care. Persall
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13 287 *et al.* (19) also showed that the older and less educated the patients were, the less they knew
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17 288 about their treatments. Our results are consistent with this study.
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20 289 Only 16% of patients could perfectly name their treatment and 36% knew all the indications.
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23 290 In general, the level of knowledge of patients about their treatment was low. However, it is
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27 291 difficult to compare our results with those found in the literature, because of the disparity
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30 292 between the number of drugs taken per patient and the number of patients included. Indeed,
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33 293 Akici *et al.* (20) showed, in a study including 1618 patients with an average number of drugs
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37 294 of 3.3 per patient, that only 10.9% of patients could correctly name their treatment. Given the
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40 295 average number of medications taken by the patients in our study, more than 9, it seems normal
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44 296 that this number is low in our results. The study by Haidar-Ahmad *et al.* including 351 patients,
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47 297 with a mean number of medications taken of 3.83, described that 80.74% of the medications
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50 298 were known by the patients (21).
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54 299 Persall *et al.*, included 616 patients in their study. Only 13.5% of patients did not know any of
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57 300 the indications. They also noted a significant lack of knowledge of their patients for
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60 301 cardiovascular medications (19).

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3 302 Although patients' levels of knowledge and compliance were low, the importance they placed
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7 303 on their treatment was high. Patient ratings showed that the majority of prescribed drug classes
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10 304 were considered important to them. Only four ATC classes scored below average. This result
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13 305 confirms the "necessity" score obtained in the BMQ questionnaire. A French study assessed
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16 306 drug-related representations in patients with multiple myeloma (22). The authors estimated the
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20 307 importance the patient placed on his or her medications. Antithrombotic drugs, unlike our study,
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23 308 were rated lower, whereas anticancer drugs scored highest. This significant difference between
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26 309 medications that are all part of the overall management of myeloma could be explained by the
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30 310 degree of information provided to patients. Indeed, while the direct link between anticancer
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33 311 drugs and myeloma can easily be made, the link between antithrombotic drugs and the fatal
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36 312 consequences of myeloma is less intuitive. Our work reports on patients with multiple and
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40 313 varied chronic pathologies, with a large number of prescribed medications. Despite this, few
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43 314 differences were observed between ATC classes and therefore chronic pathologies. For a
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46 315 majority of patients, all treatments were equivalent in importance. Indeed, even if the patients
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50 316 did not spontaneously cite their symptomatic treatments, they gave them a high importance.
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53 317 This is due to the perceived immediate effect of using these treatments. This result is consistent
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56 318 with another study (23) that showed that patients were more familiar with analgesics than with
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4 319 cardiovascular drugs, because they felt their effects directly. Lastly, in our study, patients were
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7 320 very familiar with the effects of their symptomatic medications but did not cite them directly.
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10 321 If representations about treatments influence patient adherence, adherence is also determined
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13 322 by the relationship of trust with the physician. Several studies have shown that the relationship
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16 323 between the physician and the patient has a significant impact on the feeling of usefulness and
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19 324 efficacy of the treatment, but also on adherence (24). Studies have shown that when patients
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22 325 had sufficient information and understood the purpose of their treatment, they had better
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25 326 compliance (25). In our study, the majority of patients reported receiving information about
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28 327 their treatment, but one third felt that this was not sufficient.
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33 328 Assessing patients' beliefs would allow us to better target their priorities, and thus to develop
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36 329 adapted educational actions and tools. Indeed, understanding the mechanisms and potential
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39 330 evolution of the disease will make it easier for patients to assimilate the objectives of their
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42 331 treatments and will facilitate their therapeutic adherence (26).
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333 **Strengths and biases**

334 To our knowledge, the representation and beliefs of chronic treatments have not been studied
335 in a vascular medicine and surgery department, in patients with multiple medications and

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4 336 cardiac pathologies. This is a single-center study. It would be interesting to conduct this work
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7 337 in other centers in order to obtain generalizable and transferable results.
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9 338 In our study, the BMQ was used for a combination of several diseases, whereas its French
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12 339 version has only been validated for diabetes and HIV (10). Thus, patients with several chronic
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16 340 diseases may not have the same representations regarding the treatments for each disease. The
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19 341 scores given by patients on each of their treatments were used to estimate the level of
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22 342 importance given to each medication. Finally, for the majority of patients, all their medications
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26 343 were equally important, which may indicate a lack of prioritization.
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29 344 Another limitation of our study is the use of a questionnaire alone to assess adherence, when
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32 345 several methods of measuring adherence exist (direct and indirect methods). Although the
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36 346 questionnaire is a simple, quick and inexpensive technique, it is less robust when used alone.
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39 347 Many authors recommend using at least two methods. In addition, the use of questionnaires
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42 348 tends to overestimate compliance (27) which may seem worrying in view of the already low
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46 349 adherence reported in our results. In the context of short-stay inpatients, it was not possible to
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49 350 use direct methods (drug measurements, biological marker measurements), or to use any other
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52 351 indirect method than the questionnaire. Moreover, this would have lengthened the interview
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56 352 time with the patients and thus made the procedure more cumbersome.
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3 353 Concerning the evaluation of knowledge, the hospitalization of our population certainly had an
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7 354 impact on the real knowledge of the patients about their treatment. Being in a stressful
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10 355 environment, in a context of acute pathology, could potentially have decreased their true
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13 356 knowledge of the names and indications of their treatment, inducing a bias.
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17 357 One of the exclusion criteria for the study was cognitive impairment. This was assessed
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20 358 clinically but was not confirmed by a specific assessment test such as Mini Mental State
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23 359 Examination (MMSE). This would have again made the protocol and interviews more
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27 360 cumbersome.
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362 **Conclusion**

363 The level of knowledge and compliance of patients with multiple chronic diseases in surgery
364 and vascular medicine is low. Representations of the disease and of medication have an impact
365 on patients' behaviour. They are determinants of adherence to medication. Identifying patients'
366 beliefs about their chronic treatment allows caregivers to adapt information to patients' needs.
367 Better information from healthcare professionals (physician, nurse, pharmacist, etc.) regarding
368 the indication and efficacy of the prescribed treatment is essential. Combined with the
369 consideration of patients' concerns, particularly regarding tolerance, this will improve the

370 benefit/concern ratio perceived by these patients, and thus increase their compliance. The BMQ

371 may help to identify patients at risk of poor compliance.

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27 473 **Data Availability Statement**
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31 474 The data underlying this article will be shared on reasonable request to the corresponding
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34 475 author.
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39 477 **Conflict of Interest**
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43 478 The Author(s) declare(s) that there is no conflict of interest.
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4 479 **Legends**
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7 480 **Figure 1:** Responses to the BMQ questionnaire (percentage of responses among the 100
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9 481 patients)
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For peer review only

482 **Tables**483 **Table 1. Characteristics of the population (N=100) and the drugs (N=965)**

Characteristics of patients	N=100
Female sex	31 (31.0%)
Age (years)	70.8 ± 10.7 [38.0;92.0]
Time since first chronic treatment (years)	19.4 ± 12.4 [0.5;58.0]
Level of study	
Secondary level	45 (45.0%)
Higher study	24 (24.0%)
Primary level	24 (24.0%)
Lack of study	7 (7.0%)
Socio-professional category	
Workers	31 (31.0%)
Intermediate professions	18 (18.0%)
Employees	17 (17.0%)
Executives, Higher intellectual professions	14 (14.0%)
Craftsmen, Shopkeeper, Compagny managers	12 (12.0%)
Farmer	5 (5.0%)
Other†	3 (3.0%)
Lifestyle	
Circled	91 (91.0%)
Alone	9 (9.0%)
Organization around medication intake	
Autonomous	83 (83.0%)
Help from relatives (partner, children)	11 (11.0%)
Assistance from a nurse	6 (6.0%)
Information received at the start of treatment	87 (87.0%)
Source of information	
From the general practitioner	73 (73.0%)
From the specialist doctor	61 (61.0%)
From the pharmacist	46 (46.0%)
From family and friends	5 (5.0%)
Information received perceived as sufficient by the patient	64 (64.0%)
Need for additional research (Internet, books, magazines, leaflets)	27 (27.0%)
Drug Characteristics	N=965

Number of drugs per patient	9.7 ± 3.6 [5;21]
ATC class od of drugs	
Cardiovascular (C)	310 (32.0%)
Digestive tract and metabolism (A)	190 (19.8%)
Nervous System (N)	175 (18.0%)
Blood and blood-forming organs (B)	141 (14.6%)
Respiratory system(R)	47 (4.9%)
Systemic hormones, excluding sex hormones (H)	19 (2.0%)
Other‡	83 (8.7%)

484 Results are presented as mean ± standard deviation [minimum-maximum] for quantitative variables and as counts
 485 (%) for qualitative variables

486 *To the question "Since when have you been taking your first chronic treatment?", 4 patients were unable to
 487 answer.

488 †Other occupations: Farmer (5%), Housewife (2%), No occupation (1%)

489 ‡Other ATC class: H-Systemic hormones, excluding sex hormones (2.0%), J-General anti-infectives for systemic
 490 use (0.8%), L-Antineoplastics and immunomodulators (1.6%), P-Antiparasitic, insecticides (0.1%), V-
 491 Miscellaneous (0.6%), D-Dermatological drugs (0.5%), M-Muscle and skeletal (1.4%), S-Sensory organs (1%),
 492 G-Genitourinary system and sex hormones (1.7%), No ATC class (1%)

494 **Table 2. BMQ score results - Beliefs**

BMQ* - Beliefs	N = 100	Male N = 69	Female N = 31	p-value
Specific Beliefs - Necessity	21.9±3.5 [8.0;25.0]	21.7±3.6	22.2±3.1	0,4822
Specific Beliefs - Concerns	11.1±4.8 [5.0;23.0]	10.5±4.4	12.5±5.5	0.0509
General Beliefs - Harm	9.1±3.2 [4.0;17.0]	8.6±3.0	10.1±3.5	0.0352
General Beliefs - Overuse	10.3±3.4 [4.0;17.0]	9.8±3.4	11.5±3.3	0.0170
BMQ Necessity - BMQ Concern > 0†	96 (96.0%)	66 (95.7%)	30 (96.0%)	1.0000

495 Results are presented as mean ± standard deviation [minimum-maximum] or numbers and percentages

496 Specific belief scores range from 5 to 25 and general belief scores range from 4 to 20. A high score indicates a
 497 strong belief.

498 *BMQ: Belief Medical Questionnaire

499 †BMQ "necessity" - BMQ "concern" > 0 means that the beneficial character is superior to the worrying character.

500

501

502 **Table 3. Responses to the GIRERD questionnaire and correlations between compliance and**
 503 **beliefs (N=100)**

Questions and number of positive responses				N (%)
Did you forget to take your medication this morning?				1 (1.0%)
Since your last visit, have you run out of medication?				7 (7.0%)
Have you ever taken your medication late compared to the usual time?				43 (43.0%)
Have you ever not taken your medication because your memory fails you some days?				23 (23.0%)
Have you ever not taken your medication because some days you feel that your medication is doing you more harm than good?				9 (9.0%)
Do you think you have too many pills to take?				61 (61.0%)
	Good compliance	Low compliance	Non-compliance	p-value
	N = 11 (11.0%)	N = 79 (79.0%)	N = 10 (10.0%)	
Specific Beliefs - Necessity	21.0 [6.0;12]	23.0 [21.0;25.0]	23.0 [16.0;24.0]	0.6487
Specific Beliefs - Concerns	9.0 [6.0;12.0]	11.0 [6.0;14.0]	17.0 [9.0;20.0]	0.1163
BMQ Necessity - BMQ Concern > 0†	11 (100.0%)	78 (98.7%)	7 (70.0%)	0.0039
General Beliefs - Harm	9.0 [6.0;12.0]	8.0 [6.0 ;11.0]	11.5[9.0 ;16.0]	0.0739
General Beliefs - Overconsumption	8.0 [5.0 ;12.0]	10.0 [8.0 ;13.0]	13.0 [9.0 ;16.0]	0.1086

504 The results are presented in median [1st Quartile; 3rd Quartile] for quantitative variables and in the form of
 505 numbers (%) for qualitative variables

506 Specific belief scores range from 5 to 25 and general belief scores range from 4 to 20. A high score indicates a
 507 strong belief.

508 *GIRERD score: six negative ("no") responses: patient is "good compliance". Four or five "no" responses: patient
 509 is "poorly compliant". Two or three "no" responses: the patient is "non-observant".

510 †BMQ "necessity" - BMQ "concern" > 0 means that the beneficial character is superior to the worrying character.

511 BMQ: Belief Medical Questionnaire

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4 512 **Table 4.** *Correlation between adherence, beliefs and knowledge about their treatments for the*
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6 513 *100 patients*

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8 514 Example: In patients with low adherence, the more they know about the indications for their treatments, the less
9 515 fear they have that the medications will be harmful.

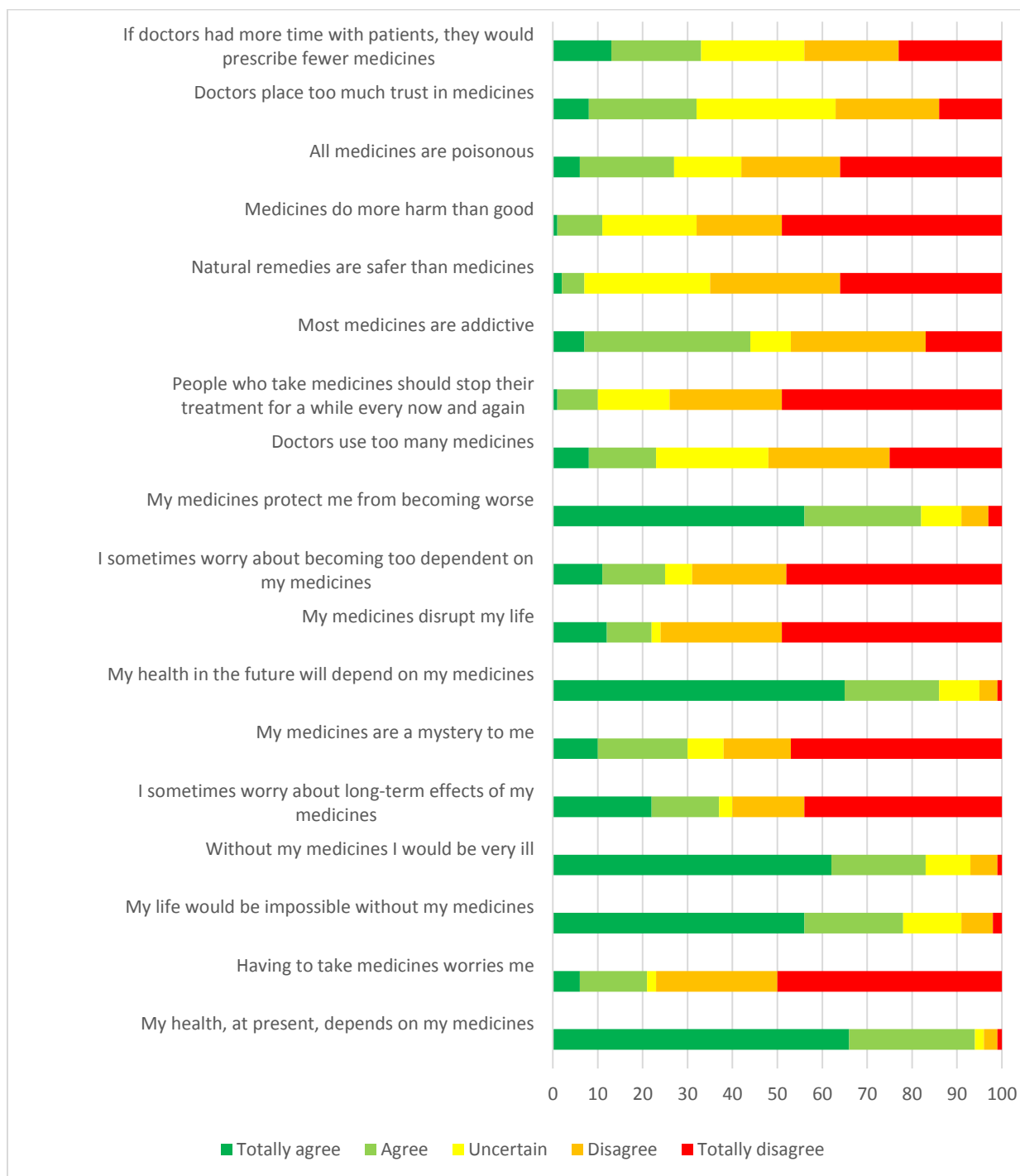
	Beliefs	Drugs mentionned		Known indications	
		r	p	r	p
Good compliance (N=11)	Specific Beliefs - Necessity	-0.22	0.5220	0.17	0.6185
	Specific Beliefs - Concerns	-0.01	0.9837	-0.11	0.7403
	General Beliefs - Harm	0.07	0.8488	0.15	0.6686
	General Beliefs - Overuse	0.37	0.2651	0.26	0.442
Low compliance (N=79)	Specific Beliefs - Necessity	0.01	0.9540	-0.07	0.5457
	Specific Beliefs - Concerns	-0.12	0.2994	-0.11	0.3491
	General Beliefs - Harm	-0.21	0.0689	-0.30	0.0069
	General Beliefs - Overuse	-0.23	0.0401	-0.21	0.0630
Non-compliance (N=10)	Specific Beliefs - Necessity	-0.35	0.3216	-0.43	0.2149
	Specific Beliefs - Concerns	0.41	0.2434	0.44	0.2064
	General Beliefs - Harm	0.21	0.5643	0.57	0.0858
	General Beliefs - Overuse	0.38	0.2726	0.47	0.1677

