

Development and Delphi validation of a Best Possible Medication History form

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Abstract

Background The Best Possible Medication History (BPMH) form is the first step for medication reconciliation across the continuum of care but getting a complete picture of the patient's current medication is a particularly difficult challenge.

Objective To develop and validate a standardized BPMH form that could be used by clinical pharmacists.

Setting Belgium hospitals

Method The draft version was presented to a focus group and was adapted following their comments. A three-rounds e-Delphi method was used to validate content, usability and face validity of BPMH form. We supplemented the quantitative analysis with a qualitative analysis of comments for each Delphi round.

Main outcome measure To select tabs and items to be included in BPMH.

Results The draft BPMH form contained 23 items grouped into 8 tabs. Refinement of these tabs and items by the focus group resulted in 7 tabs and 21 items, which were included in the Delphi survey. The consensus was obtained for all tabs within the second round ($p= 0,072$). The research group included 20 items following the qualitative analysis of the experts' comments despite a level of agreement of 76% (16/21) in third round.

Conclusion A structured BPMH form could be a reference as well for inpatient prescribing as for any home medication modification at the time of discharge. Improving medication safety is fundamental for patient safety and is a priority target for healthcare systems. The next step might be to integrate this tool through medical record to assist physicians, nurses and hospital pharmacists in their practice.

Impacts On Practice

- An inaccurate medication history may be the cause of up to 85 % of medication errors on admission. The process of collecting medication history can be facilitated by using a structured Best Possible Medication History form
- The Best Possible Medication History form is available to various healthcare providers (pharmacists, nurses, physicians)

Introduction

Medication errors are a major cause of morbidity, with clinical and economic consequences for society and patients. An incomplete medication history leads to the majority of medication errors at hospital admission. They are usually not detected later in normal clinical practice [1–7]. An inaccurate medication history may be the cause of up to 85 % of medication errors on admission [1]. This may be in part due to poor communication between primary and hospital healthcare professionals and the lack of a complete, updated and accessible medication history. The Best Possible Medication History (BPMH) is defined by

World Health Organization (WHO) as “a medication history obtained by a clinician which includes a thorough history of all regular medication use (prescribed and non-prescribed, included medication names, dose, frequency, route of administration and patient adherence), using a number of different sources of information” [8].

The BPMH represents an accurate and complete list of all medications taken prior to admission, which may differ from what is contained in their clinical records [9, 10]. Numerous studies have been conducted on discrepancies between current medication of patients and what is recorded in the clinical records [7, 11, 12]. A study achieved by emergency physicians revealed that 87 % of medication histories on admission to hospital had at least one medication error in patients aged 65 and over [11]. Involvement of a clinical pharmacist in performing the BPMH upon admission has significant potential for reducing medication discrepancies and improving quality of patient’s health care. Clinical pharmacists are well equipped to record BPMH as they are familiar with prescription and non-prescription medication actually taken by the patient, including drug name, dosage, frequency and administration route [7]. A Belgian study including 215 patients highlighted that clinical pharmacists identified 1564 drugs while physicians only 1303 [13]. Creating a BPMH form should involve the use of a systematic process and verifying medication information with more than one source. The systematic achievement of a BPMH has reduced the proportion of patients with one or more discrepancies in their admission treatment from 62 to 32% [13–15]. BPMH is difficult to obtain for multiple reasons: poor patient understanding of the home medication regimen, inadequate or fragmented health information systems, time-consuming nature of the process, etc. [16].

According to WHO, BPMH should be documented in a purpose designed form to improve accuracy and efficiency of the information required. The standardized form must be developed by organization [8]. Henneman *et al.* have shown increased accuracy of BPMH from 74 to 87% when a standardized method was used by nursing students [17]. There is scarce literature about the development of BPMH standardized forms [18]. Hospitals should thus collaborate to develop an accurate and standardized BPMH form.

Aim Of The Study

The aim of this study is to develop and validate a standardized BPMH form that could be used in hospitals. This BPMH form could be a reference as well for inpatient prescribing as for any home medication modification at the time of discharge. Improving medication safety is fundamental for patient safety and is a priority target for healthcare systems.

Ethics Approval

Non applicable

Methods

The BPMH form was developed and refined by two clinical pharmacists with 5 years of expertise in BPMH. The role of this research group was to supervise the project and to create tabs and items for the draft version of the BPMH form (Fig. 1). [Insert Fig.1 here] The starting point for items and tabs development was based on practice and literature review. The draft version was presented to a focus group with seven clinical pharmacists and was adapted following their comments. Classic focus group methodology was followed. The e-Delphi method was used to validate content, usability and face validity of BPMH form (Appendix 1). Anonymity of experts was maintained throughout the study. Reminder emails were sent as necessary to encourage participation and a deadline was given for completion.

Selection of experts

Due to a lack of guidelines concerning the ideal number of experts required to constitute a Delphi panel, it was decided that the chosen panel would contain at least 20 experts. The experts of Delphi panel were enrolled within our own network and approached by the research group. We used the SurveyMonkey[®] website to facilitate the Delphi survey.

First round

The Delphi questionnaire contained 3 sections. The first section collected background and demographic information: gender, teaching status of hospital, region, type of practice and experience. The second section asked the experts the level of agreement for each tabs/items. The third section evaluated usability of the BPMH form.

