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Pharmaceutical pictograms for low-literate patients: understanding, risk of false confidence, and evidence-based design strategies.

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Abstract

Objective This study aims to (1) evaluate ten pharmaceutical pictograms for low-literate patients on understandability, (2) assess the risk of false confidence in understanding, and (3) identify how the design can be improved to increase understandability.

Methods Interviews were conducted with *n* = 197 pharmacy visitors in the Netherlands. Additional qualitative discussions were held with *n* = 30 adequately and *n* = 25 low-literate participants (assessed with REALM-D). Qualitative data were analysed using the Thematic Framework approach.

Results Half of the pictograms reached 67% understanding (31.0% - 98.5%); two did in the low-literate group. Three pictograms showed a risk for false confidence. Pictograms appeared to be most effective when people were familiar with their visual elements and messages.

Conclusion Low-literate people have more difficulty understanding pictograms than people with adequate literacy. While the risk of false confidence is low, for critical safety information, 67% understanding might not be sufficient. Design strategies for pharmaceutical pictograms should focus on familiarity, simplicity, and showing the intake and effect of medicine.

Practice Implications Health professionals should go over the meaning of pictograms when providing drug information to patients to increase patients' familiarity with the message and to ensure that all pictograms are sufficiently understood.

1. Introduction

Nonadherence to medication is one of the main barriers for hypertensive patients to reach blood pressure control [1] and is associated with serious health risks, such as an increased chance of stroke and even death [2]. Patients with low literacy skills may struggle to understand instructions on treatment [3], increasing the likelihood of unintentional nonadherence. Indeed, studies show that low literacy is associated with poorer blood pressure control [4] and with cardiovascular-related visits to the emergency department [5].

A key area to focus on to improve cardiovascular outcomes is the communication process with patients [6]. Patients who do not understand how their treatment works are less motivated to adhere, resulting in suboptimal self-management [7]. Since patients' recall of information that is discussed between healthcare providers and patients is usually low [8], they are provided with written drug information, which is helpful to review instructions and can facilitate an informed choice [9].

However, drug information is often written at a level that is beyond the reading level of its audience, and in particular of patients with low literacy [10]. To improve the usability of patient information, visuals can be used [11]. Visuals can help to draw attention to a document [12], improve comprehension of information [13], and help to retrieve information from memory [14], as reviewed by Houts and colleagues [15]. Especially pictograms, stylised figurative drawings that convey information or express an idea [16], have been considered useful for people with low literacy [17].

Understanding of pictograms can vary between different target groups [18]. For this reason, it is advisable to involve the relevant audience in the design and evaluation of pictograms [19]. The International Organisation for Standardisation, an international standard-setting body, recommends that safety signs should at least be understood by 67% of the test group (ISO 3864) [20]. Arguably, understanding should be even higher for warnings relating safe medication use, where consequences of misinterpretations can be serious. If patients do not realise that they misinterpret a pictogram and act accordingly, this could potentially form a threat to their medication safety.

Pharmaceutical pictograms have been developed for use in written drug information for patients who have difficulty reading. The aims of this study are to determine if the pictograms reach 67% understandability and if there is a risk that patients overestimate their understanding of pictograms. The third aim is to identify design strategies to further improve the pictograms.

2. Methods

2.1 Participants

Data were collected between April and June 2014 in a community pharmacy in the central-western Netherlands. Without selecting, all pharmacy assistants invited clients they had finished helping to participate in the study and referred them to the on-site research assistant (KB). Thirty-six percent agreed to participate; those who declined usually expressed they did not have time to participate. Excluding participants under the age of 18, and two non-completers due to time constraints, the number included for analysis was 197. This number was expected to detect odds ratios above 1.4 - 1.5 in the logistic regression and large effect sizes in the chi-square tests with a significance level of 0.05 and a power of 0.80 [21, 22]. Participant characteristics are shown in table 1. The low-literate group contained slightly more male participants, fewer people in a medical profession, and more daily medication users and users of antihypertensive or heart medication.