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4 517 **Contributors** : DK, JS, MB, SPL and JFH contributed to the study conception and design. Data
5
6
7 518 collection and analysis were performed by DK. The first draft of the manuscript was written by
8
9
10 519 DK and JS, MB, AB, SPL and JFH commented on previous versions of the manuscript. All
11
12
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14 520 authors read and approved the final manuscript.
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For peer review only

Figure 1: Responses to the BMQ questionnaire (percentage of responses among the 100 patients)



Reporting checklist for cross sectional study.

Evaluation of beliefs and representations of chronic treatments of patients hospitalized in
 medicine and vascular surgery

D. Kotry *et al.*

Based on the STROBE cross sectional guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the STROBE cross sectional reporting guidelines, and cite them as:

von Elm E, Altman DG, Egger M, Pocock SJ, Gotsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies.

Page

Reporting Item

Number

Title and abstract

1	Title	#1a	Indicate the study's design with a commonly used term in the	1
2			title or the abstract	
3				
4				
5				
6	Abstract	#1b	Provide in the abstract an informative and balanced summary	2-3
7			of what was done and what was found	
8				
9				
10				
11	Introduction			
12				
13				
14				
15	Background /	#2	Explain the scientific background and rationale for the	4
16	rationale		investigation being reported	
17				
18				
19				
20	Objectives	#3	State specific objectives, including any prespecified	5
21			hypotheses	
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24				
25	Methods			
26				
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28				
29	Study design	#4	Present key elements of study design early in the paper	5
30				
31				
32	Setting	#5	Describe the setting, locations, and relevant dates, including	5
33			periods of recruitment, exposure, follow-up, and data	
34			collection	
35				
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39	Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods of	5
40			selection of participants.	
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43				
44				
45		#7	Clearly define all outcomes, exposures, predictors, potential	5-6
46			confounders, and effect modifiers. Give diagnostic criteria, if	
47			applicable	
48				
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51				
52	Data sources /	#8	For each variable of interest give sources of data and details	5-6
53	measurement		of methods of assessment (measurement). Describe	
54			comparability of assessment methods if there is more than	
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one group. Give information separately for for exposed and unexposed groups if applicable.

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6	Bias	#9	Describe any efforts to address potential sources of bias
7			
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9	Study size	#10	Explain how the study size was arrived at
10			
11			
12	Quantitative	#11	Explain how quantitative variables were handled in the
13			
14	variables		analyses. If applicable, describe which groupings were
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16			
17			chosen, and why
18			
19	Statistical	#12a	Describe all statistical methods, including those used to
20			
21	methods		control for confounding
22			
23			
24			
25	Statistical	#12b	Describe any methods used to examine subgroups and
26			
27	methods		interactions
28			
29			
30	Statistical	#12c	Explain how missing data were addressed
31			
32	methods		
33			
34			
35	Statistical	#12d	If applicable, describe analytical methods taking account of
36			
37	methods		sampling strategy
38			
39			
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41	Statistical	#12e	Describe any sensitivity analyses
42			
43	methods		
44			
45			
46	Results		
47			
48			
49	Participants	#13a	Report numbers of individuals at each stage of study—eg
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51			numbers potentially eligible, examined for eligibility,
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53			confirmed eligible, included in the study, completing follow-
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up, and analysed. Give information separately for for
exposed and unexposed groups if applicable.

Participants	#13b	Give reasons for non-participation at each stage	NA
Participants	#13c	Consider use of a flow diagram	NA
Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	7
Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest	Table 1
Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable.	7-9 + tables
Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	7-9 + tables
Main results	#16b	Report category boundaries when continuous variables were categorized	NA
Main results	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	NA

Discussion

Key results	#18	Summarise key results with reference to study objectives	10
Limitations	#19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	14
Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	10-15
Generalisability	#21	Discuss the generalisability (external validity) of the study results	14
Other Information			
Funding	#22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	20

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Supplemental Table :

Supplemental Table. Correlation between different age categories and patients' knowledge (drugs and indications cited) (N = 100)

	Age (years)	[30-59] N=10	[60-69] N=28	[70-79] N=46	[80 and more] N=16	p-value
Percentage of drugs cited	Median	83.3	46.4	40.0	28.6	0.0193
	[Q1;Q3]	[66.7;100.0]	[29.7;74.3]	[18.2;71.4]	[0.0;66.4]	
	[Min-Max]	[20.0 ;100.0]	[0.0;100.0]	[0.0;100.0]	[0.0;100.0]	
Percentage of known indications	Median	100.0	75	80.9	84.5	0.0761
	[Q1;Q3]	[82.4;100.0]	[55.2;90.5]	[54.5;100.0]	[39.4;100.0]	
	[Min-Max]	[60.0;100.0]	[23.1;100.0]	[0.0;100.0]	[0.0;100.0]	

Q1 : First Quartile ; Q3 : Third quartile ; Min : minimum ; Max : maximum

Supplemental Files 1 : Global questionnaire

Patient n°:

Length of the interview:

Socio-demographic information :

Gender: Age: Lifestyle: Married Single Children

Origins:

Level of study:

Socio-professional category: Farmer Craftsmen, Shopkeeper, Compagny managers

Executives, Higher intellectual professions Professions intermédiaires

Employees Workers Other:.....

Chronic treatment :

Number of medications on the prescription:

How long have you been taking your first chronic treatment?

Informations :

- Have you ever had your treatments explained to you? Yes No
- Do you feel you have received enough information about your treatments? Yes No
- From whom did you get information about your treatments?
 - Specialist
 - General practitioner
 - Pharmacist
 - Family

Treatment management :

- Who manages your treatments?
 - Myself
 - A nurse
 - A family member

Supplemental Files 2 : Belief Medical Questionnaire

Patient n°:

Score:

1: Totally disagree, 2: Disagree, 3: Uncertain, 4: Agree, 5: Totally agree

Specific Beliefs :

1. My health, at present, depends on my medicines:
2. Having to take medicines worries me:
3. My life would be impossible without my medicines:
4. Without my medicines I would be very ill:
5. I sometimes worry about long-term effects of my medicines:
6. My medicines are a mystery to me:
7. My health in the future will depend on my medicines:
8. My medicines disrupt my life:
9. I sometimes worry about becoming too dependent on my medicines:
10. My medicines protect me from becoming worse:

General Beliefs :

11. Doctors use too many medicines:
12. People who take medicines should stop their treatment for a while every now and again:
13. Most medicines are addictive:
14. Natural remedies are safer than medicines:
15. Medicines do more harm than good:
16. All medicines are poisonous:
17. Doctors place too much trust in medicines:
18. If doctors had more time with patients, they would prescribe fewer medicines:

Supplemental Files 3 : GIRERD questionnaire

Assessment of medication compliance

Patient n° :

	YES	NO
Did you forget to take your medication this morning?		
Since your last visit, have you run out of medication?		
Have you ever been late taking your medication?		
Have you ever not taken your medication because your memory fails you some days?		
Have you ever not taken your medication, because some days you feel that your treatment is doing you more harm than good?		
Do you think you have too many pills to take?		

Supplemental Files 4 : The local ethics committee

AVIS 22-06-2201

Groupe Nantais d'Ethique dans le Domaine de la Santé (GNEDS)

Nom du protocole Code et versioning	Croyances et représentations chez les patients polymédiqués en chirurgie et médecine vasculaire
--	--

Investigateur principal	Dr JF HUON
Lieu de l'étude	CHU NANTES
Type de l'étude	Monocentrique, prospective, exploratoire, observationnelle
Type patients/participants	Patients polymédiqués hospitalisés en chirurgie et médecine vasculaire
Nombre de patients/participants prévus	100
Objectif principal	Evaluation de la croyance des patients sur leurs traitements habituels
Objectif secondaire	Connaissance et importance données par le patient à chacun de ses traitements Adhésion médicamenteuse

Documents communiqués

Justification de l'étude	OUI
Méthodologie	OUI
Lettre d'information et lettre de consentement	OUI

Remarque générale

Le GNEDS formule d'abord la remarque qu'il n'a pas pour mission de donner un avis sur les aspects scientifiques du protocole, en particulier sur l'adéquation de la méthodologie aux objectifs poursuivis par l'étude. Il ne tient compte des données d'ordre scientifique et méthodologique que dans la mesure où elles ont des implications d'ordre éthique. Dans le cas présent, il se bornera à constater que les objectifs de cette étude et sa méthodologie sont conformes aux principes de l'éthique.

Confidentialité

Confidentialité	OUI
Anonymat	OUI
CNIL	RGPD

Commentaires :

Information et consentement*Consentement :*

Recueil nécessaire	OUI
Type consentement préférable	ORAL
Traçabilité dans le dossier	NA

Commentaires :

Lettre information précisant :

Titre de l'étude	OUI
But de l'étude	OUI
Déroulement de l'étude	OUI
Prise en charge courante inchangée	OUI
Possibilité de recevoir résultats de l'étude	OUI
Traçabilité dans le dossier	NA

Commentaires :

Conclusion

Avis favorable	OUI
Révision nécessaire selon commentaires	
Avis défavorable	

GNEDS : Professeur Paul BARRIERE

Nantes le 22 juin 2022



BMJ Open

An observational and prospective study: Evaluation of beliefs and representations of chronic treatments of polymedicated patients hospitalized in medicine and vascular surgery

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2023-073250.R1
Article Type:	Original research
Date Submitted by the Author:	30-Aug-2023
Complete List of Authors:	Kotry, Dounia; University Hospital Centre Nantes, Saillard, Justine; CHU Nantes, Pharmacy Bonsergent, Marion; CHU Nantes, Pharmacy Volteau, Christelle; Centre Hospitalier Universitaire de Nantes Benichou, Antoine; CHU Nantes, Internal Medicine Prot-Labarthe, Sonia; Nantes Université, Pharmacie; ECEVE HUON, Jean-François; University Hospital Centre Nantes, Clinical Pharmacy; University of Nantes, Faculty of Pharmacy, Clinical Pharmacy department
Primary Subject Heading:	Cardiovascular medicine
Secondary Subject Heading:	Patient-centred medicine
Keywords:	Patient-Centered Care, CLINICAL PHARMACOLOGY, Patient Reported Outcome Measures

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4 1 **An observational and prospective study: Evaluation of beliefs and**
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14 5 Dounia KOTRY¹, Justine SAILLARD¹, Marion BONSERGENT¹, Christelle VOLTEAU²,

16 6 Antoine BENICHO³, Sonia PROT-LABARTHE⁴, Jean-François HUON⁵
17
18
19

20 7
21 8 **University degree:**
22
23 9

24 10 Dounia KOTRY, PharmD

25 11 Justine SAILLARD, PharmD

26 12 Marion BONSERGENT, PharmD

27 13 Christelle VOLTEAU

28 14 Antoine BENICHO, MD

29 15 Sonia PROT-LABARTHE, PharmD, PhD

30 16 Jean-François HUON, PharmD, PhD
31
32
33
34
35
36
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38
39
40
41
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43
44

45 18 **Affiliations:**

46 19 1. Nantes Université, CHU Nantes, Pharmacie, F-44000, France

47 20 2. Plateforme de Méthodologie et Biostatistique, DRi du CHU de Nantes, Nantes, France

48 21 3. Nantes Université, CHU Nantes, Médecine interne, F-44000, France

49 22 4. Nantes Université, CHU Nantes, Pharmacie, F-44000, France, Université Paris Cité,

50 23 INSERM, ECEVE, F-75010 Paris, France
51
52
53
54
55
56
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1
2
3 24 5. Nantes Université, Univ Tours, CHU Nantes, CHU Tours, Pharmacie, INSERM, MethodS
4
5
6 25 in Patients-centered outcomes and HEalth Research, SPHERE, F-44000 Nantes, France
7
8
9 26

10 27 **Corresponding author:**

11
12
13 28 Dounia KOTRY, dounia.kotry@gmail.com
14

15 29 **Mails:**

16
17
18 30 Justine SAILLARD: justine.saillard@chu-nantes.fr
19

20 31 Marion BONSERGENT: marion.bonsergent@chu-nantes.fr
21

22 32 Christelle VOLTEAU: christelle.volteau@chu-nantes.fr
23

24 33 Antoine BENICHO: antoine.benichou@chu-nantes.fr
25

26
27 34 Sonia PROT-LABARTHE: sonia.protlabarthe@chu-nantes.fr
28

29 35 Jean-François HUON: jeanfrancois.huon@chu-nantes.fr
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32 36 **Abstract**

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36 37 **Objectives:** Today, the involvement of patients in their care is essential. As the population ages
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40 38 increases, the number of patients with chronic diseases is increasing. In the medical and
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43 39 vascular surgery departments, patients are polymedicated and mostly suffer from several
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46 40 chronic diseases. Approximately 50% of patients with a chronic disease are not adherent.
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50 41 Among the factors that can influence therapeutic adherence are the beliefs and representations
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53 42 of patients. To evaluate the beliefs and representations of chronic treatments in patients with
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56 43 multiple medications and hospitalized in a vascular medicine and surgery department, and to
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4 44 evaluate the medication adherence, the knowledge, and the importance patients attach to their
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7 45 treatments.

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10 46 **Design:** Observational, prospective and a single-center study.

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13 47 **Setting:** The study was conducted in a French tertiary hospital center of around 3000 beds in 9
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17 48 institutions.

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21 49 **Participants:** Adult polymedicated (i.e minimum of 5 chronic treatments) patients hospitalized
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24 50 in the surgical and vascular medicine department were included after application of the
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27 51 exclusion criteria.

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30 52 **Methods:** Patient interviews were carried out in the department and were based on three
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34 53 interviewer administered questionnaires (a global questionnaire, the Belief Medical
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37 54 Questionnaire (BMQ) and the GIRERD questionnaire).