Level of agreement

Experts were invited to answer a questionnaire in which they rated their level of agreement for each individual tab and item of the BPMH form. Rating was done using a 5-point Likert Scale: 0-strongly disagree; 1-disagree; 2-neither agree nor disagree; 3-agree; 4-strongly agree. Each tab was rated according visual aspect (clarity of presentation, sufficient space, line count) and written expression (syntax, language and vocabulary, etc.). The same scale was used to rate each item according usefulness, relevance, answer to the request of care providers (nurses, physicians) or hospital pharmacists. Blank space was included for comments, change in wording of item/tab or underlying reasons of the rating. At the end of the first round, experts were encouraged to provide opinions and suggestions for content that was not included in the BPMH form. Items and tabs with 100% of expert rating ≥ 3 were retained for the final version of BPMH form. Items and tabs with a lower percentage of experts' agreement were subjected to the second round. Following the comments of the experts, some items or tabs were deleted. After receiving the first round survey responses, one research team member analyzed each result. Comments were discussed with the research team.

Usability evaluation

The usability was measured with the statements of USE (Usefulness, Satisfaction and Ease) questionnaire by Lund [19]. The usability rating was considered a secondary endpoint and has not been used to exclude items or tabs. The layout of the BPMH form was assessed according to its adequacy, legibility, choice of colors and ease of use.

Second round

Experts who responded entirely the first round were given a new questionnaire containing the results of the round one (mean values, median, Q1: 25th percentile, Q3: 75th percentile, the distribution of ratings, their own ratings). Experts confirmed or re-rated their level of agreement on a Likert scale for each item or tab and they commented their position if they re-rated or if they had a deviating note. The note was considered deviating if it was not between the 25th and 75th percentile. Items and tabs with 85% or more experts rating ≥ 3 were included in the BPMH form. Experts' comments were collated and analyzed to improve the items and tabs and to refine the wording.

Additionally, new items based on experts' suggestions were added to the questionnaire and were rated by experts.

Third round

Results of the second round were provided to experts at the beginning of the third-round survey. Each expert confirmed or re-rated their level of agreement and argued the deviant comments. After the third round, only items and tabs that received rating ≥ 3 of more than 85% of the experts were retained for the final version of BPMH form.

Data analysis

The Delphi survey responses were analyzed using the software SPSS version 25. For each outcome, the mean agreement rating, the percentage of experts who rated each item or tab ≥ 3 were calculated. Level of agreement with the ranking in round 1 and 2 was measured using Wilcoxon signed-rank test. Triangulation method was used to reduce potential bias due to a single person doing all the data management with the confirmation of research group. We supplemented the quantitative analysis with a qualitative analysis of comments for each Delphi round to integrate all suggestions for content for the BPMH form, reasons underlying the rating and possible redraft wording tabs or items. Before the analysis began, irrelevant or not detailed comments were removed (e.g., 'nothing to report' or comments regarding level of agreement). Comments were coded according to an open and inductive procedure by the first author. Research group agreed on the meaning of the codes. Differences regarding wording were discussed and agreed upon together.

Results

The draft BPMH form contained 23 items grouped into 8 tabs (Fig.2). [Insert Fig.2 here] The focus group excluded the tab *“to be completed by the care provider”* containing the item *“sources used during the realization of the BPMH”*. This item merged in to the tab *“general information”*. Participants added 2 items: one concerning lifestyle (tobacco, alcohol, drugs use) and one concerning self-medication. The wording was changed for 4 items (medication management; patients’ personal treatment, sources, ©Morisky Medication Adherence Scale).

A total of 46 experts were invited to participate, of which 30 agreed. The number of experts ranged from 28 for the first round to 23 for the second round and finally 20 to the third round (Fig. 2). Of the 20 experts completing all three rounds, 5 (25%) were specialists in geriatrics, 3 (15%) in antibiotic stewardship, and 3 (15%) in general clinical pharmacy. The specialty of the other 9 experts and the characteristics of the Delphi panel of experts are described in the Table 1. [Insert Table.1 here]

First round

Expert panelists individually rated 7 tabs and 21 items. Three tabs met the consensus criteria for inclusion in the BPMH form (Table 2). [Insert Table 2 here] The research group excluded 1 tab *“remarks”* following the qualitative analysis of the experts' comments despite a level of agreement of 82% (Appendix 2).

As depicted in Table 3, no items achieved a level of agreement of 100%. Item *“medication available in the hospital's formulary”* was excluded by the research group following the qualitative analysis (14% of experts removed it and 21% reduced the size of the column). This was also the same for item *“comments”* (11% of experts removed it) and moreover the level of agreement was 65% (this item was not clear and useful). Following those removals, columns *“medication”* and *“remarks”* were enlarged and the item *“chronic and acute/on demand medication”* was added to BPMH form for inclusion in the second round of Delphi. The other suggestions were not considered relevant for this study.