2.2 Procedure

In a separate room, the researcher explained the study's purpose and procedure to the potential participant. Written informed consent was obtained. Literacy levels were assessed using the Dutch version of the Rapid Estimate of Adult Literacy in Medicine (REALM-D), a validated instrument [23]. Participants who scored ≥ 60 were classified as adequately literate.

The ten pictograms were shown separately, in a computer-generated random sequence. The participant was asked to verbally explain the meaning of each pictogram to the researcher. In addition, for each pictogram for which the participant provided an interpretation, they indicated how confident they felt about their answer on a scale of 1-10, as a subjective certainty rating.

To qualitatively evaluate the design of the pictograms, the first 25 adequately literate and 25 low-literate participants were asked additional questions to discuss pictograms that were misinterpreted. It has been suggested that as little as twelve interview are sufficient to reach data saturation [24]. Since the desired group size was reached sooner for the adequately literate group than for the low-literate group, random checks were done with adequately literate participants while sampling of low-literate participants continued, so that n = 25 low-literate and n = 30 adequately literate participants were included in the qualitative discussion. After the intended meaning of the pictograms were given, these participants were invited to comment on what aspects of the pictogram they considered clear and unclear, and to provide suggestions for improvements.

2.3 Pictograms

Pictograms were presented to participants without text, printed on separate cards, 4cm x 4cm in size. Pictogram 7 showed a two-step message and therefore was 4cm x 8cm. The pictograms, shown in table 2, were previously developed in an iterative process with individuals with low literacy, communication and pharmaceutical researchers, and graphic designers [25]. Pictograms were pre-evaluated with *n* = 12 low-literate participants and adapted accordingly [26], except for pictograms 6, 8, and 9, which were newly developed.

2.4 Data analysis

All interviews were recorded and transcribed. Scoring of participants' pictogram interpretations as correct or incorrect took place on-site, out of participants' view, and was guided by prior discussions between the researchers and a pharmacist on what would be considered acceptable interpretations. To evaluate the reliability of the on-site scoring, a random selection of *n* = 15 answers per pictogram was later double-coded by two researchers (KB, MvB). For all pictograms, substantial to perfect agreement was found, with Cohen's Kappa scores ranging between 0.67 and 1.00, so that the risk of subjectivity in scoring was considered minimal.

For the quantitative analyses in IBM SPSS Statistics 20, chi-square tests were used to assess whether there was a difference in pictogram understanding between the adequately and low-literate group. Logistic regression was performed for each pictogram to predict the likelihood that, based on the participant having more confidence in their answer, they were more likely to have also interpreted the pictogram correctly.

Qualitative data on the pictogram evaluation were analysed in Atlas.ti following the thematic framework approach [27]. One researcher (MvB) identified labels and built the initial framework, which was used by two researchers (MvB, AK) to independently code *n* = 7 interviews. The codebook was slightly adjusted, and *n* = 15 different interviews were again coded independently, after which Fleiss' Kappa scores were calculated using the online tool CAT. Four code families were identified, i.e. 'clear visual elements', 'unclear visual elements', 'unclear pictogram aspects', 'suggestions for improvement', with respective Kappa scores of 0.77, 0.85, 0.86 and 0.75, indicating a good reliability of the codebook.

3. Results

3.1 Understanding of pictograms and subjective certainty

Pictograms scored between 31.0% and 98.5% on understandability (table 2). Pictograms 4, 5, 7, 9, and 10 reached the ISO criterion of 67% understanding in the group of adequately literate participants; only pictograms 7 and 10 did in the low-literate group. The low-literate group scored significantly lower ($p < 0.05$) on understanding of all pictograms, except for pictogram 2.

