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The PERFORM-P (Principles of Evidence-based Reporting in FORensic Medicine-Pathology version)

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ABSTRACT

Introduction: Most findings of forensic pathology examinations are presented as written reports. There are currently no internationally accepted recommendations for writing forensic pathology reports. Existing recommendations are also varied and reflect the differences in the scope and role of forensic medical services and local settings in which they are to be implemented. The legal fact-finder thus faces wide variation in the quality of forensic pathology reports, which poses a threat to the reliability of legal decision-making. To address this issue, the development of the "PERFORM-P (Principles of Evidence-based Reporting in FORensic Medicine-Pathology version)" was undertaken. The goal of the PERFORM-P is to provide common practice recommendations adaptable to local requirements to promote evidence-based practice (EBP) in forensic pathology.
Methods: An international consensus study was conducted in three phases by (1) developing a *long-list* of items to be considered in the reporting recommendations, (2) conducting a Delphi process (an iterative survey method to transform individual opinions into group consensus) with international forensic pathologists, and (3) designing the PERFORM-P prototype and its accompanying manual.
Results: With assistance from 106 forensic pathologists/forensic medical practitioners from 41 countries, the PERFORM-P was developed. The PERFORM-P consists of a list of 61 items to be included in a forensic pathology report, which is accompanied by its Explanation and Elaboration (E&E) document.
Discussion: To prepare forensic pathology (postmortem) reports that incorporate principles of evidence-based practice, internationally accepted recommendations might be helpful. The PERFORM-P identifies recommendations for necessary elements to include in a forensic pathology report. PERFORM-P can be applied to a wide range of matters requiring forensic pathological analysis, acceptable to forensic pathologists from a representative selection of jurisdictions and medico-legal systems.

1. Introduction

Forensic pathology is a major branch of forensic medicine which specializes in the examination of the deceased. This examination provides evidence to assist in determining the causes and effects of external influences, *e.g.*, injury, toxic substances, and disease, on the human body, with a focus on concluding an opinion about the cause of death. [1] The results of forensic pathology examinations are

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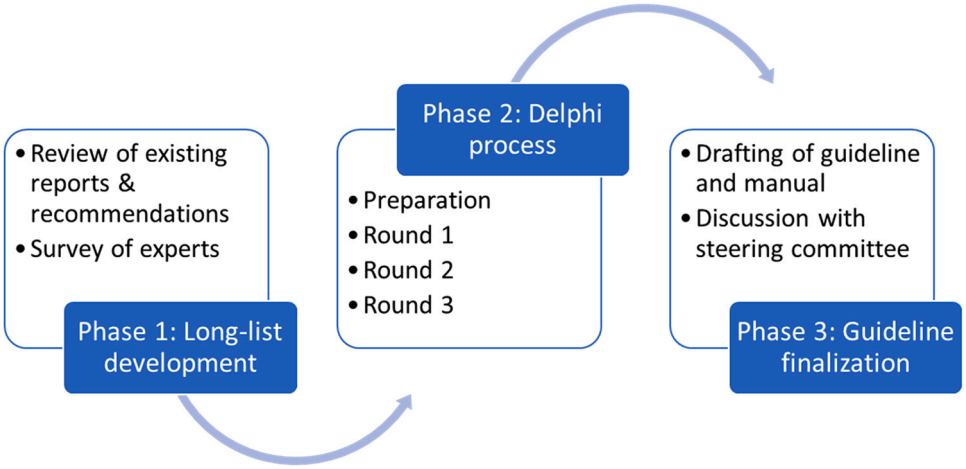

Fig. 1. Schematic of the whole project.

usually presented as written reports. Such reports are used in a medico-legal setting to help lay factfinders (*i.e.,* judge, jury, or both, or other relevant bodies of the legal system) understand the significance of physical findings on or in the body in cases involving the injury or death of a person. The forensic pathologist provides an opinion regarding the cause of death, and the processes that led to it, based on the strength of the evidence available for examination, which can vary widely from case to case. [2]