According to comments received in first-round, modifications were made to 14 items included in the second round to clarify wording, re-draft and add some more details. The item *“self-medication”* has been divided in two parts following the experts' comments. One part was integrated in the table of *“medication”* tab and the other part was moved to tabs *“questions about medication”*. This part *“self-medication”* was renamed *“are you taking any medication other than those prescribed by your physician?”* to integrate self-medication, over the counter medication but also drugs recommended/delivered by a third party. Several experts provided comments indicating a lack of clarity in the description of item *“sources”*, *“medication in the form of”* and *“medication for”*. The descriptions of these items were subsequently clarified during the second round.

The BPMH form was rated positively in the “USE questionnaire” with average scores higher than 3 (out of 4) for all three dimensions (Usefulness, Satisfaction and Ease). [Insert Table 3 here]

Second round

Rating expert panelists individually rated 6 tabs and 20 items. As shown in Table 2, consensus was obtained for all tabs within the second round ($p = 0,072$). Furthermore, consensus was reached in second round for 80% (16/20) of items according to validation rule for this round (for all items $p < .001$) (Table 3). The item *“chronic and acute/on demand medication”* introduced after the first round achieved consensus. In accordance with experts, three items were revised for clarification. One expert’s comment from the second round suggested that the term *“drug”* (item 5) could be misleading as experts might omit non-prescribed drugs, dietary supplements, essential oils, etc.. The wording was changed from *“drug”* to the broader term *“medication”*. This modification was specifically mentioned in the third-round questionnaire. The experts considered the question *“are you taking any medication other than those prescribed by your physician?”* important but redundant with the self-medication column in the table of *“medication”* tab. As a result, this question was changed into a checkbox in the item *“medication for”* (i.e., medication over the counter, drug recommended, given, purchased on the internet). Item *“terms of use”* was moved from tab *“medication”* to tab *“questions about medication”*. Additionally, an item *“vaccination”* was added after experts’ input. For tab *“home medication management”*, the items *“use of a pill dispenser”* and *“home treatment”* were revised to *“assistance in medication management”* and *“did you bring your personal treatment to the hospital?”* because their descriptions were not easy to understand. Both were well validated in the second-round of Delphi. A statistically significant level of convergence occurred between the two rounds of rating across all items and tabs ($p < .001$).

Conversely, consensus was not reached for several items: item *“sources”* for its repetitive nature, item *“assistance in medication management”* was not considered relevant for care providers, item *“terms of use”* and *“©Morisky Medication Adherence Scale”* was not considered relevant for hospital pharmacists.

Third round

76% (16/21) of items had reached consensus. Consensus was not reached for several items: item *“sources”* for its repetitive nature, item *“assistance in medication management”* was not considered relevant for care providers, item *“©Morisky Medication Adherence Scale”* was not considered relevant for hospital pharmacists.

The item *“vaccination”* achieved consensus for usefulness and relevance. The research group analyzed the qualitative comments.

Discussion

This is one of the first studies to develop a standardized BPMH form. The BPMH form is the first step for medication reconciliation across the continuum of care but getting a complete picture of the patient’s current medication is a particularly difficult challenge. A major reason for this difficulty is that the multidisciplinary healthcare team has not access to an accurate and complete medication list at patient admission [20]. Several studies proved the BPMH improves the continuity of care and decrease medication errors by allowing a better medication data sharing and better communication between

hospital healthcare and extramural healthcare providers [20–24]. Moreover, this process is part of the Joint Commission International Patient safety goals list for the hospitals' accreditation [25]. According to WHO, the BPMH form should be documented in a standardized form developed and designed by organization that prompts for the information required to improve accuracy and efficiency [8,9]. The development of a structured BPMH form contributes to ensure a systematic approach for collecting medication history. Moreover, as demonstrated by Henneman *et al.*, when a structured and systematic approach was used by nursing students, the accuracy of BPMH increases from 74 to 87% [17]. A variety of methods have been attempted to improve the process of collecting BPMH, but there is lack of information in the literature regarding the tools used to collect the data and whether and how they have been validated [10,17,20–24,26,27]. Our study combines the development of a BPMH form by the research group, its adaptation by focus group and its validation according to the Delphi method. BPMH form was specifically designed and validated by the targeted audience (i.e. clinical pharmacists). The application of Delphi method within this research context is ideal because designed to explore topics where minimal information exists. It is also ideal for the introduction and integration of viewpoints and opinions of experts.

The final BPMH includes 20 items arranged under six tabs: *“general information”*, *“medication”*, *“home medication management”*, *“questions about medication”*, *“allergies/side effects”* and *“medication adherence”*. After the first-round, the tab *“remarks”* was excluded. The experts deemed this tab as unnecessary and repetitive because they already have the opportunity to comment in each tab or item.

Throughout each round, item *“sources”* in tab *“general information”* and item *“sources table”* in the table of *“medication”* tab presented a problem because they were considered redundant by some of the experts. The qualitative analysis showed that out of 11 experts who commented, 35% (7/11) felt that the item *“sources”* should be retained and 20% (4/11) that it was redundant. Following a literature review and the experts' comments, the research team included this item. The High 5s project about medication reconciliation specifies in the definition of BPMH that different sources of information should be used and that the medication information should be checked with more than one source as appropriate [8,9,28]. The recommendation of international peak bodies was to use at least three sources to acquire a reliable medication history because it is the gold standard. According to the experts' comments, item *“sources”* increased the accuracy of the medication history because it provided the advantage of detailing the sources and providing an overview of the possibilities of sources used. By contrast, item *“sources table”* provided an overview of the sources used for each medication. Following the experts' suggestions, the proposals were added in the item *“sources”*: call to the family physician and institution, pharmacist's medication plan and institution's treatment sheet. In addition, with the evolution of e-health, the various Belgian platforms allowing the exchange of computerized health documents between healthcare providers have been introduced in item *“sources”*.

