Development and Delphi validation of a Best Possible Medication History form

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ABSTRACT

Objective To develop and validate a standardized Best Possible Medication History (BPMH) form that could be used by clinical pharmacists.

Methods 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 the BPMH form. We supplemented the quantitative analysis with a qualitative analysis of comments for each Delphi round.

Results The draft BPMH form contained 23 items grouped into eight 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). Consensus was reached on 76% (16/21) of items in the third round. 20 items were included following the qualitative analysis of the experts’ comments in the third round.

Conclusions The findings of this study provide data on the content of the BPMH form. This form can be used to help clinical pharmacists to collect a complete and accurate medication list on admission. It could have an impact on inpatient safety and improve inpatient management. Studies with an international e-Delphi should be conducted for wider use.

BACKGROUND

Medication errors are a major cause of morbidity, with clinical and economic consequences for society and patients. An inaccurate medication history may be the cause of up to 85% of medication errors on admission. Moreover, these errors are usually not detected later in normal clinical practice. 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 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.

The BPMH represents an accurate and complete list of all medications taken before admission, which may differ from what is contained in their clinical records. Numerous studies have been conducted on discrepancies between the patient’s current medications and the medications recorded in the patient’s clinical record. A study conducted by emergency physicians revealed that 87% of medication histories on admission to the hospital in patients 65 years of age and older had at least one medication error. Involvement of a clinical pharmacist in performing the BPMH on admission has significant potential for reducing medication discrepancies and improving quality of patients’ healthcare. Clinical pharmacists are well equipped to record the BPMH as they are familiar with prescription and non-prescription medications actually taken by the patient, including drug name, dosage, frequency and administration route. A Belgian study including 215 patients highlighted that clinical pharmacists identified 1564 drugs while physicians only identified 1303 drugs. 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%. A BPMH is difficult to obtain for multiple reasons: poor patient understanding of the home medication regimen, inadequate or fragmented health information systems, and the time-consuming nature of the process.

According to WHO, a BPMH should be documented in a purpose designed form to improve accuracy and efficiency of the required information, and a standardised form must be developed by the organisation conducting the BPMH. There is scarce literature about the development of BPMH standardised forms. Hospitals should thus collaborate to develop an accurate and standardized BPMH form. 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 on the one hand to create admission medication orders and to realise the medication reconciliation at admission, and on the other hand at the end of each episode of care to create the Best Possible Medication Discharge Plan. Improving medication safety is fundamental for patient safety and is a priority target for healthcare systems.

METHODS

The BPMH form was developed and refined by the research group comprising 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 (figure 1). 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 the BPMH form.
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.13 14 The experts of the Delphi panel were enrolled within our own network. They received an email to participate from the forum of the professional association. They were Belgian clinical pharmacists with at least 6 months of clinical experience. We used the SurveyMonkey® website to facilitate the Delphi survey.

First round

The Delphi questionnaire contained three 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 of the 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 to 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 to usefulness, relevance, and answer to the request of hospital pharmacists or other care providers (according to the hospital pharmacist perception). A 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 experts rating ≥3 were retained for the final version of the BPMH form.15–17 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 of survey responses, one research team member analysed each result. Comments were discussed with the research team.

Usability evaluation

The usability was measured with the statements of the USE (Usefulness, Satisfaction and Ease) questionnaire by Lund.18 The usability rating has not been used to exclude items or tabs. The layout of the BPMH form was assessed according to its adequacy, legibility, choice of colours and ease of use.

Second round

Experts who responded entirely in the first round were given a new questionnaire containing the results of round 1 (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 on their position if they re-rated or if they had a deviating note.13 The note was considered deviating if it was not between the 25th and 75th percentile. Consensus was defined in the first round as 100% of experts rating items/tabs as ≥3. Consensus was defined in the second and third round as 85% of experts rating items/tabs as ≥3.15 16 Experts’ comments were collated and analysed to improve the items and tabs and to refine the wording.16

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.