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40 55 **Results:** Our study showed that patients perceived their treatments as beneficial rather than
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44 56 worrying. A correlation between medication adherence and beliefs was observed. "Non-
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47 57 adherent" patients had a more negative overall view of medication than "adherent" patients.
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50 58 The level of compliance and knowledge of our patients was low. Only 11% of the patients were
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54 59 "good adherent", 16% of the patients could perfectly name their treatment and 36% knew all
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57 60 the indications.

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4 61 **Conclusion:** Knowledge of treatment representation and beliefs are central to understanding
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7 62 patient behaviour. Considering patients' representations will allow the identification of levers,
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10 63 and the development of actions and educational tools adapted to improve their adherence, their
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13 64 knowledge and therefore their drug management.

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17 65 Data availability statement: Data are available upon reasonable request
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21 22 23 24 67 **Strengths and limitations of this study**

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28 68 • This study aimed to explore the representation and beliefs of chronic treatments in
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31 69 patients with multiple medications in a vascular medicine and surgery department.
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35 70 • Study assessing the links between representations, beliefs, adherence medication and
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38 71 patients' knowledge of their chronic treatments.
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41 72 • However, it is important to note that this is a single-center study, which may limit the
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45 73 generalizability of the findings to other settings.
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74 **Introduction**

75 According to the World Health Organization (WHO) (1), a chronic disease is a long-term
76 condition that usually progresses slowly and requires long-term treatment and care. It is also
77 characterized by its impact on the quality of life of patients. Twenty million French people are
78 affected by a chronic disease (1). They represent 77% of all diseases, the most important of
79 which are cardiovascular, cerebral, respiratory, metabolic and malignancies (2). Today, the
80 prevalence of chronic diseases is rising sharply and can be explained by the aging of the
81 population and the increase in life expectancy. They are therefore among the most common
82 health care problems, with a major impact on public health and the economy (3).

83 In vascular medicine and surgery, the majority of patients have one or more chronic diseases
84 and are polymedicated (4). Polymedication is defined as "the administration of many drugs
85 simultaneously or the administration of an excessive number of drugs" (5,6). Furthermore, all
86 chronic diseases require long-term management with an investment by both healthcare
87 professionals and the patient. For this, a good level of information on the disease and treatments
88 is necessary for the patient to avoid the risks of poor compliance. According to the WHO (7),
89 50% of patients do not adhere to their chronic treatment, even though this adherence is essential
90 for the control of the chronic disease. Indeed, loss of adherence to treatment leads to a decrease

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3 91 in therapeutic efficacy and exposes the patient to complications of their disease and to
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7 92 therapeutic failure (7).
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10 93 The representations of treatments are factors that influence therapeutic adherence (8). This
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13 94 refers to each individual's knowledge, explanations and ideas about his disease.
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16 95 Representations are linked to the patient's behaviour, cultural, social and family background,
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20 96 education, professional activity, etc. (9). They have multiple origins and varies from one
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23 97 individual to another. Today, the representation of the disease, but also of treatments, is central
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27 98 to understanding the behaviour of patients in their health care journey. Representations and
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30 99 beliefs have been studied in certain chronic diseases, notably HIV, diabetes, hypertension,
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33 100 asthma, etc. (9-12).
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37 101 However, to our knowledge, they have not been studied in the medical and vascular surgery
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40 102 fields, when it comes to hospitalized patients with multiple medications.
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44 103 The main objective of this study was to evaluate the beliefs and representations of chronic
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47 104 treatments in multi-medicated patients hospitalized in surgery and vascular medicine. Secondly,
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50 105 the patients' knowledge of their treatments, the importance given by the patient to each of their
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53 106 treatment and the medication adherence were assessed.
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58 107 **Material and methods**

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4 108 This was an observational, prospective, single-center study conducted in a French tertiary
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7 109 hospital center of around 3000 beds in 9 institutions.
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10 110 Patients included had to be over 18 years of age and hospitalized in the surgical and vascular
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13 111 medicine department, which comprises 28 beds. Patients had to be polymedicated prior the
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17 112 hospitalization. Drawing on literature data (5) and the experience of our medication
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20 113 reconciliation activity, the threshold of five medications as a reference to designate
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23 114 polymedicated patients was established.
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27 115 Patients who were unable to participate in an interview because of cognitive impairment or
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30 116 language barrier were not included. All patients underwent a medication review on admission
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34 117 to the vascular medicine and surgery department to obtain a complete record of their usual
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37 118 treatment. The patient inclusion period was from early March 2022 to late June 2022. All
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40 119 participants provided oral consent.
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44 120 The study was based on three questionnaires completed during the patient's hospitalization. All
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47 121 questionnaires were interviewer administered and concerned the treatments patients were
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50 122 taking prior to hospitalization.
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54 123
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57 124 1/ a global questionnaire regarding the patient's sociodemographic data, their usual treatments
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60 125 identified by the reconciliation and their medication management, the information received

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4 126 about his treatments, the knowledge he had of his treatments (name and indication) as well as
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7 127 the importance he gave to each medication (scored from 1 to 10).
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10 128 2/ the BMQ (Belief Medical Questionnaire). It allows for the evaluation of different specific
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12
13 129 dimensions of patients' beliefs about their medical treatments. It consists of 18 items divided
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15
16
17 130 into two parts: specific beliefs (patients' representations of their medical prescriptions - 10
18
19
20 131 items) and general beliefs (beliefs in medicine in general - 8 items). A 5-point Likert scale was
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23
24 132 used for the responses. For each question, a total score was calculated by adding the item scores.
25
26
27 133 Each specific belief could get a score between 5 and 25, and each general belief a score between
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29
30 134 4 and 20. The higher the scores, the more important the beliefs are. For specific beliefs, a
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34 135 differential score is calculated by subtracting the specific concern from the specific need. A
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37 136 score greater than 0 means that the perceived need for treatment is greater than the concerns.
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40 137 The validated French version of this questionnaire was used (10).
41
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44 138 3/ the validated GIRERD medication adherence questionnaire, composed of 6 items (13).
45
46
47 139 GIRERD score: six negative ("no") responses: patient is "good adherent". Four or five "no"
48
49
50 140 responses: patient is "low-adherent ". Two or three "no" responses: the patient is "non-
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52
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54 141 adherent".
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57 142 The interviews were conducted by the first author.
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3 143 Characteristics of the patients and the drugs were presented with mean, standard deviation,
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5 144 minimum and maximum for the quantitative variable and with frequency and percentage of
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8 145 each category. Spearman's correlation coefficient were used to measure association between
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11 146 two continuous variables. Comparison of groups were performed using Chi-squared tests for
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14 147 categorical variables and using ANOVA, or Kruskal-Wallis tests for continuous variables,
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18 148 depending of the normality of not of the distribution. The statistical significance was established
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21 149 with a threshold to 5%. All analyses were performed using SAS® version 9.4 software.

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25 150 This study was approved by the local ethics committee (Groupe Nantais d'Ethique dans le
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28 151 Domaine de la Santé) on June 22th 2022 (GNEDS 20220622).

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31 152 Patient and Public Involvement: No patient involved
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36 153 **Results**

37 154 **Characteristics of the patients and their treatments**

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40 155 Over the period, three hundred sixty five patients underwent a medication reconciliation. Of the
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43 156 patients eligible and available at the time of service, one hundred patients were included in the
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49 157 study. All patients completed the study and were analyzed. The characteristics of the patients
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53 158 and their treatments are presented in *Supplemental Table 1*. Patients reported being treated for
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56 159 an estimated period of 19.4(± 12.4) years. On average, 9.4 (± 3.6) drugs were prescribed
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59 160 simultaneously, mostly for cardiovascular (32%), digestive (19.8%) or neurological (18%)

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4 161 diseases. The majority of patients were informed about their treatments by a doctor, but more
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7 162 than a quarter (27%) felt the need for more information.
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10 163 Women felt that they received less information about drugs from healthcare professionals than
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13 164 men (48.4% vs. 71.0%, $p = 0.0292$).
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18 166 **Beliefs**

21 167 The results of the BMQ questionnaire for the population are presented in *Figure 1* and the BMQ
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25 168 score values are detailed in *Table 1*. Overall, patients said that their medication helped them not
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28 169 to feel worse, that without it they would be sicker or that their life would be impossible. They
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32 170 were aware that their future life depended on taking them. However, almost one in three patients
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35 171 felt that doctors were too trusting of medication, and that they would prescribe less if they had
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38 172 more time. The BMQ scores clearly show that the balance of benefits and risks perceived by
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42 173 the patients is clearly in favor of taking the treatments for 96% of them.
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45 174 The more medications patients took, the more they believed in the importance of their treatment
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48 175 ($r = 0.27$, $p = 0.0064$). Women believed more in the harm of treatments ($p = 0.0352$) and in the
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52 176 overuse of drugs than men ($p = 0.0170$)
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58 178 **Compliance**
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4 179 The responses to the GIRERD questionnaire are presented in *Table 2*. Only 11% of patients had
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7 180 good medication adherence with their treatments according to the questionnaire score. One in
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10 181 10 was considered totally non-adherent.

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13 182 The more a good medication adherence patients have, the more they believed in the importance
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17 183 of their medication ($p = 0.0039$).

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20 184 No significant association was found between the level of medication adherence and age ($p =$
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23 185 0.50), level of education ($p = 0.52$) or number of medications ($p = 0.0733$).

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28 29 187 **Knowledge**

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33 188 On average, patients were able to name 49.3% of their treatments. Sixteen percent of patients
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36 189 could name all of their treatments, while 11% of patients could not name any of their treatments.

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39 190 On average, patients knew 73.1% of the indications for all their usual treatments. When 32
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43 191 patients were able to name all the indications of their medication, 3 patients could not name
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46 192 any.

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49 193 Several correlations were found, notably between age and patient knowledge (*Supplemental*
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52 194 *Table 2*), but also with educational level. Indeed, patients with higher education knew more
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56 195 about the indications of their treatments (mean= 85.1±22.8) than patients with no education
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59 196 (mean= 40.9±29.4) ($p = 0.0017$).

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4 197 The least cited drug classes were anti-histamines for systemic use (28.6%), analgesics (26.8%),
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7 198 anti-anemic preparations (24.0%) and ophthalmic drugs (20%).
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10 199 Among the most prescribed drug classes, the most cited were anti-thrombotics (64.7% of the
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13 200 116 prescriptions), beta-blockers (55.9% of the 59 prescriptions), drugs acting on the renin
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17 201 angiotensin system (49.3% of 67 the prescriptions) and anti-diabetics (46.8% of the 62
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20 202 prescriptions).
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23 203 The drug classes for which patients demonstrated inadequate knowledge regarding their
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27 204 indications primarily included cardiology drugs (60%), anti-anemic preparations (48%),
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30 205 diuretics (47.5%), beta-blockers (45.8%) and lipid-lowering drugs (45%).
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33 206 When patients were asked about their treatments, a large proportion did not spontaneously
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37 207 mention the drugs they took "if needed", in particular analgesics (26,8% of the 82 prescriptions)
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40 208 such as paracetamol or symptomatic drugs such as antihistamines (28,7% of the 14
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43 209 prescriptions).
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47 210 A comparison between beliefs, compliance and knowledge was made. The results obtained are
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50 211 detailed in *Table 3*. For patients with low adherence, the more they knew the indications of their
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53 212 treatments, the less they feared their harmfulness. And the more they knew how to name
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57 213 treatments, the less they feared overuse.
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215 **Importance ratings**

216 Fourteen patients were unable to rate the importance of their treatment because they felt that all
217 their medications were equally important.

218 Out of the most prescribed drug classes, two had a median importance score of less than 6:
219 nasal preparations (3 prescriptions, median score 5.0) and constipation medications (13
220 prescriptions, median score 5.5). Those with the highest importance scores were antidiabetics
221 (62 prescriptions, median score 9.5), immunosuppressants (10 prescriptions, median score 10),
222 and antithrombotics (116 prescriptions, median score 9).

223 Symptomatic medications scored high in importance. Analgesics (82 prescriptions),
224 antihistamines (14 prescriptions), and medications for acid-related disorders (52 prescriptions)
225 all received a median score of 8.

226 There was no significant correlation between median patient ratings and compliance ($r = -0.13$,
227 $p = 0.3623$).

228 **Discussion**

229 Our study showed that patients perceived their treatments as beneficial rather than worrying. A
230 correlation between medication adherence and beliefs was observed. "Non-adherent" patients

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4 231 had a more negative overall perception of medication compared to "adherent patients". The
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7 232 level of medication adherence and knowledge of our patients was low. Only 11% of the patients
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10 233 had "good medication adherence", 16% of the patients could perfectly name their treatment and
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13 234 36% knew all the indications.
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17 235 In recent years, several studies have assessed treatment representations and their influence on
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20 236 medication adherence. However, to our knowledge, this study is the first to examine patients'
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23 237 beliefs about their chronic treatment in relation to their knowledge and medication adherence
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27 238 in a vascular medicine and surgery department.
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30 239 Our results regarding the importance attributed by patients to their chronic medication are
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33 240 consistent with the data found in the literature. French studies have evaluated the representation
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37 241 of treatments in chronic pathologies, particularly in asthma (12), diabetes and HIV (10), and
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40 242 bronchopulmonary cancer (14). All these studies have highlighted the importance that patients
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44 243 attach to their medication. Therefore, patients perceive their treatment as beneficial rather than
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47 244 worrisome. Indeed, in our study, 77% of patients were not worried about taking medication and
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50 245 76% were not disturbed by medication in their daily lives.
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54 246 Several studies have demonstrated a correlation between patients' representations of their
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57 247 treatment and the level of medication adherence. Horne *et al.* established this link for each of
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60 248 the chronic pathologies studied via the BMQ questionnaire in a cohort of 324 patients with

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4 249 diverse chronic diseases (asthma, oncology, cardiac and renal diseases). Indeed, the "necessity"
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7 250 score was correlated with good medication adherence and the "concern" score was related to
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10 251 poor medication adherence in each of the diseases studied (11). Although our results could not
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13 252 show a significant correlation but a trend towards the same result. Conducting disease-specific
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17 253 analyses with larger sample sizes could confirm this trend.

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20 254 A French study also explored correlations between beliefs and medication adherence among
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23 255 patients with chronic diseases in general medical practices (15). Of the 265 patients included in
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27 256 the study, 40.8% had good medication adherence, 53.2% were "moderately adherent" and 6%
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30 257 were "non-adherent". In our study, only 11% of patients were "good adherent". This can be
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33 258 partially explained by a significant difference in the average number of medications taken by
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37 259 patients. In their study, patients had an average of 3.6 ± 2.6 medications, almost three times less
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40 260 than in our study. One of the 6 questions of the GIRERD questionnaire related to the amount
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43 261 of medication to be taken: "Do you think you have too many pills to take" and 67% of our
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47 262 patients answered "yes". This may explain the low rate of "good adherent".