To explore the risk of false-confidence, it was evaluated whether participants who felt more confident about their interpretation of the pictogram were also more likely to belong to the category of people who provided the correct interpretation. For all pictograms, except 2 and 3, there is a strong indication that with every step increase in confidence score, the odds to correctly interpret the pictogram increase (table 3), with odds ratios between 1.197 and 4.091 ($p < 0.001$).

We further examined cases where people provided an incorrect interpretation believing they had provided a correct one. For most pictograms, only between 0% and 13% (mean: 5.8%) of participants with a high subjective certainty score (*i.e.*, a score of 9 or 10) had given an incorrect interpretation. However, for three pictograms these percentages were considerably higher: pictogram 6, this was 25% ($n = 8$ out of 32); for pictogram 8, 29.6% ($n = 8$ out of 27); and for pictogram 2 even 67.9% ($n = 19$ out of 28).

3.2 Pictogram characteristics that influence understanding

From the qualitative discussions on the design of the pictograms, six characteristics of pictograms that affected how well they were understood were identified within the code families of 'clear visual elements', 'unclear visual elements' and 'unclear pictogram aspects', *i.e.*:

- the clarity of the visual elements within the pictogram;
- the clarity of the connection between depicted visual elements and the medicine;
- the clarity of the direction of the described effect;
- the presence of distracting elements;
- the complexity of the pictogram as a whole; and
- the familiarity of the pictogram's message.

3.2.1 Clarity of visual elements within the pictogram

Visual elements frequently mentioned as clear or easy to recognise included the blood pressure cuff, heart, question mark, the medicine in pictograms 1, 2, and 6, and the prohibition sign. Less familiar elements were the 'cross' to indicate 'relating to health', 'dizziness', and 'drowsiness', and the medicine in pictogram 6, and to a lesser extent in pictograms 2, 4 and 9. Visual elements that were not familiar enough prevented participants to successfully interpret the pictogram.

3.2.2 Clarity of the connection between depicted visual elements and the medicine

However, constructing the pictogram's message required more than recognising its visual elements. A little over 40% of both adequately (n = 13) and low-literate (n = 11) participants expressed that it was unclear how the depicted visual elements related to the medicine. In pictogram 4, this was mostly due to the poor visibility of the tablet. However, pictograms 1, 2, and 8 that showed a clearly visible tablet in the left top corner of the pictogram also suffered from this issue: participants were unable to interpret how this 'tablet' related to what was depicted in the main frame of the pictogram. This is illustrated by a participant's remark, who understood that pictogram 1 had something to do with a heart, and saw the tablet, but could not connect these icons to form the message that it concerned a medicine for the heart: '*I saw that it was about the heart, but I had no connection with [the medicine]'* [#56, low-literate, F, 56 y/o].

Low-literate participants struggled to form this connection for more different pictograms than adequately literate participants. In pictogram 5, no tablet was depicted, and some participants with low literacy did not understand how the image of 'breastfeeding' related to the medicine, as illustrated by a participant's remark about this pictogram: '*You cannot see that she has a pill in her hand, or a drink, and then I think: why is [breastfeeding] not allowed'* [#48, low-lit, F, 74 y/o].

3.2.3 Clarity of the direction of the described effect

Also the direction of effects, *e.g.,* whether the medicine *should* or *should not* be taken with heart problems and if it helps against *high* or *low* blood pressure was difficult to infer from the pictograms. Thirty percent (n = 9) of the literate and 16% (n = 4) of the low-literate participants indicated to struggle with this. A participant explained why she was unsure about the meaning of pictogram 1:*'I understand that it is your heart. But that it is [good] for [your heart] I did not see. I was doubting between 'take it' or 'do not take it', but usually when you see pictures like that at a rollercoaster you are not allowed in.'* [#14, lit, F, 28 y/o]. Another participant described why the direction of the effect was unclear in pictogram 2:*'I cannot see that it lowers the blood pressure, it could also be high. At the very least it has an effect on your blood pressure'* [#28, low-lit, M, 61 y/o].