Data analysis

The Delphi survey responses were analysed using the software SPSS version 23. For each outcome, the mean agreement rating, and 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 the Wilcoxon signed-rank test. The triangulation method was used to reduce potential bias due to a single person doing all the data management with the confirmation of the 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 of the wording of tabs or items.17 19 20 Before the analysis began, irrelevant or non-specific comments were removed (eg, ‘nothing to report’ or comments regarding level of agreement). Comments were coded according to an open and inductive procedure by the
first author.20–22 The research group agreed on the meaning of the codes.23 Differences regarding wording were discussed and agreed on together.

RESULTS

The draft BPMH form contained 23 items grouped into eight tabs (figure 2). The focus group excluded the tab ‘to be completed by the care provider’ containing the item ‘sources used during the realisation of the BPMH’. This item merged into the tab ‘general information’. Participants added two items: one concerning lifestyle (tobacco, alcohol, drugs use) and one concerning self-medication. The wording was changed for four 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 for the third round (figure 2). Of the 20 experts completing all three rounds, five (25%) were specialists in geriatrics, three (15%) in antibiotic stewardship, and three (15%) in general clinical pharmacy. The specialty of the other nine experts and the characteristics of the Delphi panel of experts are described in the table 1.

First round

Expert panellists individually rated seven tabs and 21 items. Three tabs met the consensus criteria for inclusion in the BPMH form (table 2).

Consensus was not reached for tab ‘remarks’ (82%) which was supported by the qualitative analysis of the experts’ comments (online supplemental appendix 2). The experts deemed this tab as unnecessary (14%) and repetitive because they already have the opportunities to comment in each tab or item. As depicted in table 3, item ‘medication available in the hospital’s formulary’ was excluded (the level of agreement was 92%) 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, computerised 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 (14% of experts removed it and 21% reduced the size of the column). The wording was changed for four items (medication management; patients’ personal treatment, sources, Morisky Medication Adherence Scale).

According to comments received in the first round, modifications were made to 14 items included in the second round to clarify wording, re-draft items, and add more detail or specificity to items. The item ‘self-medication’ has been divided into 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.

Second round

Rating expert panellists individually rated four tabs and 20 items. As shown in table 2, consensus was obtained for tabs 1, 2, 3, 4 within the second round (p=0.072). Furthermore, consensus was reached in the second round for 80% (16/20) of items according to the validation rule for this round (for all items p<0.001 except for item 1, 14, 21 and 22) (table 3). The item

Figure 2  Delphi flowchart. BPMH, Best Possible Medication History. Created by the authors.
The wording was changed 4 Hoornaert C, et al. Eur J Hosp Pharm 2022;0:1–9. doi:10.1136/ejhpharm-2021-003095. 'drug from the second round suggested that the term  
chronic and acute/on demand medication  
was introduced after the  
chronic and acute/on demand medication  
column in the table of  
medication adherence  
was moved from tab  
questions about medication  
was not considered relevant for care providers,  
item 'terms of use' and 'Morisky Medication Adherence Scale' 
were not considered relevant for hospital pharmacists.  

Third round  
Consensus was reached on 76% (16/21) of items in the third  
round. Consensus was not reached on the same items as in round  
2 (sources’, ‘assistance in medication management’, ‘Morisky Medication Adherence Scale’). The item ‘vaccination’ was  
included, being regarded as useful by experts but being consid- 
ered as difficult to answer by patients and time-consuming for  
the hospital pharmacists. In general, the patient does not know  
his or her vaccination schedule and the hospital pharmacist  
will have to do some research. In the third round, the item was  
changed from a closed to an open question (ie, ‘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.  

DISCUSSION  
This is one of the first studies to develop a standardised BPMH  
form. The BPMH form is the first step for medication recon- 
ciliation 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  
multi-disciplinary healthcare team may not have access to an accurate  
and complete medication list at patient admission. Several  
studies proved the BPMH improves the continuum of care and  
decreases medication errors by allowing better medication data  
sharing and better communication between hospital healthcare  
and extramural healthcare providers. Moreover, this process  
is part of the Joint Commission International Patient safety goals  
list for the hospitals’ accreditation. According to the WHO,  
the BPMH form should be documented in a standardised form  
developed and designed by the organisation that prompts for the  
information required to improve accuracy and efficiency. The  
development of a structured BPMH form contributes to ensure  
a systematic approach for collecting medication history. More- 
over, as demonstrated by Heneman et al, when a structured and  
systematic approach was used by nursing students, the accuracy  
of BPMH increased from 74% to 87%. A variety of methods  
have been attempted to improve the process of collecting the  
BPMH, but there is a lack of information in the literature  
regarding the tools used to collect the data and whether and  
how they have been validated. Our study combines the  
development of a structured BPMH form by the research group, its adap- 
tation by the focus group and its validation according to the  
Delphi method. The BPMH form was specifically designed and  
validated by the targeted audience (ie, clinical pharmacists). The  
application of the Delphi method within this research context  
is ideal because it is designed to explore topics where minimal  
information exists. It is also ideal for the introduction and inte- 
gration 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'.  