The item *“drug”* was replaced by *“medication”*. Medicinal plants, homeopathy, dietary supplement, essential oil are not part of the legislation on medicinal products. After a review of the literature and drug legislation, several terms were proposed to the experts to modify the term *“drug”* in the table of

“medication” tab: drug; medication; drug, dietary supplement, medical devices; drug and other health product; drug and product for human use.

For tab *“questions about medication”*, items *“medication in the form of”* and *“medication for”* were considered relevant memory-aids/ checklist to help all health professional to avoid forgetting medication. Several factors specific to the care unit complicate the collection of the medication history with the patient: unconscious or confused patient, limited time, acute pathology, the fact that some patients have little involvement in their therapeutic management and others may have cognitive impairment. Moreover, some medications are considered unimportant by patients, for example, sleeping pills, vitamins, etc. It is important to specifically ask them this question during the medication history [5]. Following the experts' request to add proposed answers for item *“medication in the form of”*, the number of galenic forms before round 1 was enhanced from 6 to 8 (i.e., syrup, suppository). In order to clarify this item, checkboxes have been introduced as for the item *“medication for”*. The item *“medication for”* is a checklist to conduct a human system review to ensure all health care professionals are asking pertinent questions regarding the patient's medications. To clarify this item, the existing prefilled answers were divided into three points: systems of the human body, types of medication and frequencies of administration.

The item *“vaccination”* was included being regarded as useful by experts but being considered as difficult to answer by patient and time-consuming for the hospital pharmacist. In general, the patient does not know his vaccination schedule and the hospital pharmacist will have to do some research. In the third round, the item was changed from a closed to open question (i.e., *“are you up to date on your vaccinations?”* to *“during the last 2 years, have you been vaccinated”*). That allows the patient to answer without being limited or influenced by predefined answers.

In the same tab, the item *“were there any recent changes in your treatment?”* and item *“have you taken any antibiotics recently”* were revised to *“in the last 2 months, “were there any changes in your treatment?”* and *“in the last 2 months, have you taken any antibiotics/anti-virals/antifungals?”*. This change was made because the experts wanted to clarify what is meant by "recently". Two months was established arbitrarily by the research team as no data about this period was found in the literature.

The item *“medication available in the hospital's formulary”* (in the table of *“medication”* tab) was excluded after the first-round because the experts considered the wording was not clear and not useful. For experts, this step is not part of the medication history but of the medication reconciliation. Moreover, computerized prescription software allows automatic substitutions to be made (for drugs of the same pharmaceutical class available in the hospital's formulary). This item also took too much space in the table.

The item *“[©]Morisky medication adherence scale”* was not included by the research group because did not achieve consensus. A thorough analysis of the topics and the reluctance reasons of experts was conducted. The first reasons identified were a lack of knowledge. The other reasons were the impression

that patients will feel judged and that it is a lack of time to perform this adherence test. Some experts proposed to reduce the number of questions but it was not possible because the Morisky score was validated in that form. The choice of adherence scale is left to the clinical pharmacist's discretion performing the BPMH.

In this study, outcomes that did not achieve consensus support following the third round of the Delphi were not always excluded from the BPMH form for several reasons. The first reason is that there are currently no guidelines for the most appropriate pre-defined consensus of Delphi. The second reason is that the research group has understood some "lower" ratings thanks to the experts' comments. The third reason is that in the second round, the experts were asked to give a rating for the importance of each proposal from very important to not very important. The majority of experts have always given the important or even very important rating.

The high rate of agreement obtained on most questions in this survey indicates that a strong consensus emerged. A statistically significant level of convergence occurred between the two rounds of rating across all items ($p < .001$) and items and tabs ($p < .001$). All the tabs did not reach a statistically significant difference because the percentage of agreement is between 84% and 100% for round 1 and 93% and 100% for round 2 what represents a too small deviation.

This research has several limitations. It has been validated by a small group of French-speaking Belgian clinical pharmacists, which may affect the wider generalizability of the results. Moreover, categories of some items that had not achieved consensus following the third round were included in the BPMH form.

One of the highlights of the study is the large volume of qualitative data generated from round 1 and 2 which allowed us to give a detailed qualitative feedback to experts. This qualitative analysis is not always a component of Delphi studies and is likely to have resulted in more robust findings. Furthermore, the online survey kept the experts from interacting with each other, which is an advantage to prevent biases resulting from more vocal or senior experts dominating the views of the group [29].

The next step is to test this new tool. An English version of the BPMH form will be tested in non-French-speaking countries. Another project might be to integrate this tool through medical record to assist physicians, nurses and hospital pharmacists in their practice. Another step would be to diffuse this tool to Belgian hospital pharmacists (either via the hospital pharmacists' association or by contacting the SPF public health).