Several factors threaten the reliability of the opinions provided in the medicolegal setting. Forensic pathologists were found to rely more on experience and individual customary practice in formulating their opinion, and less on evidence-based practices (EBP, *i.e.,* practices that rely on scientific evidence for guidance and decision-making). This practice is a potential source of error in the formulating conclusions. [3] Few operational principles and procedures used by forensic pathologists in formulating opinions have been standardized. They may, therefore, vary considerably in their quality between individuals and between centers. [4,5] Additionally, no internationally accepted recommendations for writing forensic pathology reports exist. [2,3,6] Existing recommendations [7–10] are also varied and reflect the differences in the scope and role of forensic medical services [11] and local settings in which they are to be implemented. The methodology by which forensic pathologists formulate their opinions are not always transparent either. Some forensic pathologists use approaches in which objective findings are refined into subjective opinions without providing the reasoning for their conclusion. Thereby, judging the value of different forensic pathology reports may be difficult. This situation is contrary to the need of the legal factfinders, *i.e.,* that to be helpful forensic pathology reports should be well-written, informative, and unambiguous. The legal factfinder thus confronts wide variation in the quality of forensic pathology reports threatening the reliability of legal decision-making.

To address this gap, the development of the "PERFORM-P (Principles of Evidence-based Reporting in FORensic Medicine-Pathology version)" was initiated. This initiative had two aims, *i.e.,* to provide recommendations for necessary elements to be included in a forensic pathology report which forensic pathologists have agreed are necessary and to provide common practice standards applicable to a range of local specificities to promote evidence-based practice (EBP) in forensic pathology.

2. Methods

The study was conducted by the research team consisting of a core team and a steering committee. The core team consists of the principal investigator who is currently undertaking this research project as part of a Doctor of Philosophy (PhD) in Forensic Medicine in the Netherlands and the supervisory team (three professors from the Netherlands, the USA, and Indonesia). The steering committee consisted of eight experts in forensic pathology and forensic medicine from the UK, the Netherlands, Denmark, Sweden, India, Rwanda, Indonesia, and Australia, with a collective accumulation of decades of relevant field and academic experience and multiple research publications. The role of the steering committee was to review and provide input to the research protocol, monitor the progress of the whole project, guide and facilitate the data collection and analysis (including providing links and access to professional organizations and potential participants), and guide and provide feedback in the publication and dissemination process of the recommendations. The goal of the study was to achieve an international consensus. The study consists of three phases (Fig. 1): [12]

1. The development of a long-list of items to be considered in the reporting recommendations,
2. A Delphi study with forensic pathologists from around the world,
3. Finalization of the PERFORM-P prototype and its accompanying manual.

English was chosen to be used throughout the preparation, conduct, report, and publication process of this project. Although this choice of language likely limited the source of potential participants in the Delphi process, it was essential to use a single common language to communicate with international participants.

2.1. Phase 1: development of long-list of candidate items

The purpose of Phase 1 was to develop a *long-list* of candidate items that could potentially be incorporated in the reporting recommendations. This long-list served as input for the Delphi process. Prospective items were collected from a review of existing forensic pathology reports and a survey among experts.

2.1.1. Review of existing forensic pathology reports and report-writing recommendations

This step aimed at gaining insight about how expert opinions in forensic pathology are currently being reported. A sample of various forensic pathology reports and existing (local) recommendations on how to write a forensic pathology report that are publicly available were obtained. Additionally, anonymized reports from the core team's personal inventories were reviewed. Because the goal of this step was to obtain a broad overview, no selection criteria for the reports were specified, but they were reviewed for relevance by the

Table 1
Data extracted from existing reports and recommendations.