3.2.4 The presence of distracting elements

Almost a quarter of the adequately literate (n = 7) and less than 10% (n = 2) of low-literate participants indicated that a particular visual element in a pictogram distracted them from forming the pictogram's message. Pictogram 2 was most problematic in this context: while for most participants it was clear that the blood pressure cuff represented high blood pressure, the presence of a heart in the pictogram distracted from this understanding. A participant's remark illustrates that the heart was considered a distracting element: '*The heart is a little more noticeable than the blood pressure cuff*' [#30, low-lit, M, 48 y/o].

3.2.5 Complexity of the pictogram as a whole

Approximately 20% of both adequately (*n* = 6) and low-literate (*n* = 5) participants pointed out that one or more pictograms were too complex. This usually concerned pictogram 6 and to a lesser extent pictograms 2, 3, and 9. A participant explained that there are too many visual elements in a small space in pictogram 2: '*You have to look at a lot of things, you have to take in the whole picture and you have to look: this would be his heart, and this, and then you have to make the combination – then it is like reading the package insert'* [#01, lit, F, 38 y/o]. Another recurring remark was that the complexity turned the pictogram into a puzzle that had to be solved, as illustrated by a participants' comment on pictogram 6: '*I think this is very unclear for a patient, because many people cannot solve cryptograms. I am also not very good at it.'* [#50, low-lit, M, 63 y/o].

3.2.6 Familiarity of the pictogram's message

Some adequately literate participants (*n* = 6) indicated to struggle with a pictogram because they were unfamiliar with its message. For example, for pictogram 3, participants tried to find a more complex interpretation than required, because the message 'pay attention' did not sound complete. Some participants thought that for pictogram 9, it would sound more familiar to say 'store at room temperature' rather than 'store under 30°C': '*Room temperature, that is what you are referring to. I hope it is not 30 degrees at your place'* [#32, lit, M, 34 y/o].

3.3 Suggestions for improvement of pictograms

In addition pictogram characteristics that influence participants' understanding, six suggestions for the improvement of the pictograms were identified*, i.e.*:

- To edit or reorganise visual elements;
- to rely on learning effect: 'When you know the meaning, it is clear';
- to use pictograms in combination with text;
- to use colour in pictograms;
- to simplify pictograms: remove unnecessary detail; and
- to increase the size of visual elements.

An overview of suggestions per pictogram is presented in table 4.

3.3.1 Edit or reorganise visual elements

Eighty-three percent (n = 25) of the adequate literate and two-third (n = 17) of the low-literate participants suggested to modify, add, or remove certain visual elements within a pictogram – mostly for pictograms 2, 6 and 8. A few participants, 13.3% (n = 4) with adequate literacy, versus 8% (n = 2) with low literacy, suggested to simply reorganise elements that were already present in the pictogram. In half of the cases this was suggested to improve the visibility of the medicine in pictogram 4.

3.3.2 Rely on learning effect: 'when you know the meaning, it is clear'

A little over half of the adequately literate (n = 17) and almost 70% (n = 17) of the low-literate participants mentioned at least once that once they had heard the meaning of the pictogram, they thought the pictogram was clear – in particular for pictograms 1, 2, 6, and 8. For example, a participant said about pictogram 6: *'Now you say [what it means], it is clear, but I would not have seen it straight away'* [#26, lit, M, 75 y/o]. Often, these participants had no suggestions for improvement of the pictogram, since they thought it visualised its message well, even though they were initially unable to infer the pictogram's meaning.

3.3.3 Use pictogram in combination with text

Approximately a third of adequately (*n* = 11) and low-literate (*n* = 8) participants suggested to use text with the pictograms, in particular for pictograms, 8, 1, and 2. For example, a participant proposes to add simple text to pictogram 8: *'I think that if you placed a very simple text next to it, outside of the pictogram, that it becomes very clear. Because this picture with this sleepiness and being confused is very clear already, but I think you need some sort of explanation with it regardless'* [#8, lit, F, 20 y/o]. Two low-literate participants further suggested to present the text in several languages, to provide additional support for patients who do not have Dutch as their first language.