A computerized version of the tool has been developed for ease of use in everyday practice. Finally, such a BPMH form could help hospital pharmacists to increase safety and ensure the continuity of treatment. Ensuring that patients receive the correct medications throughout the inpatient stay should be a collaborative and on-going effort between patients, family members and health-care providers.

Conclusion

A structured BPMH form was established and validated. The systematic use of standardized BPMH form will improve the accuracy effectiveness and efficiency of the medication history. The ability to collect a complete and accurate medication list on admission could impact inpatient safety and improve inpatient management. The BPMH collecting process is the starting point for the medication reconciliation process which has the ability to reduce such medication errors. It ensures the continuity of care by allowing a better medication data sharing and better communication between hospital healthcare and extramural healthcare providers.

Abbreviations

BPMH: Best Possible Medication History

WHO: World Health Organization

Declarations

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Conflict of interests

The authors declare that they have no conflict of interest.

Date sharing statement

The data is available on application to the corresponding author

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Tables

Table 1 : *Characteristics of the Delphi panel of experts*

	Round 1	Round 2	Round 3
	N (%)	N (%)	N (%)
Teaching status of hospital			
University hospital	13 (46,4 %)	11 (47,8 %)	10 (50,0 %)
Non-university hospital	15 (53,6 %)	12 (52,2 %)	10 (50,0 %)
Region			
Brussels	8 (28,6 %)	8 (34,8 %)	7 (35,0 %)
Liège	9 (32,1 %)	4 (17,4 %)	3 (15,0 %)
Hainaut	5 (17,9 %)	5 (21,7 %)	5 (25,0 %)
Walloon Brabant	2 (7,1 %)	2 (8,7 %)	2 (10,0 %)
Namur	3 (10,7 %)	3 (13,0 %)	2 (10,0 %)
Luxembourg	1 (3,6 %)	1 (4,3 %)	1 (5,0 %)
Sex			
Male	2 (7,1 %)	2 (8,7 %)	2 (10,0 %)
Female	26 (92,9 %)	21 (91,3 %)	18 (90,0 %)
Experience as clinical pharmacist			
≤ 1 year	4 (14,3 %)	3 (13,0 %)	3 (15,0 %)
≤ 5 years	11 (39,3 %)	9 (39,1 %)	6 (30,0 %)
≤ 10 years	9 (32,1 %)	8 (34,8 %)	8 (40,0 %)
> 10 years	4 (14,3 %)	3 (13,0 %)	3 (15,0 %)
Clinical pharmacy programs covered			
Geriatrics	8 (28,6%)	5 (21,7 %)	5 (25,0 %)
Antibiotic stewardship	4 (14,3 %)	4 (17,4 %)	3 (15,0 %)
General	3 (10,7 %)	3 (13,0 %)	3 (15,0 %)
Anticoagulation	1 (3,6 %)	1 (4,3 %)	1 (5,0 %)
Emergency	1 (3,6 %)	1 (4,3 %)	1 (5,0 %)
HIV ^a /Hepatitis C	1 (3,6 %)	1 (4,3 %)	1 (5,0 %)
ICU	1 (3,6 %)	1 (4,3 %)	1 (5,0 %)
Internal medicine	1 (3,6 %)	1 (4,3 %)	1 (5,0 %)
Oncology	4 (14,3 %)	3 (13,0 %)	1 (5,0 %)
Oncogeriatrics	1 (3,6 %)	1 (4,3 %)	1 (5,0 %)
Pain	1 (3,6 %)	1 (4,3 %)	1 (5,0 %)
Surgery	2 (7,1 %)	1 (4,3 %)	1 (5,0 %)

^aHIV: human immunodeficiency viruses, ICU: intensive care unit

Table 2: Agreement ratings per tab per round

Tabs	Round 1		Round 2		Round 3		P
	N (% agreement)	Median (Q1-Q3)	N (% agreement)	Median (Q1-Q3)	N (% agreement)	Median (Q1-Q3)	
Tab 1 : general information	28 (98 %)	4 [3,75-4]	23 (98%)	4 [4-4]			0.072
Visual aspect	27 (96 %)	4 [3,75-4]	22 (96 %)	4 [4-4]	Included 2 nd round		
Written expression	28 (100 %)	4 [3,75-4]	Included 1 st round		Included 1 st round		
Tab 2: medication	24 (84 %)	3 [3-4]	22 (96 %)	3,5 [3-4]			
Visual aspect	20 (71 %)	3 [2-4]	21 (91 %)	4 [3-4]	Included 2 nd round		
Written expression	27 (96 %)	3,5 [3-4]	23 (100 %)	3 [3-4]			
Tab 3: home medication management	27 (95 %)	3 [3-4]	23 (100 %)	3 [3-4]			
Visual aspect	27 (96 %)	3 [3-4]	23 (100 %)	3 [3-4]	Included 2 nd round		
Written expression	26 (93 %)	3 [3-4]	23 (100 %)	3 [3-4]			
Tab 4: questions about medication	26 (91 %)	4 [3-4]	22 (93 %)	4 [3-4]			
Visual aspect	23 (82 %)	3,5 [3-4]	21 (91 %)	3 [3-4]	Included 2 nd round		
Written expression	28 (100 %)	4 [3-4]	22 (96 %)	4 [3-4]			
Tab 5: allergies/side effects	28 (100 %)	4 [4-4]					
Visual aspect	28 (100 %)	4 [4-4]	Included 1 st round		Included 1 st round		
Written expression	28 (100 %)	4 [4-4]					
Tab 6: medication adherence	28 (100 %)	4 [3-4]					
Visual aspect	28 (100 %)	4 [3-4]	Included 1 st round		Included 1 st round		
Written expression	28 (100 %)	4 [3,75-4]					
Tab 7 : remarks	23 (82 %)	4 [3-4]					
Visual aspect	23 (82 %)	4 [3-4]	Excluded 1 st round		Excluded 1 st round		
Written expression	23 (82 %)	4 [3-4]					