Domain	Information	Example
Administrative	Identification of the case and the examiner	Case registration number, name of the examiner
Identification	Identification of the deceased (if known)	Name and age/date of birth of the deceased
External/physical examination	Findings from the external examination/physical examination	Physical features, injuries
Internal examination	Findings from the internal examination (if performed)	Description of internal organs, bleeding, internal injuries
Ancillary testing	Findings from ancillary testings (if performed)	Result of toxicology tests, histopathology, serology
Additional information	Information from police reports, medical records, literature review, and databases	Findings at the crime scene, echocardiography (ECG) records
Opinion	Opinion from the examiner regarding the case	Opinion on the cause of death
Justification of opinion	Methods by which the expert formulated his/her opinion	Analysis of findings, results of literature reviews

core team. Existing recommendations were selected based on their scope of content (forensic pathology), their issuing organization, and their representativeness of various geographic regions and legal jurisdictions. Table 1 shows the type of data extracted from those reports and recommendations to form a long-list of candidate-reporting items.

2.1.2. Survey of experts

This survey was conducted through a web-based questionnaire (using Qualtrics©) targeting international forensic pathologists. Prospective participants were identified through their membership in professional organizations, *curriculum vitae* at LinkedIn, authorship of relevant publications, and nomination by colleagues through professional networks. The survey asked for participant demographics and characteristics, the caseload and case types handled by experts in forensic pathology, the current practice in the formulation and reporting of forensic pathology expert opinions, the participants' perception regarding EBP and their attitude towards it, and the perceived need for evidence-based reporting recommendations in forensic medicine. Additionally, participants were asked to comment on the long-list of potential reporting items from the review.

At the end of Phase 1, the prospective items collected were revised with recommendations from the steering committee and compiled in a refined long-list of items to be considered in the Delphi process.

2.2. Phase 2: Delphi consensus process

2.2.1. Design and setting

A Delphi consensus process was conducted according to the description provided by Hsu et al. [13] and the checklist recommended by Sinha et al. [14] and Hasson et al. [12] The process consisted of three iterative rounds of the questionnaire, participant response, and controlled feedback until convergence of expert opinions was achieved. The long-list of prospective items collected in Phase 1 was used to inform the Delphi. Delphi participants were, however, invited in the first round to add any items that are not on the list that they feel should be included in the recommendations. The level of consensus that needed to be achieved for each item was set at 67% [14].

It was intended to consult approximately 100 forensic pathologists as the panel of the Delphi. [15] Therefore, more than 1000 potential participants were contacted to ensure a sufficient participation rate. Potential participants were identified through their membership in professional organizations, curriculum vitae at LinkedIn, authorship of relevant publications, and nomination by colleagues through professional networks. Participants had to have relevant knowledge and experience, a sufficiently good command of the written English language (as can be presumed from their nationality, country of residence, place of work, or publication track records), and were from different countries/various geographical regions. Participants were asked to provide relevant demographic data, such as their name, profession, place of employment, and self-perceived level of expertise. [15] This participant background information was kept confidential and was only known to the research team.

2.2.2. Procedure

The whole Delphi process was conducted using Google Forms. Invitations to participate and the link to the Delphi survey were sent to prospective participants by email and LinkedIn messaging. The invitation contained an explanation about the project, the process of the Delphi, what is expected from the participants, the projected timeline, and the amount of time, effort, and commitment required to finish all iterative rounds of the Delphi. Participants were strongly encouraged to participate in all three rounds. Each Delphi round lasted 7–8 weeks, consisting of a survey distribution period, a response collection period, and a response compilation and analysis period. A reminder was sent to the participants at seven days before the end of each response collection period. Although participants were strongly encouraged to complete the whole Delphi process, (potential) participants were not required to provide a reason for declining to participate or to drop-out in the middle of the process. It is well understood that forensic pathologists are extremely busy professionals who might have their own reasons for not participating.

In Round 1, participants were asked to rate the importance of every item in the long-list on a scale from 0 (not important at all/should be excluded) to 10 (most important item/must always be included). Participants were asked to provide a reason if they gave a score of 3 or less. Participants were also encouraged to add comments regarding individual items, the wording of items, the inclusion of an item in a domain, or any other comments. The number of participants who completed the survey in Round 1 was recorded. For each item, the median score and interquartile range (IQR) was calculated, and any comments from the participants were compiled. All items were grouped according to their median score (median 0–4: low importance; median 5–7: moderate importance; median 8–10: high importance).