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'  
were not considered relevant for hospital pharmacists.  

'chronic and acute/on demand medication' introduced after the  
first round achieved consensus (92%). 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 med- 
ication 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' (ie, medication over the  
counter, drug recommended, given, purchased on the internet).  
Item 'terms of use' was moved from tab 'medication' to tab 'ques- 
tions 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 vali- 
dated in the second round of Delphi. A statistically significant  
level of convergence occurred between the two rounds of rating  
among all items and tabs (p<0.001).  

| Table 1 | Characteristics of the Delphi panel of experts. Created by the authors |
|---------|--------------------------------------------------------------------------------|
|         | Round 1 | Round 2 | Round 3 |
| 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 (8.3%) | 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 (8.3%) | 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 programmes 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/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%) |
| Oncogeriatics | 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%) |

ICU, intensive care unit.
that out of 11 experts who commented, 35% (7/20) felt that the item ‘sources’ should be retained and 20% (4/20) felt 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.4,23 The recommendation of international peak bodies was to use at least two 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 medication. Following the experts’ suggestions, the proposals were added in the item ‘sources’.

The item ‘drug’ was replaced by ‘medication’. Medicinal plants, homeopathy, dietary supplements and essential oils 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.

| Table 2 | Agreement ratings per tab per round. Created by the authors |
|---------|-------------------------------------------------------------|
| Tabs    | Round 1 | Round 2 | Round 3 |
|         | N (% agreement) | Median (Q1–Q3) | N (% agreement) | Median (Q1–Q3) | N (% agreement) | Median (Q1–Q3) | P value |
| Tab 1: general information | 28 (98%) | 4 (3.75–4) | 23 (98%) | 4 (4–4) | 0.180 |
| Visual aspect | 27 (96%) | 4 (3.75–4) | 22 (96%) | 4 (4–4) | Included 2nd round |
| Written expression | 28 (100%) | 4 (3.75–4) | Included 1st round |
| Tab 2: medication | 24 (84%) | 3 (3–4) | 22 (96%) | 3.5 (3–4) | Included 1st round |
| Visual aspect | 20 (71%) | 3 (2–4) | 21 (91%) | 4 (3–4) | Included 2nd round |
| Written expression | 27 (96%) | 3.5 (3–4) | 23 (100%) | 3 (3–4) | Included 2nd round |
| Tab 3: home medication management | 27 (95%) | 3 (3–4) | 23 (100%) | 3 (3–4) | 0.180 |
| Visual aspect | 27 (96%) | 3 (3–4) | 23 (100%) | 3 (3–4) | Included 2nd round |
| Written expression | 26 (93%) | 3 (3–4) | 23 (100%) | 3 (3–4) | Included 2nd round |
| Tab 4: questions about medication | 26 (91%) | 4 (3–4) | 22 (93%) | 4 (3–4) | 0.655 |
| Visual aspect | 23 (82%) | 3.5 (3–4) | 21 (91%) | 3 (3–4) | Included 2nd round |
| Written expression | 28 (100%) | 4 (3–4) | 22 (96%) | 4 (3–4) | Included 2nd round |
| Tab 5: allergies/side effects | 28 (100%) | 4 (3–4) | Included 1st round |
| Visual aspect | 28 (100%) | 4 (3–4) | Included 1st round |
| Written expression | 28 (100%) | 4 (3–4) | Included 1st round |
| Tab 6: medication adherence | 28 (100%) | 4 (3–4) | Included 1st round |
| Visual aspect | 28 (100%) | 4 (3–4) | Included 1st round |
| Written expression | 28 (100%) | 4 (3–4) | Included 1st round |
| Tab 7: remarks | 23 (82%) | 4 (3–4) | Excluded 1st round |
| Visual aspect | 23 (82%) | 4 (3–4) | Excluded 1st round |
| Written expression | 23 (82%) | 4 (3–4) | Excluded 1st round |