3.3.4 Use colour in the pictogram

Twenty percent (*n* = 6) of adequately literate and 8% (*n* = 2) of low-literate participants suggested to add colour to the pictograms. A specific suggestion was to use yellow to emphasise the warning sign in pictogram 3. In addition, for pictogram 6, two participants proposed to use colours to visualise a mix of different medication types, instead of drawing different packaging forms.

3.3.5 Simplify the pictogram: remove unnecessary detail

Twenty percent (*n* = 6) of adequately literate and 8% (*n* = 2) of the low-literate participants specifically recommended to simplify a pictogram. This often coincided with the feedback that the pictogram was too complex. An adequately literate participant, who commented on the complexity of pictogram 6 and suggested to simplify it, said: *'You have to be able to see and understand it in one glance'* [#01, lit, F, 38 y/o].

3.3.6 Increase the size of visual elements

It was suggested to increase the size of visual elements within the pictogram to increase their visibility by 13.3% ($n = 4$) of the adequately literate and 8% ($n = 2$) of the low-literate participants. This suggestion was mostly targeted at the visualisation of the medicine in pictogram 4.

4. Discussion and Conclusion

4.1 Discussion

This study evaluated pharmaceutical pictograms which were developed for use in written drug information for low-literate patients, with the aim to provide insight into their understandability, the likelihood of patients overestimating their understanding of the pictograms, and to identify strategies to improve the design.

A pictogram's perceived complexity is an important determinant of how well it is understood. Some pictograms contained too many, or even redundant, elements. Distracting elements should be avoided, in particular for older and low-literate audiences [28, 29]. To find the right balance between designing a pictogram that is simple and provides enough visual information, it is essential to involve end-users in the design.

A strategy to reduce visual load in pictograms is to increase the size of pictograms, which has been shown to lead to better understanding [18]. Another strategy is to split up pictograms into multiple frames to reduce the visual load per frame. The connection between the different steps should then be indicated clearly [30]. However, the issue that some pictograms are considered too complex may reflect that some messages themselves are just too complicated to be successfully illustrated in a traditional pictogram: the simpler the message, the greater the likelihood that a successful pictogram can be created.

Our findings also confirm the strategy to use familiar visual elements to lower the perceived complexity of pictograms [30, 31] and call attention to the importance of patients' familiarity with the pictogram's *message*. People prefer to see messages visualised that are familiar to them, such as 'store at room temperature' rather than 'store under 30°C'. Also, after people have had their first exposure to the intended meaning of the pictogram, they often agree that the pictogram is a good representation of its message. This 'relatedness' of the pictogram's message and visualisation is captured in the concept 'translucency' [32], and could indicate that with repeated exposure to the pictogram and its message, patients' understanding of the pictogram would reach satisfactory levels.

Successful pharmaceutical pictograms should leave little room for ambiguity, in particular for patients with low literacy. To indicate the effect of taking a medicine without ambiguity, a step-wise representation strategy could be used: first show the intake of the medicine, a commonly encountered and easy-to-understand visual element [33], followed by showing the effect of the medicine.

Another strategy to help reduce ambiguity in pictograms is to use them with simple text, recommended by both adequately and low-literate participants. According to the Multimedia Principle, people learn more profoundly from a combination of textual and visual information than from words or images alone [34, 35]. In addition, low-literate patients could use the pictograms as a tool to ask questions about the textual information to literate carers [25]. Despite the low risk for false-confidence we see for most pictograms, it should be noted that pictograms alone are not sufficient communication tools, even if they reach 67% understandability, and that it is advisable to use them to support written information and in combination with oral explanations.