Table 3: Agreement ratings per item per round

Items	Round 1		Round 2		Round 3		p
	N (% agreement)	Median (Q1-Q3)	N (% agreement)	Median (Q1-Q3)	N (% agreement)	Median (Q1-Q3)	
Item 1: medication chronic and a cute/on demand			21 (92 %)	4 [3-4]			
Usefulness			22 (96 %)	4 [3-4]			
Relevance			21 (91 %)	4 [3-4]			
Care provider			20 (87 %)	3 [3-4]			
Hospital pharmacist			22 (96 %)	4 [3-4]			
		Added 2 nd round					Included 2 nd round
Item 2: lifestyle	23 (83 %)	4 [3-4]	21 (90 %)	4 [3-4]			
Usefulness	24 (86 %)	4 [3-4]	21 (91 %)	4 [3-4]			
Relevance	24 (86 %)	4 [3-4]	21 (91 %)	4 [3-4]			
Care provider	22 (79 %)	4 [3-4]	20 (87 %)	3 [3-4]			
Hospital pharmacist	23 (82 %)	3 [3-4]	21 (91 %)	3 [3-4]			
							Included 2 nd round
Item 3: sources	21 (76 %)	4 [3-4]	21 (89 %)	4 [3-4]			
Usefulness	22 (79 %)	4 [3-4]	22 (96 %)	4 [3-4]			
Relevance	22 (79 %)	4 [3-4]	21 (91 %)	4 [3-4]			
Repetitive	20 (71 %)	3 [2-4]	17 (74 %)	3 [2,5-4]	13 (65 %)	3 [2-4]	
Hospital pharmacist	21 (75 %)	4 [2,75-4]	22 (96 %)	4 [3-4]			Included 2 nd round
Item 4: sources table	26 (94 %)	3 [3-4]	23 (99 %)	4 [4-4]			
Usefulness	26 (93 %)	4 [3,75-4]	22 (96 %)	4 [4-4]			
Relevance	27 (96 %)	4 [3-4]	23 (100 %)	4 [3,5-4]			
Hospital pharmacist	26 (93 %)	4 [3,75-4]	23 (100 %)	4 [4-4]			
							Included 2 nd round
Item 5: medication	27 (96 %)	4 [4-4]	23 (99 %)	4 [4-4]			
Usefulness	28 (100 %)	4 [4-4]	Included 1 st round				
Relevance	27 (96 %)	4 [4-4]	22 (96 %)	4 [4-4]			
Care provider	25 (89 %)	4 [3-4]	23 (100 %)	4 [4-4]			
Hospital pharmacist	27 (96 %)	4 [4-4]	23 (100 %)	4 [4-4]			
							Included 2 nd round
Item 6: dosage	27 (96 %)	4 [4-4]	23 (100 %)	4 [4-4]			
Usefulness	28 (100 %)	4 [4-4]	Included 1 st round				
Relevance	27 (96 %)	4 [4-4]	23 (100 %)	4 [4-4]			
Care provider	26 (93 %)	4 [4-4]	23 (100 %)	4 [4-4]			
Hospital pharmacist	26 (93 %)	4 [4-4]	23 (100 %)	4 [4-4]			
							Included 2 nd round
Item 7: remarks	27 (95 %)	4 [4-4]	23 (99 %)	4 [4-4]			
Usefulness	28 (100 %)	4 [4-4]	Included 1 st round				
Relevance	27 (96 %)	4 [4-4]	23 (100 %)	4 [4-4]			
Care provider	24 (86 %)	4 [3-4]	22 (96 %)	4 [3,5-4]			
Hospital pharmacist	27 (96 %)	4 [4-4]	23 (100 %)	4 [4-4]			
							Included 2 nd round
Item 8: self-medication	22 (78 %)	3 [3-4]	20 (86 %)	3 [3-4]			
Usefulness	22 (79 %)	4 [3-4]	20 (87 %)	4 [3-4]			
Relevance	23 (82 %)	3,5 [3-4]	21 (91 %)	4 [3-4]			
Care provider	19 (68 %)	3 [2-3,25]	22 (96 %)	3 [2-3]			
Hospital pharmacist	23 (82 %)	3,5 [3-4]	22 (96 %)	3 [3-4]			
							Included 2 nd round
Item 9: medication management	26 (92 %)	4 [4-4]	23 (98 %)	4 [4-4]			
Usefulness	27 (96 %)	4 [4-4]	23 (100 %)	4 [4-4]			
Relevance	27 (96 %)	4 [4-4]	23 (100 %)	4 [4-4]			
Care provider	23 (82 %)	4 [3-4]	21 (91 %)	4 [3-4]			
Hospital pharmacist	26 (93 %)	4 [4-4]	23 (100 %)	4 [4-4]			
							Included 2 nd round
Item 10: assistance in medication management	24 (84 %)	3 [3-4]	20 (88 %)	3 [3-4]			
Usefulness	26 (93 %)	4 [3-4]	22 (96 %)	4 [3-4]			
Relevance	26 (93 %)	4 [3-4]	22 (96 %)	4 [3-4]			
Care provider	17 (61 %)	3 [2-4]	15 (65 %)	3 [2-3]	13 (65 %)	3 [2-3]	
Hospital pharmacist	25 (89 %)	3,5 [3-4]	22 (96 %)	4 [3-4]			Included 2 nd round
Item 11: patients' personal treatment	27 (95 %)	4 [3,75-4]	22 (97 %)	4 [4-4]			
Usefulness	28 (100 %)	4 [4-4]	Included 1 st round				
Relevance	27 (96 %)	4 [4-4]	23 (100 %)	4 [4-4]			
Care provider	24 (86 %)	4 [3-4]	21 (91 %)	4 [3-4]			
Hospital pharmacist	27 (96 %)	4 [4-4]	23 (100 %)	4 [4-4]			
							Included 2 nd round
Item 12: medication in the form of	26 (93 %)	4 [4-4]	21 (91 %)	4 [4-4]			
Usefulness	26 (93 %)	4 [4-4]	21 (91 %)	4 [4-4]			
Relevance	26 (93 %)	4 [4-4]	21 (91 %)	4 [4-4]			
							Included 2 nd round