Hoornaert C, et al. Eur J Hosp Pharm 2022;0:1–9. doi:10.1136/ejhpharm-2021-003095
## Table 3  Agreement ratings per item per round. Created by the authors

| Items | Round 1 | Round 2 | Round 3 | P* |
|-------|---------|---------|---------|----|
|       | N (% agreement) | N (% agreement) | N (% agreement) |   |
| **Item 1: medication chronic and acute/on demand** | | | | |
| Usefulness | 21 (92%) | 22 (96%) | Included 2nd round |
| Relevance | 21 (91%) | 21 (90%) | Included 2nd round |
| Care provider | 20 (87%) | 21 (90%) |  |
| Hospital pharmacist | 22 (96%) | 21 (90%) |  |
| **Item 2: lifestyle** | 23 (93%) | 21 (90%) | 0.066 |
| Usefulness | 24 (86%) | 21 (91%) | Included 2nd round |
| Relevance | 24 (86%) | 21 (91%) | Included 2nd round |
| Care provider | 22 (79%) | 20 (87%) |  |
| Hospital pharmacist | 23 (82%) | 21 (90%) |  |
| **Item 3: sources** | 21 (76%) | 21 (89%) | 0.068 |
| Usefulness | 22 (79%) | 21 (90%) | Included 2nd round |
| Relevance | 22 (79%) | 20 (81%) | Included 2nd round |
| Repetitive | 22 (79%) | 17 (74%) | 13 (63%) |
| Hospital pharmacist | 21 (75%) | 22 (96%) | Included 2nd round |
| **Item 4: sources table** | 26 (94%) | 22 (96%) | 0.059 |
| Usefulness | 26 (93%) | 22 (96%) | Included 2nd round |
| Relevance | 24 (86%) | 21 (90%) | Included 2nd round |
| Hospital pharmacist | 27 (96%) | 23 (100%) |  |
| **Item 5: medication management** | 27 (96%) | 23 (99%) | 0.180 |
| Usefulness | 27 (96%) | 23 (100%) | Included 2nd round |
| Relevance | 27 (96%) | 23 (100%) | Included 2nd round |
| Care provider | 26 (93%) | 23 (100%) |  |
| Hospital pharmacist | 26 (93%) | 23 (100%) |  |
| **Item 6: dosage** | 27 (96%) | 27 (96%) | 0.102 |
| Usefulness | 28 (100%) | 27 (96%) | Included 1st round |
| Relevance | 27 (96%) | 23 (100%) | Included 1st round |
| Care provider | 26 (93%) | 23 (100%) | Included 2nd round |
| Hospital pharmacist | 26 (93%) | 23 (100%) |  |
| **Item 7: remarks** | 27 (95%) | 23 (99%) | 0.102 |
| Usefulness | 28 (100%) | 27 (96%) | Included 1st round |
| Relevance | 27 (96%) | 23 (100%) | Included 1st round |
| Care provider | 26 (93%) | 23 (100%) | Included 2nd round |
| Hospital pharmacist | 27 (96%) | 23 (100%) |  |
| **Item 8: self-medication** | 22 (78%) | 20 (86%) | 0.066 |
| Usefulness | 22 (79%) | 20 (87%) | Included 2nd round |
| Relevance | 22 (79%) | 21 (91%) | Included 2nd round |
| Care provider | 19 (68%) | 21 (91%) | Included 2nd round |
| Hospital pharmacist | 23 (82%) | 22 (96%) |  |
| **Item 9: medication management** | 26 (82%) | 23 (98%) | 0.660 |
| Usefulness | 27 (96%) | 23 (100%) | Included 2nd round |
| Relevance | 27 (96%) | 23 (100%) | Included 2nd round |
| Care provider | 26 (93%) | 23 (100%) | Included 2nd round |
| Hospital pharmacist | 26 (93%) | 23 (100%) |  |
| **Item 10: assistance in medication management** | 24 (84%) | 20 (88%) | 0.660 |
| Usefulness | 24 (84%) | 20 (88%) | Included 2nd round |
| Relevance | 26 (93%) | 22 (96%) | Included 2nd round |
| Care provider | 26 (93%) | 22 (96%) | Included 2nd round |
| Hospital pharmacist | 26 (93%) | 22 (96%) |  |
| **Item 11: patients’ personal treatment** | 27 (95%) | 22 (97%) | 0.102 |
| Usefulness | 28 (100%) | 27 (96%) | Included 1st round |
| Relevance | 27 (96%) | 23 (100%) | Included 1st round |
| Care provider | 24 (86%) | 23 (100%) | Included 2nd round |
| Hospital pharmacist | 27 (96%) | 23 (100%) |  |
| **Item 12: medication in the form of** | 26 (93%) | 23 (89%) | 0.157 |
| Usefulness | 26 (93%) | 21 (91%) | Included 2nd round |
| Relevance | 26 (93%) | 21 (91%) | Included 2nd round |
| **Item 13: medication for** | 27 (95%) | 21 (91%) | 0.317 |
| Usefulness | 27 (96%) | 21 (91%) | Included 2nd round |
| Relevance | 26 (93%) | 20 (87%) | Included 2nd round |
| **Item 14: vaccination** | 27 (96%) | 22 (96%) | 0.102 |
| Usefulness | 27 (96%) | 22 (96%) | Included 2nd round |
| Relevance | 27 (96%) | 22 (96%) | Included 2nd round |