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50 263 Deat *et al.* highlighted a significant correlation between the degree of adherence and the BMQ
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53 264 scores "concerns", "harmfulness" and "overuse", supporting the trend shown in our study. The
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57 265 absence of a statistical significance could be explained by an important difference in the number
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60 266 of patients in each compliant group. Only ten patients were "non-adherent". Regarding the

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4 267 concerns of "non-adherent" patients, our results are consistent with their study: patients were
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7 268 more concerned with their treatment, which may have an impact on medication adherence.
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10 269 Fall *et al.* conducted a study among diabetic and HIV patients (10). A disease-specific analysis
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13 270 demonstrated significant correlations between medication adherence and the necessity and
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17 271 worry scales. Thus, negative beliefs were predictive of poor adherence. "Non-adherent"
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20 272 patients would therefore have a more negative overall view of medication than adherent
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23 273 patients.
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27 274 According to the study by Huon *et al.* (16), the average number of medications taken by the
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30 275 elderly is 8 in the 70–80-year-olds, 9.61 in the 80–90-year-olds, 9.92 in the 90–100-year-olds
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34 276 and 8.11 for the over 100-year-olds. Overall, the increase in medication use varies as the
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37 277 population ages. Our patients, with an average age of 70.8 years, took an average of 9.7
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40 278 medications. Unfortunately, the higher the number of medications, the higher the risk of
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44 279 forgetting or not taking the treatments (17). This high number of medications also has a role in
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47 280 patients' knowledge and beliefs. Our results demonstrated that the more medications patients
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50 281 took, the less they knew about their names and indications. These results are consistent with
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54 282 those reported in the literature (18).
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57 283 One study showed that knowledge of drug indications varied based on the ATC class. Indeed,
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60 284 the drug classes where indications were not known included cardiovascular drugs (12%),

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4 285 asthma drugs (5%) and estrogen therapies (5%) (19). In our study, we also noted that indications
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7 286 for cardiovascular drugs were the least known. This observation aligns with the fact that patients
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10 287 in the vascular medicine department have many cardiology medications. It is therefore essential
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13 288 that caregivers take sufficient time with patients to educate and involve them in their care.
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16 289 Persall *et al.* (19) also revealed that the older and less educated the patients were, the less they
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20 290 knew about their treatments. Our results support these findings.
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23 291 Only 16% of patients could perfectly name their treatment and 36% knew all the indications.
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26 292 In general, the level of knowledge of patients about their treatment was low. However,
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30 293 comparing our results to existing literature is challenging due to disparities in the number of
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33 294 drugs per patient and the number of patients included. Akici *et al.* (20) showed, in a study
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36 295 including 1618 patients with an average of 3.3 drugs per patient, that only 10.9% of patients
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40 296 could correctly name their treatment. Given the average number of medications taken by the
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43 297 patients in our study, over 9, it seems normal that the number of patients who could cite their
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46 298 entire treatment is low in our results. The study by Haidar-Ahmad *et al.* including 351 patients,
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50 299 with a mean number of medications taken of 3.83, described that 80.74% of the medications
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53 300 were known by the patients (21). Persall *et al.*, included 616 patients in their study. Only 13.5%
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56 301 of patients did not know any of the indications. They also noted a significant lack of knowledge
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60 302 of their patients for cardiovascular medications (19).

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4 303 Although patient knowledge levels and medication adherence were low, the importance they
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7 304 attached to their treatment was high. Patient ratings indicated that the majority of prescribed
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10 305 drug classes were considered important to them. Only four ATC classes scored below average.
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13 306 This outcome confirms the "necessity" score obtained in the BMQ questionnaire. A French
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17 307 study assessed drug-related representations in patients with multiple myeloma (22). The authors
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20 308 estimated the importance the patient placed on his or her medications. Antithrombotic drugs,
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23 309 unlike our study, were rated lower, whereas anticancer drugs scored highest. This significant
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27 310 difference between medications that are all part of the overall management of myeloma could
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30 311 be explained by the degree of information provided to patients. Indeed, while the direct link
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33 312 between anticancer drugs and myeloma can easily be made, the link between antithrombotic
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37 313 drugs and the fatal consequences of myeloma is less intuitive. Our work reports on patients with
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40 314 multiple and varied chronic pathologies, with a large number of prescribed medications.
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44 315 Despite this, few differences were observed between ATC classes and therefore chronic
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47 316 pathologies. For a majority of patients, all treatments carried equivalent importance. Indeed,
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50 317 even if the patients did not spontaneously cite their symptomatic treatments, they gave them a
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54 318 high importance. This is due to the perceived immediate effect of using these treatments. This
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57 319 finding is in alignment with another study (23) which demonstrated that patients exhibited
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60 320 greater familiarity with analgesics compared to cardiovascular drugs, as they could directly

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4 321 sense their effects. Notably, in our study, patients were very familiar with the effects of their
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7 322 symptomatic medications but did not cite them directly. This individual perception of treatment
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10 323 efficacy has been described as a determining factor in patient adherence to medication (24).

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13 324 Moreover, if representations about treatments impact patient adherence, adherence is also
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17 325 determined by the relationship of trust with the physician. Several studies have shown that the
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20 326 relationship between the physician and the patient has a significant impact on the feeling of
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24 327 usefulness and efficacy of the treatment, but also on adherence (25). Research has indicated
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27 328 that patients exhibit improved medication adherence when they possess sufficient information
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30 329 and a clear understanding of the rationale behind their treatment (26). As described by Peh et
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34 330 al. in their study, various factors contribute to therapeutic adherence, include healthcare
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37 331 professionals. For them, medication adherence depends on patients' perceived needs and beliefs
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40 332 about medication, which are, in turn, influenced by the information and advice provided by the
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44 333 healthcare provider during the medical consultation (27). In our study, the majority of patients
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47 334 reported receiving information about their treatment, but one third felt that this was not
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50 335 sufficient.

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54 336 In our study, we were interested in the link between beliefs and adherence. Nevertheless,
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57 337 therapeutic adherence represents a multifaceted behavior shaped by a multitude of factors;
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60 338 factors linked to the patient (age for example, beliefs), to the care team (information), to the

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4 339 disease (asymptomatic or symptomatic), to the treatment (undesirable effects or not), and to
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7 340 social and economic factors (24,27). With enhanced information, efficacious, and secure for
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10 341 their well-being. Consequently, this perception aids in optimizing their medication-taking
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13 342 behavior over an extended period (24).

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16 343 Assessing patients' beliefs would allow us to better target their priorities, and thus to develop
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19 344 adapted educational actions and tools. Indeed, understanding the mechanisms and potential
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22 345 evolution of the disease will make it easier for patients to assimilate the objectives of their
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25 346 treatments and will facilitate their therapeutic adherence (28).

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35 350 **Strengths and biases**

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38 351 To our knowledge, the representation and beliefs of chronic treatments have not been studied
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43 352 in a vascular medicine and surgery department, in patients with multiple medications and
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46 353 cardiac pathologies. This is a single-center study. It would be of interest to replicate this
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49 354 investigation across multiple centers to achieve outcomes that are both generalizable and
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52 355 transferable.

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55 356 In our study, the BMQ was used for a combination of several diseases, whereas its French
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58 357 version has only been validated for diabetes and HIV (10). Thus, patients with several chronic
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4 358 diseases may not have the same representations regarding the treatments for each disease. The
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7 359 scores given by patients on each of their treatments were used to estimate the level of
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10 360 importance given to each medication. Notably, a predominant observation was that for the
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13 361 majority of patients, all their prescribed medications were perceived as equally significant,
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17 362 potentially indicating an absence of prioritization.

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20 363 Another limitation inherent in our study pertains to the exclusive utilization of a questionnaire
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23 364 to assess adherence, despite the availability of various adherence measurement methods (both
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27 365 direct and indirect). While the questionnaire presents a straightforward, swift, and cost-effective
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30 366 technique, its stand-alone use is less robust. Many authors recommend using at least two
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33 367 methods. In addition, the use of questionnaires tends to overestimate medication adherence (29)
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37 368 which may seem worrying in view of the already low adherence reported in our results. In the
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40 369 context of short-stay inpatients, it was not possible to use direct methods (drug measurements,
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43 370 biological marker measurements), or to use any other indirect method than the questionnaire.
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47 371 Moreover, this would have lengthened the interview time with the patients and thus made the
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50 372 procedure more cumbersome.

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53 373 Concerning the evaluation of knowledge, the hospitalization of our population certainly had an
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57 374 impact on the real knowledge of the patients about their treatment. In discussion with the
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60 375 doctors, we reached this limit in our study. Being in a stressful environment, in a context of

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4 376 acute pathology, could potentially have decreased their true knowledge of the names and
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7 377 indications of their treatment, inducing a bias.
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10 378 One of the exclusion criteria for the study was cognitive impairment. This was assessed
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13 379 clinically but was not confirmed by a specific assessment test such as Mini Mental State
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17 380 Examination (MMSE). This would have again made the protocol and interviews more
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20 381 cumbersome.
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25 382 **Conclusion**

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31 383 The level of knowledge and medication adherence of patients with multiple chronic diseases in
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34 384 surgery and vascular medicine is low. Representations of the disease and of medication have
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37 385 an impact on patients' behaviour. They are determinants of adherence to medication. Identifying
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41 386 patients' beliefs about their chronic treatment allows caregivers to adapt information to patients'
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44 387 needs. Better information from healthcare professionals (physician, nurse, pharmacist, etc.)
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47 388 regarding the indication and efficacy of the prescribed treatment is essential. Combined with
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51 389 the consideration of patients' concerns, particularly regarding tolerance, this will improve the
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54 390 benefit/concern ratio perceived by these patients, and thus increase their compliance. The BMQ
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57 391 may help to identify patients at risk of poor compliance.
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24
25 401 analysis were performed by CV and DK. The first draft of the manuscript was written by DK
26
27
28 402 and JS, MB, AB, SPL, CV and JFH commented on previous versions of the manuscript. All
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30
31
32 403 authors read and approved the final manuscript.
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39 405 **Competing interests**
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47

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4 411 **Data sharing statement**
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7 412 The data underlying this article will be shared on reasonable request to the corresponding
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9 413 author.
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504 **Legends**

505 **Figure 1:** Responses to the BMQ questionnaire (percentage of responses among the 100
506 patients)

For peer review only

507 **Tables**508 **Table 1. BMQ score results - Beliefs**

BMQ* - Beliefs	N = 100	Male N = 69	Female N = 31	p-value
Specific Beliefs - Necessity	21.9±3.5 [8.0;25.0]	21.7±3.6	22.2±3.1	0,4822
Specific Beliefs - Concerns	11.1±4.8 [5.0;23.0]	10.5±4.4	12.5±5.5	0.0509
General Beliefs - Harm	9.1±3.2 [4.0;17.0]	8.6±3.0	10.1±3.5	0.0352
General Beliefs - Overuse	10.3±3.4 [4.0;17.0]	9.8±3.4	11.5±3.3	0.0170
BMQ Necessity - BMQ Concern > 0†	96 (96.0%)	66 (95.7%)	30 (96.0%)	1.0000

509 Results are presented as mean ± standard deviation [minimum-maximum] or frequencies and percentages

510 Specific belief scores range from 5 to 25 and general belief scores range from 4 to 20. A high score indicates a
511 strong belief.

512 *BMQ: Belief Medical Questionnaire

513 †BMQ "necessity" - BMQ "concern" > 0 means that the beneficial character is superior to the worrying character.

514 **Table 2. Responses to the GIRERD questionnaire and correlations between compliance and**
 515 **beliefs (N=100)**

Questions and number of positive responses				N (%)
Did you forget to take your medication this morning?				1 (1.0%)
Since your last visit, have you run out of medication?				7 (7.0%)
Have you ever taken your medication late compared to the usual time?				43 (43.0%)
Have you ever not taken your medication because your memory fails you some days?				23 (23.0%)
Have you ever not taken your medication because some days you feel that your medication is doing you more harm than good?				9 (9.0%)
Do you think you have too many pills to take?				61 (61.0%)
	Good adherent	Low adherent	Non-adherent	p-value
	N = 11 (11.0%)	N = 79 (79.0%)	N = 10 (10.0%)	
Specific Beliefs - Necessity	21.0 [6.0;12]	23.0 [21.0;25.0]	23.0 [16.0;24.0]	0.6487
Specific Beliefs - Concerns	9.0 [6.0;12.0]	11.0 [6.0;14.0]	17.0 [9.0;20.0]	0.1163
BMQ Necessity - BMQ Concern > 0†	11 (100.0%)	78 (98.7%)	7 (70.0%)	0.0039
General Beliefs - Harm	9.0 [6.0;12.0]	8.0 [6.0 ;11.0]	11.5[9.0 ;16.0]	0.0739
General Beliefs - Overconsumption	8.0 [5.0 ;12.0]	10.0 [8.0 ;13.0]	13.0 [9.0 ;16.0]	0.1086

516 The results are presented in median [1st Quartile; 3rd Quartile] for quantitative variables and in the form of
 517 frequencies (%) for qualitative variables

518 Specific belief scores range from 5 to 25 and general belief scores range from 4 to 20. A high score indicates a
 519 strong belief.

520 †BMQ "necessity" - BMQ "concern" > 0 means that the beneficial character is superior to the worrying character.

521 BMQ: Belief Medical Questionnaire

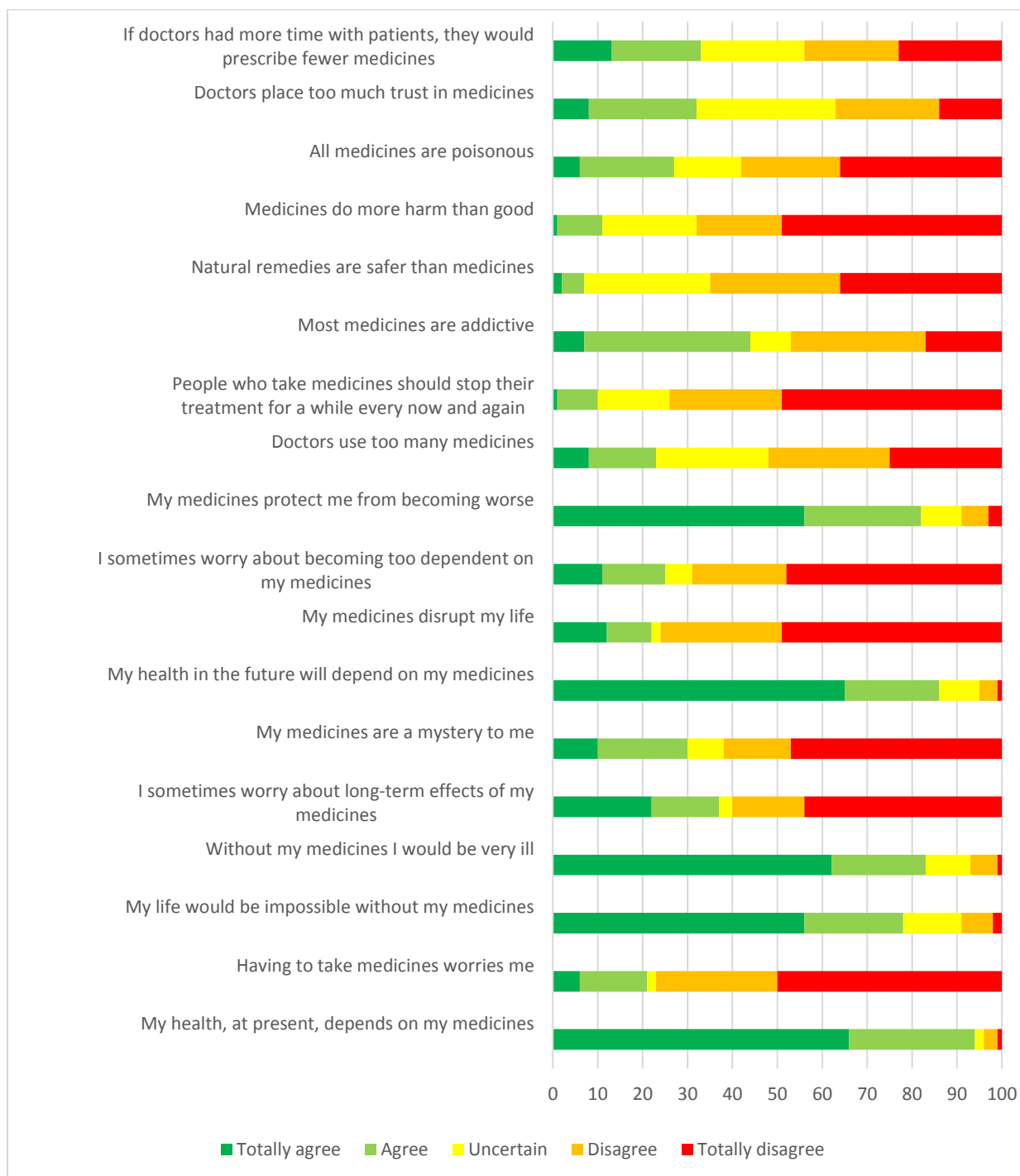
522 **Table 3.** Correlation between adherence, beliefs and knowledge about their treatments for the
 523 100 patients