While low-literate patients benefit most from such a visual/textual leaflet [36], they also struggle more than those with adequate literacy skills to interpret the meaning of pictograms. To address this issue, after the design has been further optimised for a low-literate audience, health professionals who provide pictogram-enhanced information to patients should take care to go over the meaning of pictograms. This could be particularly helpful for pictograms with less familiar and more complex messages [31] and can help to further bring down the risk of patients overestimating their understanding of the pictograms. Public education about the meaning of the pictograms would further help to encourage familiarity of the pictograms.

Despite the fact that low-literate participants score lower on understanding of the pictograms, they also have fewer remarks and suggestions for the pictograms compared to the group with adequate literacy. Since preferences for visualisation style can differ between people with varying levels of literacy [37], and low-literate participants were involved in the pre-design of the pictograms, it is possible that the design of the pictograms appeals more to low-literate than to adequately literate patients. Although possibly supportive for our argument that pictograms should be developed in cooperation with the target audience, these results could also reflect lower cognitive abilities such as processing speed, working memory, inductive reasoning and verbal ability that are associated with low (health) literacy [38].

Study limitations should be noted. Due to limited resources, sampling took place at a single pharmacy that had a separate room available and was willing to recruit potential participants, which may limit the generalisability of findings. In addition, non-participation bias may have occurred. However, the number of people with low-literacy in the sample is as expected [37, 39], so the possible participation bias does not appear to have affected the involvement of the main target group in a significant way. There was however, a relatively high proportion of native Dutch speakers. Therefore, in the future it is advisable to evaluate the pictograms with a sample including a more mixed background.

4.2 Conclusion

Five pictograms meet the 67% ISO cut-off for understanding in the overall group; two in the low-literate group. Despite needing pictograms most, low literate people struggle more to interpret pictograms compared to people with adequate literacy. The risk that patients overestimate their understanding of a pictogram is generally low. Design strategies for pharmaceutical pictograms include using familiar visual elements and messages, to aim for simplicity and clear visibility, to use simple text and colour, and to visually indicate how the message relates to the medication to avoid ambiguity in interpretation.

4.3 Practice implications

The identified design strategies will guide the further development of the pictograms of this project and can be used by other designers of pictogram interventions for low-literate patients. More complex ideas may not be suited to be described in a traditional pictogram. Health professionals who provide patients with pictogram-enhanced written drug information should explain the pictograms to ensure that the patients are familiar with their message. Future studies should test whether patients' understanding of the pictograms does indeed improve with repeated exposure, and should evaluate the pictograms in the context of written drug information.

Patient details:

I confirm all patient/personal identifiers have been removed or disguised so the patient/person(s) described are not identifiable and cannot be identified through the details of the story.

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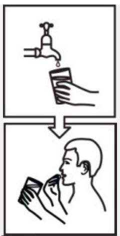
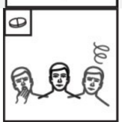
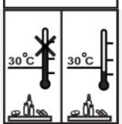
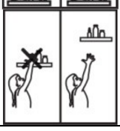
Table 1: Participant characteristics

	Low-literate participants *n* = 31	Adequately literate participants *n* = 166
Mean age (range)	61 (32-80)	50 (18-88)
Gender - female (%)	12 (38.7)	112 (67.5)
Mean REALM-D (range)	55.3 (34-60)	64.4 (61-66)
Dutch as native language (%)	29 (93.5)	162 (97.6)
In a medical profession (%)	2 (6.5)	49 (29.5)
Daily medication user (%)	23 (74.2)	90 (54.2)
Antihypertension or heart medication user (%)	19 (61.3)	51 (30.7)

Table 2: Comparison of pictogram understanding between participants with low literacy and adequate literacy.