Continued
In the same tab, the items ‘were there any recent changes in your treatment?’ and ‘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 were found in the literature.

The item ‘Morisky Medication Adherence Scale’ was not included by the research group because two parameters (relevance, answer to the request of other care providers) did not achieve consensus. A thorough analysis of the topics and the

### Table 3

In the same tab, the items ‘were there any recent changes in your treatment?’ and ‘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 were found in the literature.

The item ‘Morisky Medication Adherence Scale’ was not included by the research group because two parameters (relevance, answer to the request of other care providers) did not achieve consensus. A thorough analysis of the topics and the
reasons for the experts’ reluctance was conducted. The first reason identified was a lack of knowledge. The other reasons were the impression that patients will feel judged and that there 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 all the proposals that did not reach consensus on any of the parameters are part of the definition of the tasks involved in the medication history by Penm et al. The fourth 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 has emerged. A statistically significant level of convergence occurred between the two rounds of rating across all items (p<0.001) and items and tabs (p<0.001). 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 which represents a deviation that is too small.

This research has several limitations. It has been validated by a small group of French-speaking Belgian clinical pharmacists, which may affect the wider generalisability of the results. Following the comments of the experts, some items or tabs were deleted. Researcher bias may have affected the outcome of this study. Tabs and items were refined by the research team based on the panels’ comments. This may allow the researchers to place more emphasis on concepts that aligned with their own beliefs. However, to minimise the risk of researcher bias, all modification provided by the research team were distributed to the expert panel after each round. Moreover, categories of some items (‘sources’, ‘assistance in medication management’, ‘vaccination’) 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 rounds 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.

The next step is to test this new tool. Another project might be to integrate this tool through medical records to assist physicians, nurses and hospital pharmacists in their practice. Another step would be to disseminate this tool to Belgian hospital pharmacists (either via the hospital pharmacists’ association or by contacting the SPF public health). A computerised 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 ongoing effort between patients, family members and healthcare providers.

CONCLUSION
This study provides the BPMH form, including 20 items arranged under six tabs. The systematic use of a standardized BPMH form can be used to help clinical pharmacists to collect a complete and accurate medication list on admission. It could have an impact on 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. An international e-Delphi should be conducted for wider use of the BPMH form.

Key messages
What is already known on this topic
► An inaccurate medication history may be the cause of up to 85% of medication errors on admission. The process of collecting a medication history can be facilitated by using a structured Best Possible Medication History (BPMH) form.

What this study adds
► This study provided data on the content of the structured BPMH form.

How this study might affect research, practice and/or policy
► This form can be used to help clinical pharmacists to collect a complete and accurate medication list on admission.
► The standardised BPMH form is available to various healthcare providers (pharmacists, nurses, physicians). It could have an impact on inpatient safety and improve inpatient management.

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