524

	Beliefs	Drugs mentioned		Known indications	
		r	p	r	p
Good adherent (N=11)	Specific Beliefs - Necessity	-0.22	0.5220	0.17	0.6185
	Specific Beliefs - Concerns	-0.01	0.9837	-0.11	0.7403
	General Beliefs - Harm	0.07	0.8488	0.15	0.6686
	General Beliefs - Overuse	0.37	0.2651	0.26	0.442
Low adherent (N=79)	Specific Beliefs - Necessity	0.01	0.9540	-0.07	0.5457
	Specific Beliefs - Concerns	-0.12	0.2994	-0.11	0.3491
	General Beliefs - Harm	-0.21	0.0689	-0.30	0.0069
	General Beliefs - Overuse	-0.23	0.0401	-0.21	0.0630
Non-adherent (N=10)	Specific Beliefs - Necessity	-0.35	0.3216	-0.43	0.2149
	Specific Beliefs - Concerns	0.41	0.2434	0.44	0.2064
	General Beliefs - Harm	0.21	0.5643	0.57	0.0858
	General Beliefs - Overuse	0.38	0.2726	0.47	0.1677

525

Figure 1: Responses to the BMQ questionnaire (percentage of responses among the 100 patients)



Supplemental Table :

Supplemental Table 1. Characteristics of the population (N=100) and the drugs (N=965)

Characteristics of patients	N=100
Female sex	31 (31.0%)
Age (years)	70.8 ± 10.7 [38.0;92.0]
Time since first chronic treatment (years)	19.4 ± 12.4 [0.5;58.0]
Level of study	
Secondary level	45 (45.0%)
Higher study	24 (24.0%)
Primary level	24 (24.0%)
Lack of study	7 (7.0%)
Socio-professional category	
Workers	31 (31.0%)
Intermediate professions	18 (18.0%)
Employees	17 (17.0%)
Executives, Higher intellectual professions	14 (14.0%)
Craftsmen, Shopkeeper, Compagny managers	12 (12.0%)
Farmer	5 (5.0%)
Other†	3 (3.0%)
Lifestyle	
Circled	91 (91.0%)
Alone	9 (9.0%)
Organization around medication intake	
Autonomous	83 (83.0%)
Help from relatives (partner, children)	11 (11.0%)
Assistance from a nurse	6 (6.0%)
Information received at the start of treatment	87 (87.0%)
Source of information	
From the general practitioner	73 (73.0%)
From the specialist doctor	61 (61.0%)
From the pharmacist	46 (46.0%)
From family and friends	5 (5.0%)
Information received perceived as sufficient by the patient	64 (64.0%)
Need for additional research (Internet, books, magazines, leaflets)	27 (27.0%)

Drug Characteristics	N=965
Number of drugs per patient	9.7 ± 3.6 [5;21]
ATC class of drugs	
Cardiovascular (C)	310 (32.0%)
Alimentary tract and metabolism (A)	190 (19.8%)
Nervous System (N)	175 (18.0%)
Blood and blood-forming organs (B)	141 (14.6%)
Respiratory system(R)	47 (4.9%)
Systemic hormones, excluding sex hormones (H)	19 (2.0%)
Other‡	83 (8.7%)

Results are presented as mean ± standard deviation [minimum-maximum] for quantitative variables and as counts (%) for qualitative variables

*To the question "Since when have you been taking your first chronic treatment?", 4 patients were unable to answer.

†Other occupations: Housewife (2%), No occupation (1%)

‡Other ATC class: J-General anti-infectives for systemic use (0.8%), L-Antineoplastics and immunomodulators (1.6%), P-Antiparasitic, insecticides (0.1%), V-Miscellaneous (0.6%), D-Dermatological drugs (0.5%), M-Muscle and skeletal (1.4%), S-Sensory organs (1%), G-Genitourinary system and sex hormones (1.7%), No ATC class (1%)

Supplemental Table 2. Correlation between different age categories and patients' knowledge (drugs and indications cited) (N = 100)

	Age (years)	[30-59] N=10	[60-69] N=28	[70-79] N=46	[80 and more] N=16	p-value
Percentage of drugs cited	Median	83.3	46.4	40.0	28.6	0.0193
	[Q1;Q3]	[66.7;100.0]	[29.7;74.3]	[18.2;71.4]	[0.0;66.4]	
	[Min-Max]	[20.0 ;100.0]	[0.0;100.0]	[0.0;100.0]	[0.0;100.0]	
Percentage of known indications	Median	100.0	75	80.9	84.5	0.0761
	[Q1;Q3]	[82.4;100.0]	[55.2;90.5]	[54.5;100.0]	[39.4;100.0]	
	[Min-Max]	[60.0;100.0]	[23.1;100.0]	[0.0;100.0]	[0.0;100.0]	

Q1 : First Quartile ; Q3 : Third quartile ; Min : minimum ; Max : maximum

Supplemental Files 1 : Global questionnaire

Patient n°:

Length of the interview:

Socio-demographic information :

Gender: Age: Lifestyle: Married Single Children

Origins:

Level of study:

Socio-professional category: Farmer Craftsmen, Shopkeeper, Compagny managers

Executives, Higher intellectual professions Professions intermédiaires

Employees Workers Other:.....

Chronic treatment :

Number of medications on the prescription:

How long have you been taking your first chronic treatment?

Informations :

- Have you ever had your treatments explained to you? Yes No
- Do you feel you have received enough information about your treatments? Yes No
- From whom did you get information about your treatments?
 - Specialist
 - General practitioner
 - Pharmacist
 - Family

Treatment management :

- Who manages your treatments?
 - Myself
 - A nurse
 - A family member

Supplemental Files 2 : Belief Medical Questionnaire

Patient n°:

Score:

1: Totally disagree, 2: Disagree, 3: Uncertain, 4: Agree, 5: Totally agree

Specific Beliefs :

1. My health, at present, depends on my medicines:
2. Having to take medicines worries me:
3. My life would be impossible without my medicines:
4. Without my medicines I would be very ill:
5. I sometimes worry about long-term effects of my medicines:
6. My medicines are a mystery to me:
7. My health in the future will depend on my medicines:
8. My medicines disrupt my life:
9. I sometimes worry about becoming too dependent on my medicines:
10. My medicines protect me from becoming worse:

General Beliefs :

11. Doctors use too many medicines:
12. People who take medicines should stop their treatment for a while every now and again:
13. Most medicines are addictive:
14. Natural remedies are safer than medicines:
15. Medicines do more harm than good:
16. All medicines are poisonous:
17. Doctors place too much trust in medicines:
18. If doctors had more time with patients, they would prescribe fewer medicines:

Supplemental Files 3 : GIRERD questionnaire

Assessment of medication compliance

Patient n° :

	YES	NO
Did you forget to take your medication this morning?		
Since your last visit, have you run out of medication?		
Have you ever been late taking your medication?		
Have you ever not taken your medication because your memory fails you some days?		
Have you ever not taken your medication, because some days you feel that your treatment is doing you more harm than good?		
Do you think you have too many pills to take?		

Supplemental Files 4 : The local ethics committee

AVIS 22-06-2201

Groupe Nantais d'Éthique dans le Domaine de la Santé (GNEDS)

Nom du protocole Code et versioning	Croyances et représentations chez les patients polymédiqués en chirurgie et médecine vasculaire
--	--

Investigateur principal	Dr JF HUON
Lieu de l'étude	CHU NANTES
Type de l'étude	Monocentrique, prospective, exploratoire, observationnelle
Type patients/participants	Patients polymédiqués hospitalisés en chirurgie et médecine vasculaire
Nombre de patients/participants prévus	100
Objectif principal	Evaluation de la croyance des patients sur leurs traitements habituels
Objectif secondaire	Connaissance et importance données par le patient à chacun de ses traitements Adhésion médicamenteuse

Documents communiqués

Justification de l'étude	OUI
Méthodologie	OUI
Lettre d'information et lettre de consentement	OUI

Remarque générale

Le GNEDS formule d'abord la remarque qu'il n'a pas pour mission de donner un avis sur les aspects scientifiques du protocole, en particulier sur l'adéquation de la méthodologie aux objectifs poursuivis par l'étude. Il ne tient compte des données d'ordre scientifique et méthodologique que dans la mesure où elles ont des implications d'ordre éthique. Dans le cas présent, il se bornera à constater que les objectifs de cette étude et sa méthodologie sont conformes aux principes de l'éthique.

Confidentialité

Confidentialité	OUI
Anonymat	OUI
CNIL	RGPD

Commentaires :

Information et consentement*Consentement :*

Recueil nécessaire	OUI
Type consentement préférable	ORAL
Traçabilité dans le dossier	NA

Commentaires :

Lettre information précisant :

Titre de l'étude	OUI
But de l'étude	OUI
Déroulement de l'étude	OUI
Prise en charge courante inchangée	OUI
Possibilité de recevoir résultats de l'étude	OUI
Traçabilité dans le dossier	NA

Commentaires :

Conclusion

Avis favorable	OUI
Révision nécessaire selon commentaires	
Avis défavorable	

GNEDS : Professeur Paul BARRIERE

Nantes le 22 juin 2022



Reporting checklist for cross sectional study.

An observational and prospective study: Evaluation of beliefs and representations of chronic treatments of polymedicated patients hospitalized in medicine and vascular surgery

D. Kotry *et al.*

Based on the STROBE cross sectional guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the STROBE cross sectional reporting guidelines, and cite them as:

von Elm E, Altman DG, Egger M, Pocock SJ, Gotsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies.

	Reporting Item	Page Number
Title and abstract		
Title	#1a Indicate the study's design with a commonly used term in the title or the abstract	1
Abstract	#1b Provide in the abstract an informative and balanced summary of what was done and what was found	2-3

Introduction

1	Background /	#2	Explain the scientific background and rationale for the	4
2	rationale		investigation being reported	
3				
4	Objectives	#3	State specific objectives, including any prespecified	5
5			hypotheses	
6				
7				
8	Methods			
9				
10				
11	Study design	#4	Present key elements of study design early in the paper	5
12				
13	Setting	#5	Describe the setting, locations, and relevant dates,	5
14			including periods of recruitment, exposure, follow-up,	
15			and data collection	
16				
17				
18	Eligibility criteria	#6a	Give the eligibility criteria, and the sources and	5
19			methods of selection of participants.	
20				
21				
22		#7	Clearly define all outcomes, exposures, predictors,	5-6
23			potential confounders, and effect modifiers. Give	
24			diagnostic criteria, if applicable	
25				
26				
27				
28	Data sources /	#8	For each variable of interest give sources of data and	5-6
29	measurement		details of methods of assessment (measurement).	
30			Describe comparability of assessment methods if there	
31			is more than one group. Give information separately for	
32			for exposed and unexposed groups if applicable.	
33				
34				
35				
36	Bias	#9	Describe any efforts to address potential sources of	NA
37			bias	
38				
39				
40	Study size	#10	Explain how the study size was arrived at	5
41				
42	Quantitative	#11	Explain how quantitative variables were handled in the	6
43	variables		analyses. If applicable, describe which groupings were	
44			chosen, and why	
45				
46				
47	Statistical	#12a	Describe all statistical methods, including those used to	6
48	methods		control for confounding	
49				
50				
51	Statistical	#12b	Describe any methods used to examine subgroups and	NA
52	methods		interactions	
53				
54				
55	Statistical	#12c	Explain how missing data were addressed	NA
56	methods			
57				
58				
59				
60				

1	Statistical	#12d	If applicable, describe analytical methods taking	NA
2	methods		account of sampling strategy	
3				
4	Statistical	#12e	Describe any sensitivity analyses	NA
5	methods			
6				
7				
8	Results			
9				
10				
11	Participants	#13a	Report numbers of individuals at each stage of study—	7
12			eg numbers potentially eligible, examined for eligibility,	
13			confirmed eligible, included in the study, completing	
14			follow-up, and analysed. Give information separately	
15			for for exposed and unexposed groups if applicable.	
16				
17				
18				
19	Participants	#13b	Give reasons for non-participation at each stage	NA
20				
21	Participants	#13c	Consider use of a flow diagram	NA
22				
23				
24	Descriptive data	#14a	Give characteristics of study participants (eg	7
25			demographic, clinical, social) and information on	
26			exposures and potential confounders. Give information	
27			separately for exposed and unexposed groups if	
28			applicable.	
29				
30				
31				
32	Descriptive data	#14b	Indicate number of participants with missing data for	Supplemental
33			each variable of interest	Table 1
34				
35				
36	Outcome data	#15	Report numbers of outcome events or summary	7-10 + tables
37			measures. Give information separately for exposed and	
38			unexposed groups if applicable.	
39				
40				
41	Main results	#16a	Give unadjusted estimates and, if applicable,	7-10 + tables
42			confounder-adjusted estimates and their precision (eg,	
43			95% confidence interval). Make clear which	
44			confounders were adjusted for and why they were	
45			included	
46				
47				
48				
49	Main results	#16b	Report category boundaries when continuous variables	NA
50			were categorized	
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53	Main results	#16c	If relevant, consider translating estimates of relative risk	NA
54			into absolute risk for a meaningful time period	
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1	Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	NA
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3				
4	Discussion			
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6				
7	Key results	#18	Summarise key results with reference to study objectives	10
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11	Limitations	#19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	15
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16	Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	10-16
17				
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21	Generalisability	#21	Discuss the generalisability (external validity) of the study results	14
22				
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24				
25	Other			
26	Information			
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28				
29	Funding	#22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	17
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BMJ Open

An observational and prospective study: Evaluation of beliefs and representations of chronic treatments of polymedicated patients hospitalized in a vascular medicine and surgery department

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4 1 **An observational and prospective study: Evaluation of beliefs and**
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7 2 **representations of chronic treatments of polymedicated patients**
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10 3 **hospitalized in a vascular medicine and surgery department**
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14 5 Dounia KOTRY¹, Justine SAILLARD¹, Marion BONSERGENT¹, Christelle VOLTEAU²,

16 6 Antoine BENICHO³, Sonia PROT-LABARTHE⁴, Jean-François HUON⁵
17
18
19
20 7

21 8 **University degree:**
22
23 9

24 10 Dounia KOTRY, PharmD

25 11 Justine SAILLARD, PharmD

26 12 Marion BONSERGENT, PharmD

27 13 Christelle VOLTEAU

28 14 Antoine BENICHO, MD

29 15 Sonia PROT-LABARTHE, PharmD, PhD

30 16 Jean-François HUON, PharmD, PhD
31
32
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35
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40
41
42
43
44
45 17

46 18 **Affiliations:**

47 19 1. Nantes Université, CHU Nantes, Pharmacie, F-44000, France

48 20 2. Plateforme de Méthodologie et Biostatistique, DRi du CHU de Nantes, Nantes, France

49 21 3. Nantes Université, CHU Nantes, Médecine interne, F-44000, France

50 22 4. Nantes Université, CHU Nantes, Pharmacie, F-44000, France, Université Paris Cité,

51 23 INSERM, ECEVE, F-75010 Paris, France
52
53
54
55
56
57
58
59
60

1
2
3 24 5. Nantes Université, Univ Tours, CHU Nantes, CHU Tours, Pharmacie, INSERM, MethodS
4
5
6 25 in Patients-centered outcomes and HEalth Research, SPHERE, F-44000 Nantes, France
7
8