Round 2 of the Delphi process contained all Round 1 items. The definition of each item was improved based on the comments from Round 1 and advice of the steering committee. Newly nominated items from Round 1 were added. For each item, participants were provided with the median score and IQR and anonymized comments from Round 1. Participants were asked to re-rate the items (using the same scale as in Round 1) and respond to existing comments, if desired. Participants were also asked to provide the reason if they gave a score of 3 or less. The number of participants who completed the survey in Round 2 was recorded. For each item, the median score and IQR was re-calculated, and any comments from the participants were compiled. All items were grouped according to their median score, as in Round 1.

In Round 3, participants were provided only with items which received a low to moderate importance median rating in Round 2. Participants were asked to re-rate each item on a scale from 0 to 10, as before. For each item, the median score and IQR from Round 2

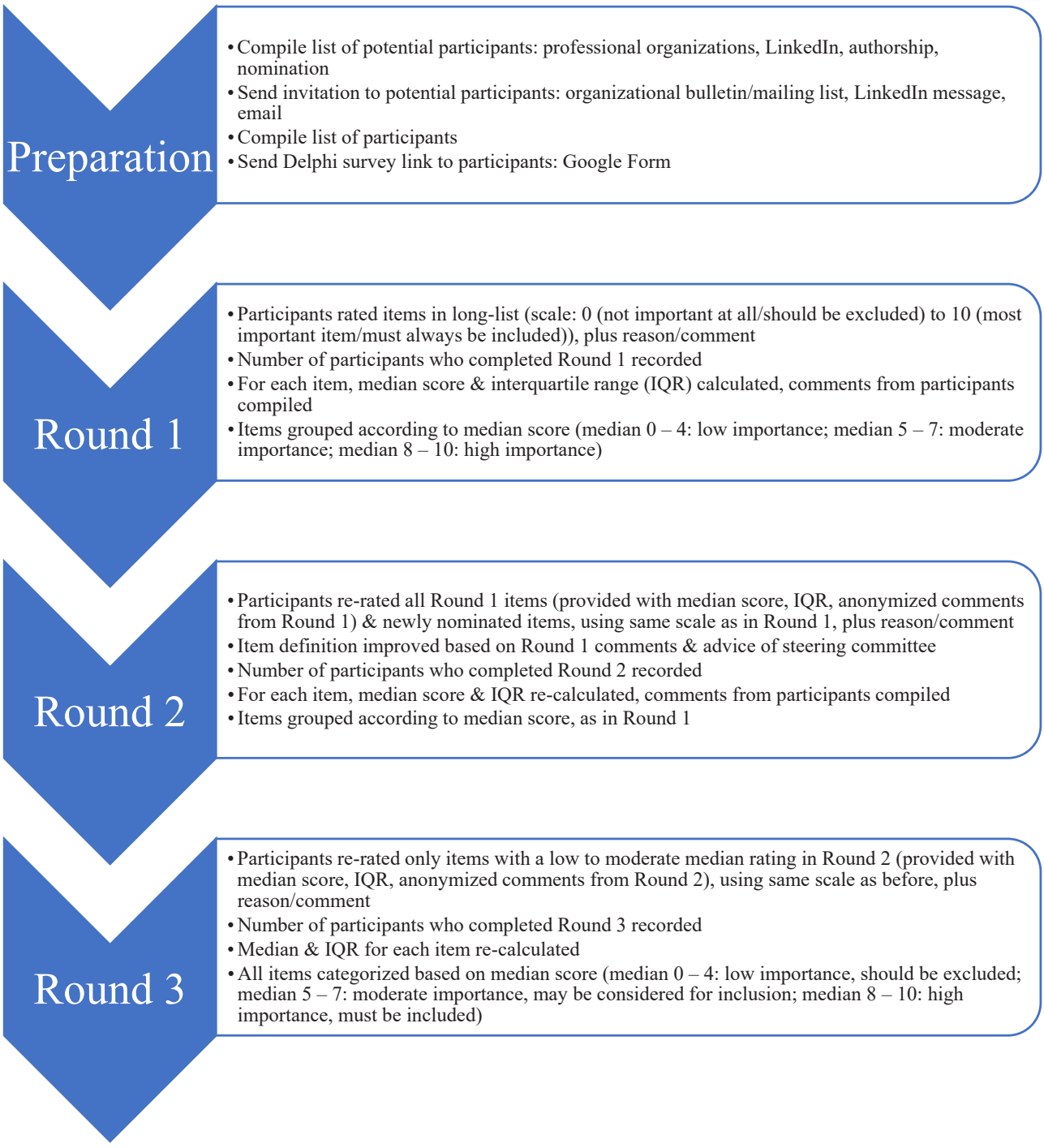

Fig. 2. Schematic of the Delphi process.