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Item 13: medication for	27 (95 %)	4 [4-4]	21 (91%)	4 [4-4]		
Usefulness	27 (96 %)	4 [4-4]	22 (96 %)	4 [4-4]	Included 2nd round	
Relevance	26 (93 %)	4 [4-4]	20 (87 %)	4 [4-4]		
Item 14: vaccination					16 (80%)	3 [3-4]
Usefulness					17 (85 %)	3 [3-4]
Relevance				Added 3 rd round	17 (85 %)	3 [3-4]
Hospital pharmacist					14 (70%)	3 [2-4]
Item 15: change in your medication	27 (95 %)	4 [4-4]	23 (98 %)	4 [4-4]		
Usefulness	28 (100 %)	4 [4-4]			Included 2 nd round	
Relevance	28 (100 %)	4 [4-4]	Included 1 st round			
Care provider	24 (86 %)	4 [3-4]	22 (96 %)	4 [3,5-4]		
Hospital pharmacist	26 (93 %)	4 [4-4]	23 (100 %)	4 [4-4]		
Item 16: antibiotic	26 (94 %)	4 [4-4]	22 (96 %)	4 [4-4]		
Usefulness	27 (96 %)	4 [4-4]	23 (100 %)	4 [4-4]	Included 2 nd round	
Relevance	27 (96 %)	4 [4-4]	22 (96 %)	4 [4-4]		
Care provider	25 (89 %)	4 [3-4]	21 (91 %)	4 [3-4]		
Hospital pharmacist	26 (93 %)	4 [4-4]	22 (96 %)	4 [4-4]		
Item 17: swallowing difficulties	26 (93 %)	4 [4-4]	23 (99 %)	4 [4-4]		
Usefulness	27 (96 %)	4 [4-4]	23 (100 %)	4 [4-4]	Included 2 nd round	
Relevance	27 (96 %)	4 [4-4]	23 (100 %)	4 [4-4]		
Care provider	24 (86 %)	4 [3-4]	22 (96 %)	4 [3,5-4]		
Hospital pharmacist	26 (93 %)	4 [4-4]	23 (100 %)	4 [4-4]		
Item 18: terms of use	23 (83 %)	4 [3-4]	20 (86 %)	4 [3-4]		
Usefulness	24 (86 %)	4 [3-4]	20 (87 %)	4 [3-4]	Included 2nd round	
Relevance	24 (86 %)	4 [3-4]	20 (87 %)	4 [3-4]		
Hospital pharmacist	22 (79 %)	3,5 [3-4]	19 (83 %)	3 [3-4]	18 (90 %)	3,5 [3-4]
Item 19: allergies	27 (95 %)	4 [4-4]	23 (100 %)	4 [4-4]		
Usefulness	27 (96 %)	4 [4-4]	23 (100 %)	4 [4-4]	Included 2 nd round	
Relevance	27 (96 %)	4 [4-4]	23 (100 %)	4 [4-4]		
Care provider	26 (93 %)	4 [3-4]	23 (100 %)	4 [3,5-4]		
Hospital pharmacist	26 (93 %)	4 [3,75-4]	23 (100 %)	4 [4-4]		
Item 20: side effects	26 (93 %)	4 [3-4]	23 (98 %)	4 [3-4]		
Usefulness	27 (96 %)	4 [3-4]	23 (100 %)	4 [3-4]	Included 2 nd round	
Relevance	27 (96 %)	4 [3-4]	23 (100 %)	4 [3,5-4]		
Care provider	24 (86 %)	4 [3-4]	21 (91 %)	4 [3-4]		
Hospital pharmacist	26 (93 %)	4 [3-4]	23 (100 %)	4 [3-4]		
Item 21: medication available in the hospital's formulary	26 (92 %)	4 [3-4]				
Usefulness	26 (93 %)	4 [3,75-4]			Excluded	Excluded
Relevance	26 (93 %)	4 [3,75-4]				
Care provider	24 (86 %)	4 [3-4]				
Hospital pharmacist	27 (96 %)	4 [3,75-4]				
Item 22: comments	18 (65 %)	4 [2-4]				
Usefulness	20 (71 %)	4 [2-4]			Excluded	Excluded
Relevance	20 (71 %)	4 [2-4]				
Care provider	13 (46 %)	2 [2-4]				
Hospital pharmacist	20 (71 %)	4 [2-4]				
Item 23: ©Morisky Medication Adherence Scale	21 (75 %)	3 [2,75-4]	17 (73 %)	3 [2-4]	15 (76%)	3 [3-4]
Usefulness	22 (79 %)	4 [3-4]	18 (78 %)	4 [3-4]	17 (85 %)	4 [3-4]
Relevance	21 (75 %)	3 [2,75-4]	16 (70 %)	3 [2-4]	14 (70%)	3 [2-4]
Care provider	19 (68 %)	3 [2-4,3,25]	15 (65 %)	3 [2-3]	13 (65%)	3 [2-3]
Hospital pharmacist	22 (79 %)	3 [3-4]	18 (78 %)	3 [3-4]	17 (85 %)	4 [3-4]
Layout of the document	23 (81 %)	3 [3-4]	21 (91 %)	3 [3-4]		
Legible	27 (96 %)	3 [3-4]	23 (100 %)	4 [3-4]	Included 2nd round	
Choice of colours	21 (75 %)	3 [2,75-4]	22 (96 %)	3 [3-4]		
Easy-fill	20 (71 %)	3 [2-4]	17 (74 %)	3 [2,5-4]	16 (80%)	3 [3-4]
Adequate	23 (82%)	3 [3-4]	22 (96 %)	3 [3-4]	Included 2nd round	