9 26

10 27 **Corresponding author:**

11
12
13 28 Dounia KOTRY, dounia.kotry@gmail.com
14

15 29 **Mails:**

16
17
18 30 Justine SAILLARD: justine.saillard@chu-nantes.fr
19

20 31 Marion BONSERGENT: marion.bonsergent@chu-nantes.fr
21

22 32 Christelle VOLTEAU: christelle.volteau@chu-nantes.fr
23

24 33 Antoine BENICHO: antoine.benichou@chu-nantes.fr
25

26
27 34 Sonia PROT-LABARTHE: sonia.protlabarthe@chu-nantes.fr
28

29 35 Jean-François HUON: jeanfrancois.huon@chu-nantes.fr
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31

32 36 **Abstract**
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36 37 **Objectives:** Today, the involvement of patients in their care is essential. As the population ages
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40 38 increases, the number of patients with chronic diseases is increasing. In the vascular medicine
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43 39 and surgery departments, patients are polymedicated and mostly suffer from several chronic
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46 40 diseases. Approximately 50% of patients with a chronic disease are not adherent. Among the
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50 41 factors that can influence therapeutic adherence are the beliefs and representations of patients.
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53 42 To evaluate the beliefs and representations of chronic treatments in patients with multiple
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56 43 medications and hospitalized in a vascular medicine and surgery department, and to evaluate
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59 44 the medication adherence, the knowledge, and the importance patients attach to their treatments.
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4 45 **Design:** Observational, prospective and a single-center study.
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7 46 **Setting:** The study was conducted in a French tertiary hospital center of around 3000 beds in 9
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10 47 institutions.
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14 48 **Participants:** Adult polymedicated (i.e minimum of 5 chronic treatments) patients hospitalized
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17 49 in a vascular medicine and surgery department were included after application of the exclusion
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20 50 criteria.
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23 51 **Methods:** Patient interviews were carried out in the department and were based on three
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27 52 interviewer administered questionnaires (a global questionnaire, the Belief Medical
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30 53 Questionnaire (BMQ) and the GIRERD questionnaire).
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33 54 **Results:** Our study showed that patients perceived their treatments as beneficial rather than
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37 55 worrying. A correlation between medication adherence and beliefs was observed. "Non-
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40 56 adherent" patients had a more negative overall view of medication than "adherent" patients.
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43 57 The level of compliance and knowledge of our patients was low. Only 11% of the patients were
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47 58 "good adherent", 16% of the patients could perfectly name their treatment and 36% knew all
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49
50 59 the indications.
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53 60 **Conclusion:** Knowledge of treatment representation and beliefs are central to understanding
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57 61 patient behaviour. Considering patients' representations will allow the identification of levers,
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4 62 and the development of actions and educational tools adapted to improve their adherence, their
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7 63 knowledge and therefore their drug management.
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10 64 Data availability statement: Data are available upon reasonable request
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17 66 **Strengths and limitations of this study**

- 21 67 • This study is pioneering in its examination of the representation and beliefs associated
22
23
24 68 with chronic treatments within a vascular medicine and surgery department.
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28 69 • We employed validated and widely accepted questionnaires to assess beliefs and
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31 70 measure medication adherence.
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35 71 • Nonetheless, it is crucial to acknowledge that this study was conducted at a single center,
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38 72 which may limit the broader applicability of the findings.
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41 73 • It is worth noting that medication adherence questionnaires often tend to overestimate
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44 74 adherence, underscoring the importance of employing multiple measurement methods.
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75 **Introduction**

76 A chronic disease can be defined as a long-term condition that usually progresses slowly and
77 requires long-term treatment and care (1). It is also characterized by its impact on the quality
78 of life of patients. About twenty million people in France are affected by a chronic disease (1),
79 the most frequent being cardiovascular, cerebral, respiratory and metabolic diseases, as well as
80 malignant tumors (2). Today, the prevalence of chronic diseases is rising sharply and can be
81 explained by the aging of the population and the increase in life expectancy. They are therefore
82 among the most common health care problems, with a major impact on public health and the
83 economy (3).

84 In the vascular medicine and surgery department, the majority of patients have one or more
85 chronic diseases and are polymedicated (4). Polymedication is defined as "the administration
86 of many drugs simultaneously or the administration of an excessive number of drugs" (5,6).
87 Furthermore, all chronic diseases require long-term management with an investment by both
88 healthcare professionals and the patient. For this, a good level of information on the disease and
89 treatments is necessary for the patient to avoid the risks of poor compliance. According to the
90 WHO (7), 50% of patients do not adhere to their chronic treatment, even though this adherence
91 is essential for the control of the chronic disease. Indeed, loss of adherence to treatment leads

92 to a decrease in therapeutic efficacy and exposes the patient to complications of their disease
93 and to therapeutic failure (7).

94 The representations of treatments are factors that influence therapeutic adherence (8). This
95 refers to each individual's knowledge, explanations and ideas about his disease.
96 Representations are linked to the patient's behaviour, cultural, social and family background,
97 education, professional activity, etc. (9). They have multiple origins and varies from one
98 individual to another. Today, the representation of the disease, but also of treatments, is central
99 to understanding the behaviour of patients in their health care journey. Representations and
100 beliefs have been studied in certain chronic diseases, notably HIV, diabetes, hypertension,
101 asthma, etc. (9-12).

102 However, to our knowledge, they have not been studied in a vascular medicine and surgery
103 department fields, when it comes to hospitalized patients with multiple medications.

104 The main objective of this study was to evaluate the beliefs and representations of chronic
105 treatments in multi-medicated patients hospitalized in a vascular medicine and surgery
106 department Secondly, the patients' knowledge of their treatments, the importance given by the
107 patient to each of their treatment and the medication adherence were assessed.

108 **Material and methods**

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4 109 This was an observational, prospective, single-center study conducted in a French tertiary
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7 110 hospital center of around 3000 beds in 9 institutions.

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10 111 Patients included had to be over 18 years of age and hospitalized in the vascular medicine and
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13 112 surgery department, which comprises 28 beds. Patients had to be polymedicated prior the
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17 113 hospitalization. Drawing on literature data (5) and the experience of our medication
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20 114 reconciliation activity, the threshold of five medications as a reference to designate
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23 115 polymedicated patients was established.

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27 116 Patients who were unable to participate in an interview because of cognitive impairment or
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30 117 language barrier were not included. All patients underwent a medication review on admission
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34 118 to the vascular medicine and surgery department to obtain a complete record of their usual
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36
37 119 treatment. The patient inclusion period was from early March 2022 to late June 2022. All
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40 120 participants provided oral consent.

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43 121 The study was based on three questionnaires completed during the patient's hospitalization. All
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47 122 questionnaires were interviewer administered and concerned the treatments patients were
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50 123 taking prior to hospitalization.

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57 125 1/ a global questionnaire, specifically developed for the study, regarding the patient's
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60 126 sociodemographic data, their usual treatments identified by the reconciliation and their

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4 127 medication management, the information received about his treatments, the knowledge he had
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7 128 of his treatments (name and indication) as well as the importance he gave to each medication
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10 129 (scored from 1 to 10).

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13 130 2/ the BMQ (Belief Medical Questionnaire). It allows for the evaluation of different specific
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17 131 dimensions of patients' beliefs about their medical treatments. It consists of 18 items divided
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20 132 into two parts: specific beliefs (patients' representations of their medical prescriptions - 10
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23 133 items) and general beliefs (beliefs in medicine in general - 8 items). A 5-point Likert scale was
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27 134 used for the responses. For each question, a total score was calculated by adding the item scores.
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30 135 Each specific belief could get a score between 5 and 25, and each general belief a score between
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34 136 4 and 20. The higher the scores, the more important the beliefs are. For specific beliefs, a
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37 137 differential score is calculated by subtracting the specific concern from the specific need. A
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40 138 score greater than 0 means that the perceived need for treatment is greater than the concerns.
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44 139 The validated French version of this questionnaire was used (10).

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47 140 3/ the validated GIRERD medication adherence questionnaire, composed of 6 items (13).
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50 141 GIRERD score: six negative ("no") responses: patient is "good adherent". Four or five "no"
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54 142 responses: patient is "low-adherent ". Two or three "no" responses: the patient is "non-
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57 143 adherent".

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60 144 The interviews were conducted by the first author.

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3 145 Characteristics of the patients and the drugs were presented with mean, standard deviation,
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5 146 minimum and maximum for the quantitative variable and with frequency and percentage of
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8 147 each category. Spearman's correlation coefficient were used to measure association between
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11 148 two continuous variables. Comparison of groups were performed using Chi-squared tests for
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14 149 categorical variables and using ANOVA, or Kruskal-Wallis tests for continuous variables,
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18 150 depending of the normality or not of the distribution. The statistical significance was established
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21 151 with a threshold to 5%. All analyses were performed using SAS® version 9.4 software.

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25 152 This study was approved by the local ethics committee (Groupe Nantais d'Ethique dans le
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28 153 Domaine de la Santé) on June 22th 2022 (GNEDS 20220622).

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31 154 Patient and Public Involvement: No patient involved
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34 35 36 155 **Results**

37 38 39 156 **Characteristics of the patients and their treatments**

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43 157 Over the period, three hundred sixty five patients underwent a medication reconciliation. Of the
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46 158 patients eligible and available at the time of service, one hundred patients were included in the
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49 159 study. All patients completed the study and were analyzed. The characteristics of the patients
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53 160 and their treatments are presented in *Supplemental Table 1*. Patients reported being treated for
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56 161 an estimated period of 19.4(± 12.4) years. On average, 9.4 (± 3.6) drugs were prescribed
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59 162 simultaneously, mostly for cardiovascular (32%), digestive (19.8%) or neurological (18%)

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4 163 diseases. The majority of patients were informed about their treatments by a doctor, but more
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7 164 than a quarter (27%) felt the need for more information.
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10 165 Women felt that they received less information about drugs from healthcare professionals than
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13 166 men (48.4% vs. 71.0%, $p = 0.0292$).
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18 168 **Beliefs**
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21 169 The results of the BMQ questionnaire for the population are presented in *Figure 1* and the BMQ
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25 170 score values are detailed in *Table 1*. Overall, patients said that their medication helped them not
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28 171 to feel worse, that without it they would be sicker or that their life would be impossible. They
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32 172 were aware that their future life depended on taking them. However, almost one in three patients
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35 173 felt that doctors were too trusting of medication, and that they would prescribe less if they had
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38 174 more time. The BMQ scores clearly show that the balance of benefits and risks perceived by
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42 175 the patients is clearly in favor of taking the treatments for 96% of them.
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45 176 The more medications patients took, the more they believed in the importance of their treatment
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48 177 ($r = 0.27$, $p = 0.0064$). Women believed more in the harm of treatments ($p = 0.0352$) and in the
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52 178 overuse of drugs than men ($p = 0.0170$)
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58 180 **Compliance**
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4 181 The responses to the GIRERD questionnaire are presented in *Table 2*. Only 11% of patients had
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7 182 good medication adherence with their treatments according to the questionnaire score. One in
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10 183 10 was considered totally non-adherent.

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13 184 The more a good medication adherence patients have, the more they believed in the importance
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17 185 of their medication ($p = 0.0039$).

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20 186 No significant association was found between the level of medication adherence and age ($p =$
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23 187 0.50), level of education ($p = 0.52$) or number of medications ($p = 0.0733$).

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29 189 **Knowledge**

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33 190 On average, patients were able to name 49.3% of their treatments. Sixteen percent of patients
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36 191 could name all of their treatments, while 11% of patients could not name any of their treatments.

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39 192 On average, patients knew 73.1% of the indications for all their usual treatments. When 32
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43 193 patients were able to name all the indications of their medication, 3 patients could not name
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46 194 any.

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49 195 Several correlations were found, notably between age and patient knowledge (*Supplemental*
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52 196 *Table 2*), but also with educational level. Indeed, patients with higher education knew more
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56 197 about the indications of their treatments (mean= 85.1 ± 22.8) than patients with no education
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59 198 (mean= 40.9 ± 29.4) ($p = 0.0017$).

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4 199 The least cited drug classes were anti-histamines for systemic use (28.6%), analgesics (26.8%),
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7 200 anti-anemic preparations (24.0%) and ophthalmic drugs (20%).
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10 201 Among the most prescribed drug classes, the most cited were anti-thrombotics (64.7% of the
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13 202 116 prescriptions), beta-blockers (55.9% of the 59 prescriptions), drugs acting on the renin
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17 203 angiotensin system (49.3% of 67 the prescriptions) and anti-diabetics (46.8% of the 62
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20 204 prescriptions).
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23 205 The drug classes for which patients demonstrated inadequate knowledge regarding their
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27 206 indications primarily included cardiology drugs (60%), anti-anemic preparations (48%),
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30 207 diuretics (47.5%), beta-blockers (45.8%) and lipid-lowering drugs (45%).
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33 208 When patients were asked about their treatments, a large proportion did not spontaneously
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37 209 mention the drugs they took "if needed", in particular analgesics (26,8% of the 82 prescriptions)
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40 210 such as paracetamol or symptomatic drugs such as antihistamines (28,7% of the 14
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43 211 prescriptions).
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47 212 A comparison between beliefs, compliance and knowledge was made. The results obtained are
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50 213 detailed in *Table 3*. For patients with low adherence, the more they knew the indications of their
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53 214 treatments, the less they feared their harmfulness. And the more they knew how to name
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57 215 treatments, the less they feared overuse.
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217 **Importance ratings**

218 Fourteen patients were unable to rate the importance of their treatment because they felt that all

219 their medications were equally important.

220 Out of the most prescribed drug classes, two had a median importance score of less than 6:

221 nasal preparations (3 prescriptions, median score 5.0) and constipation medications (13

222 prescriptions, median score 5.5). Those with the highest importance scores were antidiabetics

223 (62 prescriptions, median score 9.5), immunosuppressants (10 prescriptions, median score 10),

224 and antithrombotics (116 prescriptions, median score 9).

225 Symptomatic medications scored high in importance. Analgesics (82 prescriptions),

226 antihistamines (14 prescriptions), and medications for acid-related disorders (52 prescriptions)

227 all received a median score of 8.

228 There was no significant correlation between median patient ratings and compliance ($r = -0.13$,

229 $p = 0.3623$).

230 **Discussion**

231 Our study showed that patients perceived their treatments as beneficial rather than worrying. A

232 correlation between medication adherence and beliefs was observed. "Non-adherent" patients

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4 233 had a more negative overall perception of medication compared to "adherent patients". The
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7 234 level of medication adherence and knowledge of our patients was low. Only 11% of the patients
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10 235 had "good medication adherence", 16% of the patients could perfectly name their treatment and
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13 236 36% knew all the indications.
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17 237 In recent years, several studies have assessed treatment representations and their influence on
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20 238 medication adherence. However, to our knowledge, this study is the first to examine patients'
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23 239 beliefs about their chronic treatment in relation to their knowledge and medication adherence
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27 240 in a vascular medicine and surgery department.
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30 241 Our results regarding the importance attributed by patients to their chronic medication are
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33 242 consistent with the data found in the literature. French studies have evaluated the representation
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37 243 of treatments in chronic pathologies, particularly in asthma (12), diabetes and HIV (10), and
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40 244 bronchopulmonary cancer (14). All these studies have highlighted the importance that patients
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44 245 attach to their medication. Therefore, patients perceive their treatment as beneficial rather than
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47 246 worrisome. Indeed, in our study, 77% of patients were not worried about taking medication and
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50 247 76% were not disturbed by medication in their daily lives.
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54 248 Several studies have demonstrated a correlation between patients' representations of their
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57 249 treatment and the level of medication adherence. Horne *et al.* established this link for each of
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60 250 the chronic pathologies studied via the BMQ questionnaire in a cohort of 324 patients with

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4 251 diverse chronic diseases (asthma, oncology, cardiac and renal diseases). Indeed, the "necessity"
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7 252 score was correlated with good medication adherence and the "concern" score was related to
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10 253 poor medication adherence in each of the diseases studied (11). Although our results could not
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13 254 show a significant correlation but a trend towards the same result. Conducting disease-specific
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17 255 analyses with larger sample sizes could confirm this trend.