		Meaning	Understanding low-literate $n = 31$	Understanding literate $n = 166$	Understanding low-literate vs. literate	
			n (%)	*n (%)*	χ^2 *(1 d.f.)*	*P-value*
P1		Heart medication	11 (35.5%)	91 (54.8%)	3.911	0.048
P2		Medication to treat high blood pressure	5 (16.1%)	56 (33.7%)	3.788	0.052
P3		Pay attention	11 (35.5%)	104 (62.7%)	7.934	0.005
P4		Cannot be used during pregnancy	20 (64.5%)	**140 (84.3%)**	6.728	0.009
P5		Cannot be used in combination with breastfeeding	17 (54.8%)	**154 (92.8%)**	32.809	<0.00001
P6		Discuss with your doctor if this medicine can be used with your current medication	8 (25.8%)	80 (48.2%)	5.297	0.021
P7		Take medicine with a glass of water	**28 (90.3%)**	**85.6 (100%)**	16.313	<0.00001
P8		Side effects can be drowsiness and dizziness	4 (12.9%)	69 (41.6%)	9.201	0.002
P9		Do not store warmer than 30°C.	19 (61.3%)	**136 (81.9%)**	6.632	0.010
P10		Keep out of reach of children.	**23 (74.2%)**	**162 (97.6%)**	24.997	<0.00001

In **bold**: scores that meet the 67% ISO cut-off for pictogram understanding.

Table 3: Logistic regression predicting understanding for certainty score.

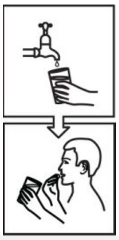
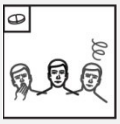
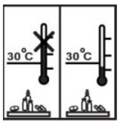
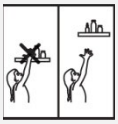
	Overall understanding [a] *n* = 197 *n (%)*	Mean subjective certainty rating [b]	Understanding vs. certainty *OR (95% CI)*	 *P-value*
P1	102 (51.8)	6.24 (*n* =144)	1.197 (1.003 – 1.428)	0.046
P2	61 (31.0)	6.42 (*n* =171)	1.023 (0.892 – 1.173)	0.745
P3	115 (58.4)	5.95 (*n* =144)	1.084 (0.914 – 1.287)	0.354
P4	**160 (81.2)**	8.87 (*n* =192)	1.470 (1.190 – 1.817)	<0.00001
P5	**171 (86.8)**	8.71 (*n* =187)	1.671 (1.307-2.137)	<0.00001
P6	88 (44.7)	6.87 (*n* =156)	1.329 (1.121 – 1.576)	0.001
P7	**194 (98.5)**	9.26 (*n* =197)	4.091 (1.556 - 10.752)	0.004
P8	73 (37.1)	6.68 (*n* =179)	1.393 (1.168 – 1.661)	<0.00001
P9	**155 (78.7)**	7.82 (*n* =179)	1.527 (1.232 – 1.893)	<0.00001
P10	**185 (93.9)**	8.99 (*n* =192)	2.093 (1.354 – 3.235)	0.001

[a] Understanding in overall group (*n* = 197)

[b] Only subjects who made an attempt to answer the pictogram were asked to give their subjective certainty rating, so that the *n* varies per pictogram.

In **bold**: scores that meet the 67% ISO cut-off for pictogram understanding.

Table 4: Main suggestions for improvement per pictogram.

	Suggestions for improvement		Suggestions for improvement
P1 	Remove red cross, show intake of medicine, clarify if it is good/bad for heart, add text	**P6** 	Edit speech balloon and medicines, simplify, increase size of elements, reduce complexity, more clearly show link with medicine.
P2 	Remove heart and red cross, add arrow to indicate direction of the effect, add text, reduce pictogram complexity	**P7** 	Use colour
P3 	Remove person, show intake of medicine, make message more familiar	**P8** 	Remove middle figure, clarify 'dizzy' and 'drowsy', add text, more clearly show link with medicine.
P4 	More clearly show link with medicine, reorganise elements so that the tablet is visible	**P9** 	Add a fridge or a sun, add a sign to indicate the recommended situation, increase recognisability of medicine
P5 	Add a tablet, add a head to the figure	**P10** 	Make the child look more childish, add an adult, add a cupboard, add a sign to indicate the recommended situation.