Figures



Figure 1

Method

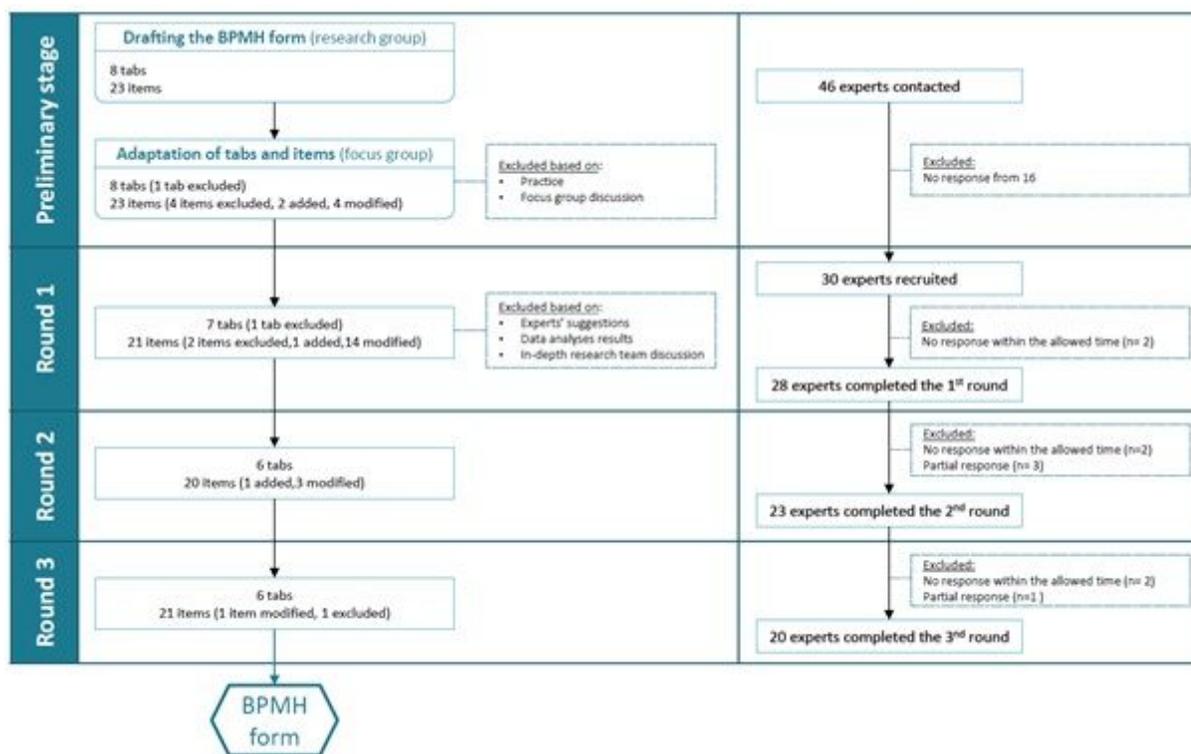


Figure 2

Delphi flowchart

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Appendix1C.Hoornaert.pdf](#)
- [Appendix2C.Hoornaert.pdf](#)