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20 256 A French study also explored correlations between beliefs and medication adherence among
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23 257 patients with chronic diseases in general medical practices (15). Of the 265 patients included in
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27 258 the study, 40.8% had good medication adherence, 53.2% were "moderately adherent" and 6%
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30 259 were "non-adherent". In our study, only 11% of patients were "good adherent". This can be
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33 260 partially explained by a significant difference in the average number of medications taken by
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37 261 patients. In their study, patients had an average of 3.6 ± 2.6 medications, almost three times less
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40 262 than in our study. One of the 6 questions of the GIRERD questionnaire related to the amount
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43 263 of medication to be taken: "Do you think you have too many pills to take" and 67% of our
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46
47 264 patients answered "yes". This may explain the low rate of "good adherent".

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49
50 265 Deat *et al.* highlighted a significant correlation between the degree of adherence and the BMQ
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53 266 scores "concerns", "harmfulness" and "overuse", supporting the trend shown in our study. The
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57 267 absence of a statistical significance could be explained by an important difference in the number
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60 268 of patients in each compliant group. Only ten patients were "non-adherent". Regarding the

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4 269 concerns of "non-adherent" patients, our results are consistent with their study: patients were
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7 270 more concerned with their treatment, which may have an impact on medication adherence.
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10 271 Fall *et al.* conducted a study among diabetic and HIV patients (10). A disease-specific analysis
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13 272 demonstrated significant correlations between medication adherence and the necessity and
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17 273 worry scales. Thus, negative beliefs were predictive of poor adherence. "Non-adherent"
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20 274 patients would therefore have a more negative overall view of medication than adherent
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24 275 patients.
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27 276 According to the study by Huon *et al.* (16), the average number of medications taken by the
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30 277 elderly is 8 in the 70–80-year-olds, 9.61 in the 80–90-year-olds, 9.92 in the 90–100-year-olds
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34 278 and 8.11 for the over 100-year-olds. Overall, the increase in medication use varies as the
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37 279 population ages. Our patients, with an average age of 70.8 years, took an average of 9.7
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40 280 medications. Unfortunately, the higher the number of medications, the higher the risk of
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44 281 forgetting or not taking the treatments (17). This high number of medications also has a role in
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47 282 patients' knowledge and beliefs. Our results demonstrated that the more medications patients
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50 283 took, the less they knew about their names and indications. These results are consistent with
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54 284 those reported in the literature (18).
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57 285 One study showed that knowledge of drug indications varied based on the ATC class. Indeed,
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60 286 the drug classes where indications were not known included cardiovascular drugs (12%),

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4 287 asthma drugs (5%) and estrogen therapies (5%) (19). In our study, we also noted that indications
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7 288 for cardiovascular drugs were the least known. This observation aligns with the fact that patients
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10 289 in the vascular medicine and surgery department have many cardiology medications. It is
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14 290 therefore essential that caregivers take sufficient time with patients to educate and involve them
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17 291 in their care. Persall *et al.* (19) also revealed that the older and less educated the patients were,
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20 292 the less they knew about their treatments. Our results support these findings.
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24 293 Only 16% of patients could perfectly name their treatment and 36% knew all the indications.
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27 294 In general, the level of knowledge of patients about their treatment was low. However,
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30 295 comparing our results to existing literature is challenging due to disparities in the number of
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34 296 drugs per patient and the number of patients included. Akici *et al.* (20) showed, in a study
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37 297 including 1618 patients with an average of 3.3 drugs per patient, that only 10.9% of patients
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40 298 could correctly name their treatment. Given the average number of medications taken by the
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44 299 patients in our study, over 9, it seems normal that the number of patients who could cite their
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47 300 entire treatment is low in our results. The study by Haidar-Ahmad *et al.* including 351 patients,
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50 301 with a mean number of medications taken of 3.83, described that 80.74% of the medications
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54 302 were known by the patients (21). Persall *et al.*, included 616 patients in their study. Only 13.5%
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57 303 of patients did not know any of the indications. They also noted a significant lack of knowledge
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60 304 of their patients for cardiovascular medications (19).

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4 305 Although patient knowledge levels and medication adherence were low, the importance they
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7 306 attached to their treatment was high. Patient ratings indicated that the majority of prescribed
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10 307 drug classes were considered important to them. Only four ATC classes scored below average.
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13 308 This outcome confirms the "necessity" score obtained in the BMQ questionnaire. A French
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16 309 study assessed drug-related representations in patients with multiple myeloma (22). The authors
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20 310 estimated the importance the patient placed on his or her medications. Antithrombotic drugs,
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23 311 unlike our study, were rated lower, whereas anticancer drugs scored highest. This significant
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26 312 difference between medications that are all part of the overall management of myeloma could
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30 313 be explained by the degree of information provided to patients. Indeed, while the direct link
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33 314 between anticancer drugs and myeloma can easily be made, the link between antithrombotic
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36 315 drugs and the fatal consequences of myeloma is less intuitive. Our work reports on patients with
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40 316 multiple and varied chronic pathologies, with a large number of prescribed medications.
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43 317 Despite this, few differences were observed between ATC classes and therefore chronic
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46 318 pathologies. For a majority of patients, all treatments carried equivalent importance. Indeed,
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50 319 even if the patients did not spontaneously cite their symptomatic treatments, they gave them a
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53 320 high importance. This is due to the perceived immediate effect of using these treatments. This
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56 321 finding is in alignment with another study (23) which demonstrated that patients exhibited
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60 322 greater familiarity with analgesics compared to cardiovascular drugs, as they could directly

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4 323 sense their effects. Notably, in our study, patients were very familiar with the effects of their
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7 324 symptomatic medications but did not cite them directly. This individual perception of treatment
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10 325 efficacy has been described as a determining factor in patient adherence to medication (24).
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13 326 Moreover, if representations about treatments impact patient adherence, adherence is also
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17 327 determined by the relationship of trust with the physician. Several studies have shown that the
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20 328 relationship between the physician and the patient has a significant impact on the feeling of
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23 329 usefulness and efficacy of the treatment, but also on adherence (25). Research has indicated
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27 330 that patients exhibit improved medication adherence when they possess sufficient information
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30 331 and a clear understanding of the rationale behind their treatment (26). As described by Peh et
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33 332 al. in their study, various factors contribute to therapeutic adherence, include healthcare
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37 333 professionals. For them, medication adherence depends on patients' perceived needs and beliefs
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40 334 about medication, which are, in turn, influenced by the information and advice provided by the
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43 335 healthcare provider during the medical consultation (27). In our study, the majority of patients
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47 336 reported receiving information about their treatment, but one third felt that this was not
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50 337 sufficient.
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53 338 In our study, we were interested in the link between beliefs and adherence. Nevertheless,
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57 339 therapeutic adherence represents a multifaceted behavior shaped by a multitude of factors;
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60 340 factors linked to the patient (age for example, beliefs), to the care team (information), to the

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4 341 disease (asymptomatic or symptomatic), to the treatment (undesirable effects or not), and to
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7 342 social and economic factors (24,27). A better information would mean a more effective and
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10 343 safer treatment for the patient. Consequently, this perception aids in optimizing their
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13 344 medication-taking behavior over an extended period (24).

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16 345 Assessing patients' beliefs would allow us to better target their priorities, and thus to develop
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19 346 adapted educational actions and tools. Indeed, understanding the mechanisms and potential
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22 347 evolution of the disease will make it easier for patients to assimilate the objectives of their
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25 348 treatments and will facilitate their therapeutic adherence (28).

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35 352 **Strengths and biases**

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38 353 To our knowledge, the representation and beliefs of chronic treatments have not been studied
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41 354 in a vascular medicine and surgery department, in patients with multiple medications and
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44 355 cardiac pathologies. This is a single-center study. It would be of interest to replicate this
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47 356 investigation across multiple centers to achieve outcomes that are both generalizable and
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50 357 transferable.

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53 358 In our study, the BMQ was used for a combination of several diseases, whereas its French
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56 359 version has only been validated for diabetes and HIV (10). Thus, patients with several chronic
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4 360 diseases may not have the same representations regarding the treatments for each disease. The
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7 361 scores given by patients on each of their treatments were used to estimate the level of
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10 362 importance given to each medication. Notably, a predominant observation was that for the
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13 363 majority of patients, all their prescribed medications were perceived as equally significant,
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16 364 potentially indicating an absence of prioritization.

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20 365 Another limitation inherent in our study pertains to the exclusive utilization of a questionnaire
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23 366 to assess adherence, despite the availability of various adherence measurement methods (both
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26 367 direct and indirect). While the questionnaire presents a straightforward, swift, and cost-effective
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29 368 technique, its stand-alone use is less robust. Many authors recommend using at least two
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32 369 methods. In addition, the use of questionnaires tends to overestimate medication adherence (29)
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35 370 which may seem worrying in view of the already low adherence reported in our results. In the
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38 371 context of short-stay inpatients, it was not possible to use direct methods (drug measurements,
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41 372 biological marker measurements), or to use any other indirect method than the questionnaire.
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44 373 Moreover, this would have lengthened the interview time with the patients and thus made the
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47 374 procedure more cumbersome.

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51 375 Concerning the evaluation of knowledge, the hospitalization of our population certainly had an
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54 376 impact on the real knowledge of the patients about their treatment. In discussion with the
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57 377 doctors, we reached this limit in our study. Being in a stressful environment, in a context of
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4 378 acute pathology, could potentially have decreased their true knowledge of the names and
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7 379 indications of their treatment, inducing a bias.
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10 380 One of the exclusion criteria for the study was cognitive impairment. This was assessed
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13 381 clinically but was not confirmed by a specific assessment test such as Mini Mental State
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16 382 Examination (MMSE). This would have again made the protocol and interviews more
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20 383 cumbersome.
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25 384 **Conclusion**

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31 385 The level of knowledge and medication adherence of patients with multiple chronic diseases in
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34 386 the vascular medicine and surgery department is low. Representations of the disease and of
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37 387 medication have an impact on patients' behaviour. They are determinants of adherence to
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41 388 medication. Identifying patients' beliefs about their chronic treatment allows caregivers to adapt
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44 389 information to patients' needs. Better information from healthcare professionals (physician,
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47 390 nurse, pharmacist, etc.) regarding the indication and efficacy of the prescribed treatment is
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51 391 essential. Combined with the consideration of patients' concerns, particularly regarding
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54 392 tolerance, this will improve the benefit/concern ratio perceived by these patients, and thus
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57 393 increase their compliance. The BMQ may help to identify patients at risk of poor compliance.
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24
25 403 analysis were performed by CV and DK. The first draft of the manuscript was written by DK
26
27
28 404 and JS, MB, AB, SPL, CV and JFH commented on previous versions of the manuscript. All
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32 405 authors read and approved the final manuscript.
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7 414 The data underlying this article will be shared on reasonable request to the corresponding
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505 **Legends**

506 **Figure 1:** Responses to the BMQ questionnaire (percentage of responses among the 100
507 patients)

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508 **Tables**509 **Table 1. BMQ score results - Beliefs**

BMQ* - Beliefs	N = 100	Male N = 69	Female N = 31	p-value
Specific Beliefs - Necessity	21.9±3.5 [8.0;25.0]	21.7±3.6	22.2±3.1	0,4822
Specific Beliefs - Concerns	11.1±4.8 [5.0;23.0]	10.5±4.4	12.5±5.5	0.0509
General Beliefs - Harm	9.1±3.2 [4.0;17.0]	8.6±3.0	10.1±3.5	0.0352
General Beliefs - Overuse	10.3±3.4 [4.0;17.0]	9.8±3.4	11.5±3.3	0.0170
BMQ Necessity - BMQ Concern > 0†	96 (96.0%)	66 (95.7%)	30 (96.0%)	1.0000

510 Results are presented as mean ± standard deviation [minimum-maximum] or frequencies and percentages

511 Specific belief scores range from 5 to 25 and general belief scores range from 4 to 20. A high score indicates a
512 strong belief.

513 *BMQ: Belief Medical Questionnaire

514 †BMQ "necessity" - BMQ "concern" > 0 means that the beneficial character is superior to the worrying character.

515 **Table 2. Responses to the GIRERD questionnaire and correlations between compliance and**
 516 **beliefs (N=100)**

Questions and number of positive responses				N (%)
Did you forget to take your medication this morning?				1 (1.0%)
Since your last visit, have you run out of medication?				7 (7.0%)
Have you ever taken your medication late compared to the usual time?				43 (43.0%)
Have you ever not taken your medication because your memory fails you some days?				23 (23.0%)
Have you ever not taken your medication because some days you feel that your medication is doing you more harm than good?				9 (9.0%)
Do you think you have too many pills to take?				61 (61.0%)
	Good adherent	Low adherent	Non-adherent	p-value
	N = 11 (11.0%)	N = 79 (79.0%)	N = 10 (10.0%)	
Specific Beliefs - Necessity	21.0 [6.0;12]	23.0 [21.0;25.0]	23.0 [16.0;24.0]	0.6487
Specific Beliefs - Concerns	9.0 [6.0;12.0]	11.0 [6.0;14.0]	17.0 [9.0;20.0]	0.1163
BMQ Necessity - BMQ Concern > 0†	11 (100.0%)	78 (98.7%)	7 (70.0%)	0.0039
General Beliefs - Harm	9.0 [6.0;12.0]	8.0 [6.0 ;11.0]	11.5[9.0 ;16.0]	0.0739
General Beliefs - Overconsumption	8.0 [5.0 ;12.0]	10.0 [8.0 ;13.0]	13.0 [9.0 ;16.0]	0.1086

517 The results are presented in median [1st Quartile; 3rd Quartile] for quantitative variables and in the form of
 518 frequencies (%) for qualitative variables

519 Specific belief scores range from 5 to 25 and general belief scores range from 4 to 20. A high score indicates a
 520 strong belief.

521 †BMQ "necessity" - BMQ "concern" > 0 means that the beneficial character is superior to the worrying character.