were provided to the participants as additional consideration. Again, participants were asked to provide the reason if they gave a score of 3 or less. Participants were also encouraged to add any comments regarding individual items, the wording of items, the inclusion of an item in a domain, or any other comments they feel necessary. Upon completion, the number of participants who completed Round 3 was recorded. The median and IQR for each item was again calculated. Then, all items were categorized based on their median score into the following categories: (1) 0–4: low importance, should be excluded; (2) 5–7: moderate importance, may be considered for inclusion; (3) 8–10: high importance, must be included.

Fig. 2 shows a schematic of the whole Delphi process and Fig. 3 provides an example of the Google Form layout from Round 2 and Round 3 of the Delphi process.

The consensus was regarded as achieved for an item when ≥67% of Round 3 participants gave a score in the same category as its median score. Otherwise, that item was set aside for further discussion in Phase 3, together with any comments from Rounds 2 and

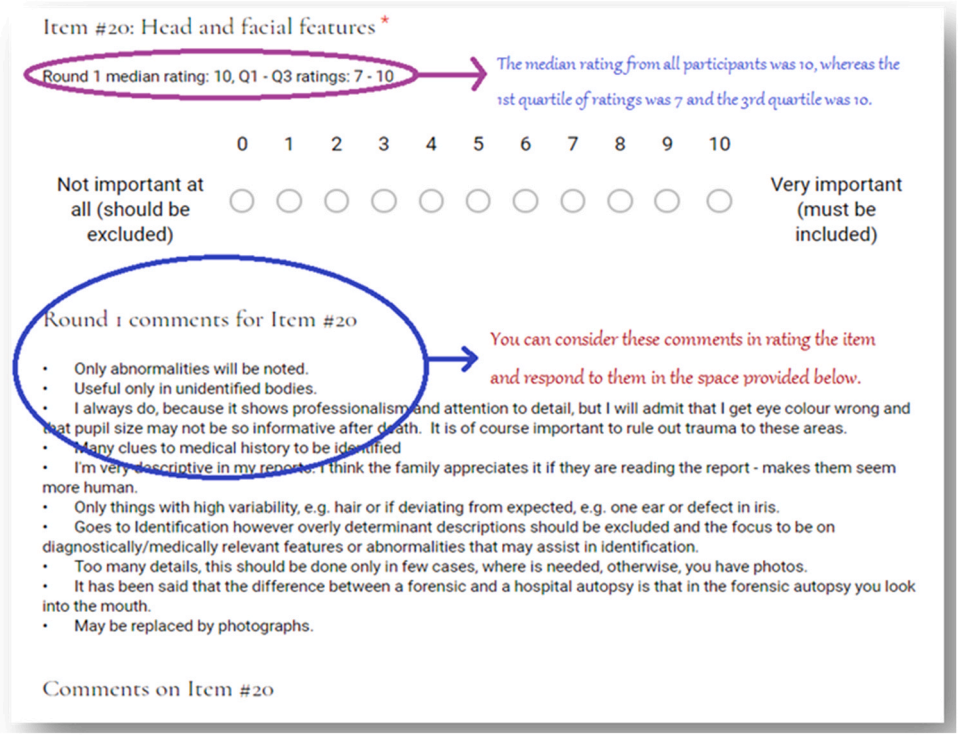

Fig. 3. Example of the Google Form layout from Round 2 and Round 3 of the Delphi process.