522 BMQ: Belief Medical Questionnaire

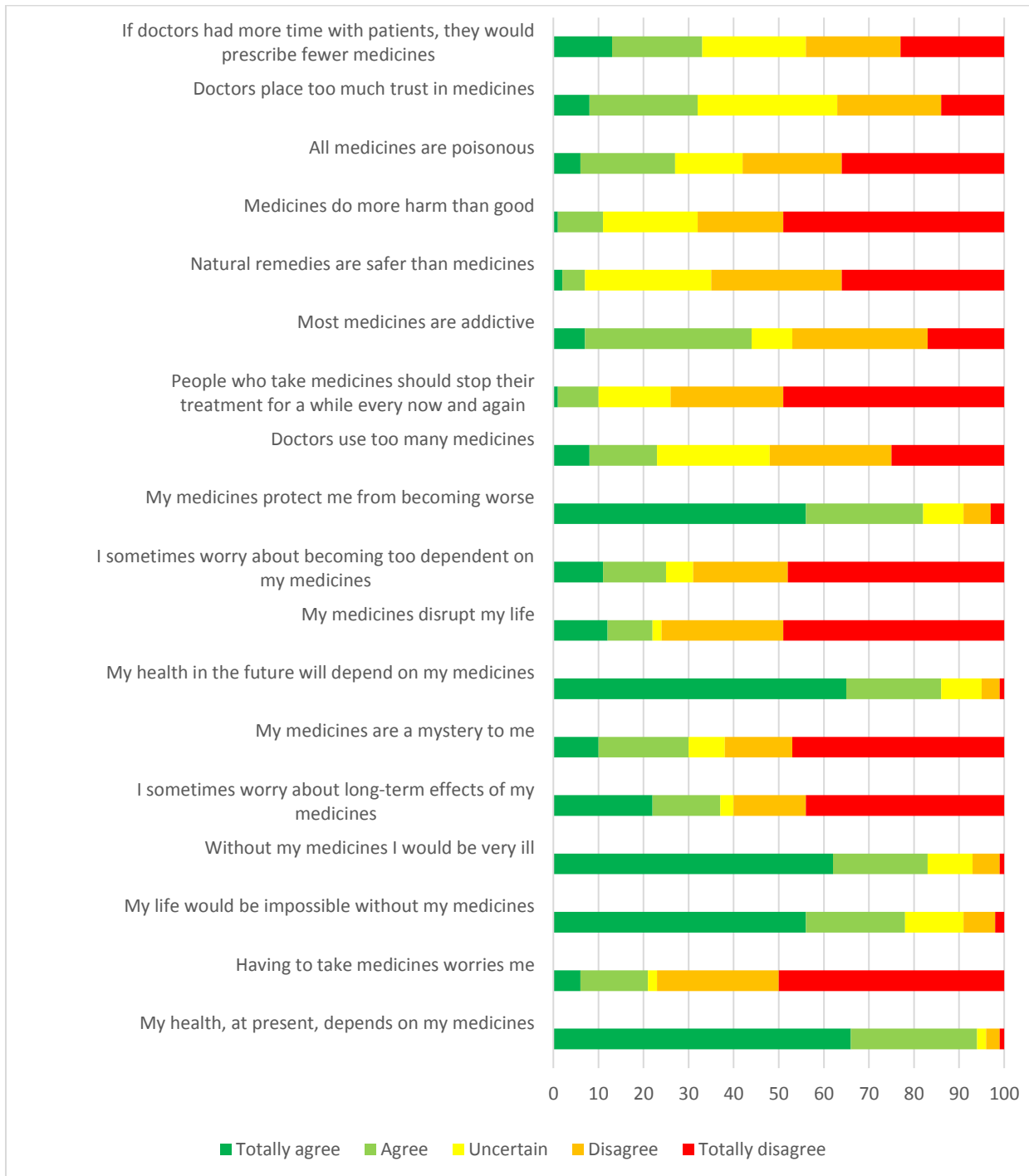
523 **Table 3.** Correlation between adherence, beliefs and knowledge about their treatments for the
 524 100 patients

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	Beliefs	Drugs mentioned		Known indications	
		r	p	r	p
Good adherent (N=11)	Specific Beliefs - Necessity	-0.22	0.5220	0.17	0.6185
	Specific Beliefs - Concerns	-0.01	0.9837	-0.11	0.7403
	General Beliefs - Harm	0.07	0.8488	0.15	0.6686
	General Beliefs - Overuse	0.37	0.2651	0.26	0.442
Low adherent (N=79)	Specific Beliefs - Necessity	0.01	0.9540	-0.07	0.5457
	Specific Beliefs - Concerns	-0.12	0.2994	-0.11	0.3491
	General Beliefs - Harm	-0.21	0.0689	-0.30	0.0069
	General Beliefs - Overuse	-0.23	0.0401	-0.21	0.0630
Non-adherent (N=10)	Specific Beliefs - Necessity	-0.35	0.3216	-0.43	0.2149
	Specific Beliefs - Concerns	0.41	0.2434	0.44	0.2064
	General Beliefs - Harm	0.21	0.5643	0.57	0.0858
	General Beliefs - Overuse	0.38	0.2726	0.47	0.1677

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Figure 1: Responses to the BMQ questionnaire (percentage of responses among the 100 patients)



Supplemental Table :

Supplemental Table 1. Characteristics of the population (N=100) and the drugs (N=965)

Characteristics of patients	N=100
Female sex	31 (31.0%)
Age (years)	70.8 ± 10.7 [38.0;92.0]
Time since first chronic treatment (years)	19.4 ± 12.4 [0.5;58.0]
Level of study	
Secondary level	45 (45.0%)
Higher study	24 (24.0%)
Primary level	24 (24.0%)
Lack of study	7 (7.0%)
Socio-professional category	
Workers	31 (31.0%)
Intermediate professions	18 (18.0%)
Employees	17 (17.0%)
Executives, Higher intellectual professions	14 (14.0%)
Craftsmen, Shopkeeper, Compagny managers	12 (12.0%)
Farmer	5 (5.0%)
Other†	3 (3.0%)
Lifestyle	
Circled	91 (91.0%)
Alone	9 (9.0%)
Organization around medication intake	
Autonomous	83 (83.0%)
Help from relatives (partner, children)	11 (11.0%)
Assistance from a nurse	6 (6.0%)
Information received at the start of treatment	87 (87.0%)
Source of information	
From the general practitioner	73 (73.0%)
From the specialist doctor	61 (61.0%)
From the pharmacist	46 (46.0%)
From family and friends	5 (5.0%)
Information received perceived as sufficient by the patient	64 (64.0%)
Need for additional research (Internet, books, magazines, leaflets)	27 (27.0%)

Drug Characteristics	N=965
Number of drugs per patient	9.7 ± 3.6 [5;21]
ATC class of drugs	
Cardiovascular (C)	310 (32.0%)
Alimentary tract and metabolism (A)	190 (19.8%)
Nervous System (N)	175 (18.0%)
Blood and blood-forming organs (B)	141 (14.6%)
Respiratory system(R)	47 (4.9%)
Systemic hormones, excluding sex hormones (H)	19 (2.0%)
Other‡	83 (8.7%)

Results are presented as mean ± standard deviation [minimum-maximum] for quantitative variables and as counts (%) for qualitative variables

*To the question "Since when have you been taking your first chronic treatment?", 4 patients were unable to answer.

†Other occupations: Housewife (2%), No occupation (1%)

‡Other ATC class: J-General anti-infectives for systemic use (0.8%), L-Antineoplastics and immunomodulators (1.6%), P-Antiparasitic, insecticides (0.1%), V-Miscellaneous (0.6%), D-Dermatological drugs (0.5%), M-Muscle and skeletal (1.4%), S-Sensory organs (1%), G-Genitourinary system and sex hormones (1.7%), No ATC class (1%)

Supplemental Table 2. Correlation between different age categories and patients' knowledge (drugs and indications cited) (N = 100)

	Age (years)	[30-59] N=10	[60-69] N=28	[70-79] N=46	[80 and more] N=16	p-value
Percentage of drugs cited	Median	83.3	46.4	40.0	28.6	0.0193
	[Q1;Q3]	[66.7;100.0]	[29.7;74.3]	[18.2;71.4]	[0.0;66.4]	
	[Min-Max]	[20.0 ;100.0]	[0.0;100.0]	[0.0;100.0]	[0.0;100.0]	
Percentage of known indications	Median	100.0	75	80.9	84.5	0.0761
	[Q1;Q3]	[82.4;100.0]	[55.2;90.5]	[54.5;100.0]	[39.4;100.0]	
	[Min-Max]	[60.0;100.0]	[23.1;100.0]	[0.0;100.0]	[0.0;100.0]	

Q1 : First Quartile ; Q3 : Third quartile ; Min : minimum ; Max : maximum

Supplemental Files 1 : Global questionnaire

Patient n°:

Length of the interview:

Socio-demographic information :

Gender: Age: Lifestyle: Married Single Children

Origins:

Level of study:

Socio-professional category: Farmer Craftsmen, Shopkeeper, Compagny managers

Executives, Higher intellectual professions Professions intermédiaires

Employees Workers Other:.....

Chronic treatment :

Number of medications on the prescription:

How long have you been taking your first chronic treatment?

Informations :

- Have you ever had your treatments explained to you? Yes No
- Do you feel you have received enough information about your treatments? Yes No
- From whom did you get information about your treatments?
 - Specialist
 - General practitioner
 - Pharmacist
 - Family

Treatment management :

- Who manages your treatments?
 - Myself
 - A nurse
 - A family member

Supplemental Files 2 : Belief Medical Questionnaire

Patient n°:

Score:

1: Totally disagree, 2: Disagree, 3: Uncertain, 4: Agree, 5: Totally agree

Specific Beliefs :

1. My health, at present, depends on my medicines:
2. Having to take medicines worries me:
3. My life would be impossible without my medicines:
4. Without my medicines I would be very ill:
5. I sometimes worry about long-term effects of my medicines:
6. My medicines are a mystery to me:
7. My health in the future will depend on my medicines:
8. My medicines disrupt my life:
9. I sometimes worry about becoming too dependent on my medicines:
10. My medicines protect me from becoming worse:

General Beliefs :

11. Doctors use too many medicines:
12. People who take medicines should stop their treatment for a while every now and again:
13. Most medicines are addictive:
14. Natural remedies are safer than medicines:
15. Medicines do more harm than good:
16. All medicines are poisonous:
17. Doctors place too much trust in medicines:
18. If doctors had more time with patients, they would prescribe fewer medicines:

Supplemental Files 3 : GIRERD questionnaire

Assessment of medication compliance

Patient n° :

	YES	NO
Did you forget to take your medication this morning?		
Since your last visit, have you run out of medication?		
Have you ever been late taking your medication?		
Have you ever not taken your medication because your memory fails you some days?		
Have you ever not taken your medication, because some days you feel that your treatment is doing you more harm than good?		
Do you think you have too many pills to take?		

Supplemental Files 4 : The local ethics committee

AVIS 22-06-2201

Groupe Nantais d'Éthique dans le Domaine de la Santé (GNEDS)

Nom du protocole Code et versioning	Croyances et représentations chez les patients polymédiqués en chirurgie et médecine vasculaire
--	--

Investigateur principal	Dr JF HUON
Lieu de l'étude	CHU NANTES
Type de l'étude	Monocentrique, prospective, exploratoire, observationnelle
Type patients/participants	Patients polymédiqués hospitalisés en chirurgie et médecine vasculaire
Nombre de patients/participants prévus	100
Objectif principal	Évaluation de la croyance des patients sur leurs traitements habituels
Objectif secondaire	Connaissance et importance données par le patient à chacun de ses traitements Adhésion médicamenteuse

Documents communiqués

Justification de l'étude	OUI
Méthodologie	OUI
Lettre d'information et lettre de consentement	OUI

Remarque générale

Le GNEDS formule d'abord la remarque qu'il n'a pas pour mission de donner un avis sur les aspects scientifiques du protocole, en particulier sur l'adéquation de la méthodologie aux objectifs poursuivis par l'étude. Il ne tient compte des données d'ordre scientifique et méthodologique que dans la mesure où elles ont des implications d'ordre éthique. Dans le cas présent, il se bornera à constater que les objectifs de cette étude et sa méthodologie sont conformes aux principes de l'éthique.

Confidentialité

Confidentialité	OUI
Anonymat	OUI
CNIL	RGPD

Commentaires :

Information et consentement*Consentement :*

Recueil nécessaire	OUI
Type consentement préférable	ORAL
Traçabilité dans le dossier	NA

Commentaires :

Lettre information précisant :

Titre de l'étude	OUI
But de l'étude	OUI
Déroulement de l'étude	OUI
Prise en charge courante inchangée	OUI
Possibilité de recevoir résultats de l'étude	OUI
Traçabilité dans le dossier	NA

Commentaires :

Conclusion

Avis favorable	OUI
Révision nécessaire selon commentaires	
Avis défavorable	

GNEDS : Professeur Paul BARRIERE

Nantes le 22 juin 2022



Reporting checklist for cross sectional study.

An observational and prospective study: Evaluation of beliefs and representations of chronic treatments of polymedicated patients hospitalized in a vascular medicine and surgery department

D. Kotry *et al.*

Based on the STROBE cross sectional guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the STROBE cross sectional reporting guidelines, and cite them as:

von Elm E, Altman DG, Egger M, Pocock SJ, Gotsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies.

Reporting Item

Page Number

1	Title and abstract		
2			
3			
4	Title	#1a	1
5		Indicate the study's design with a commonly used term	
6		in the title or the abstract	
7			
8			
9			
10	Abstract	#1b	2-3
11		Provide in the abstract an informative and balanced	
12		summary of what was done and what was found	
13			
14			
15	Introduction		
16			
17			
18	Background /	#2	4
19		Explain the scientific background and rationale for the	
20	rationale	investigation being reported	
21			
22			
23	Objectives	#3	5
24		State specific objectives, including any prespecified	
25		hypotheses	
26			
27			
28			
29	Methods		
30			
31			
32	Study design	#4	5
33		Present key elements of study design early in the paper	
34			
35	Setting	#5	5
36		Describe the setting, locations, and relevant dates,	
37		including periods of recruitment, exposure, follow-up,	
38		and data collection	
39			
40			
41			
42	Eligibility criteria	#6a	5
43		Give the eligibility criteria, and the sources and	
44		methods of selection of participants.	
45			
46			
47			
48		#7	5-6
49		Clearly define all outcomes, exposures, predictors,	
50		potential confounders, and effect modifiers. Give	
51		diagnostic criteria, if applicable	
52			
53			
54			
55			
56	Data sources /	#8	5-6
57		For each variable of interest give sources of data and	
58	measurement	details of methods of assessment (measurement).	
59			
60			

1			Describe comparability of assessment methods if there	
2			is more than one group. Give information separately for	
3			for exposed and unexposed groups if applicable.	
4				
5				
6				
7				
8	Bias	#9	Describe any efforts to address potential sources of	NA
9			bias	
10				
11				
12				
13	Study size	#10	Explain how the study size was arrived at	5
14				
15				
16	Quantitative	#11	Explain how quantitative variables were handled in the	6
17	variables		analyses. If applicable, describe which groupings were	
18			chosen, and why	
19				
20				
21				
22				
23				
24	Statistical	#12a	Describe all statistical methods, including those used to	6
25	methods		control for confounding	
26				
27				
28				
29	Statistical	#12b	Describe any methods used to examine subgroups and	NA
30	methods		interactions	
31				
32				
33				
34				
35	Statistical	#12c	Explain how missing data were addressed	NA
36	methods			
37				
38				
39				
40	Statistical	#12d	If applicable, describe analytical methods taking	NA
41	methods		account of sampling strategy	
42				
43				
44				
45	Statistical	#12e	Describe any sensitivity analyses	NA
46	methods			
47				
48				
49				
50				
51	Results			
52				
53				
54	Participants	#13a	Report numbers of individuals at each stage of study—	7
55			eg numbers potentially eligible, examined for eligibility,	
56				
57				
58				
59				
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confirmed eligible, included in the study, completing follow-up, and analysed. Give information separately for for exposed and unexposed groups if applicable.

Participants	#13b	Give reasons for non-participation at each stage	NA
Participants	#13c	Consider use of a flow diagram	NA
Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	7
Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest	Supplemental Table 1
Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable.	7-10 + tables
Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	7-10 + tables
Main results	#16b	Report category boundaries when continuous variables were categorized	NA

1	Main results	#16c	If relevant, consider translating estimates of relative risk	NA
2				
3			into absolute risk for a meaningful time period	
4				
5				
6	Other analyses	#17	Report other analyses done—e.g., analyses of	NA
7			subgroups and interactions, and sensitivity analyses	
8				
9				
10				
11				
12	Discussion			
13				
14				
15	Key results	#18	Summarise key results with reference to study	10
16			objectives	
17				
18				
19				
20	Limitations	#19	Discuss limitations of the study, taking into account	15
21			sources of potential bias or imprecision. Discuss both	
22			direction and magnitude of any potential bias.	
23				
24				
25				
26				
27				
28	Interpretation	#20	Give a cautious overall interpretation considering	10-16
29			objectives, limitations, multiplicity of analyses, results	
30			from similar studies, and other relevant evidence.	
31				
32				
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34				
35	Generalisability	#21	Discuss the generalisability (external validity) of the	14
36			study results	
37				
38				
39				
40				
41	Other Information			
42				
43				
44	Funding	#22	Give the source of funding and the role of the funders	17
45			for the present study and, if applicable, for the original	
46			study on which the present article is based	
47				
48				
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51				

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