3. The items that met consensus with a median score of ≥8 were compiled into a list to be included in the recommendations.

2.2.3. Analysis

SPSS® 21 (IBM SPSS Statistics version 21.0) was used to calculate the medians and IQRs of each proposed reporting item.

2.3. Phase 3: PERFORM-P prototype finalization

The research team presented the findings of Phase 2 to be discussed by the steering committee. The comments, feedback, and input from the discussion were compiled and used to finalize the PERFORM-P. The final prototype consists of the included items and their explanation and elaboration (E&E) document.

The domain www.perform-statement.org has been reserved for the dissemination of the PERFORM-P. In addition to the list of recommendations and its E&E document, the website also contains a description of the project. There is also a discussion forum where visitors of the website can provide comments and feedback to the PERFORM-P and discuss their experience in its real-world application.

3. Results

3.1. Phase 1

Fifty reports were reviewed by the research team from which the reporting items were extracted as per the data extraction sheet. Recommendations on the format and content of forensic pathology reports were also identified from the National Association of Medical Examiners (NAME), [7] the European Council of Legal Medicine (ECLM), [8] the *Deutsche Gesellschaft für Rechtsmedizin* (DGRM), [9] the *Schweizerische Gesellschaft für Rechtsmedizin* (SGRM), [16] and a book by V.I. Adams. [10] These guidelines were chosen to represent a variety of judicial systems regarding the writing of forensic pathology reports.

Sixty-nine forensic pathologists completed the online survey. The list of the participants' country of origin and the number of participants from each country is shown in Table 2. Many of the participants were 40–49 years old (n = 21), had 20–29 years working experience (n = 18), employed at academic institutions (n = 30), and had a caseload of 100 cases/year or more (n = 38).

The questions regarding the current practice in forensic medicine show that most participants (n = 58) claim to use EBP in formulating their expert opinions, 55 of whom claim to combine EBP with experience-based practice. Only around one-third of the participants report using data sources (*e.g.*, published literature, epidemiological databases, institutional databases) in formulating all their expert opinions. When asked regarding their perception about the strengths of the current practice, the most frequent responses were (1) being scientific (n = 62) and (2) based on experience and commonly accepted practices among peers (n = 51). The lack of standard methods of formulation (n = 48) and the variety of methods (n = 50) were most often perceived as weaknesses of current practice. Most participants considered that current practice produces reports that are very accurate (n = 47) and very reliable (n = 49). Most participants thought that EBP (n = 45) and standardized reporting guidelines (n = 33) are extremely important in forensic medicine. The fact that one of the participants opined that they are unimportant is, however, noteworthy. Lastly, most participants (n = 39) stated that they would very likely use standardized reporting guidelines, if these were available. From the results of Phase 1, a long-list of 63 candidate reporting items was compiled to be considered in the Delphi process.

3.2. Phase 2

3.2.1. Delphi participants

Invitations were sent out to participate in the Delphi process to 1152 forensic pathologists and 23 professional associations. Responses were received from 271 experts, 111 of whom declined to participate. Initially, 160 experts agreed to participate in Round 1. From them, 135 experts from 45 countries completed the survey.

Table 2
List of the survey of expert participants' country of origin (alphabetical order).

No.	Country	Participants
1	Afghanistan	1
2	Argentina	1
3	Australia	6
4	Benin	1
5	Brazil	2
6	Chile	1
7	Ghana	1
8	Greece	1
9	India	2
10	Libya	1
11	Malaysia	1
12	Mexico	1
13	Pakistan	2
14	Panama	1
15	Peru	1
16	Portugal	1
17	Qatar	1
18	Saudi Arabia	3
19	Singapore	1
20	South Africa	1
21	Spain	8
22	Sri Lanka	1
23	The Netherlands	7
24	Turkey	1
25	UAE	1
26	UK	8
27	USA	13

Those 135 experts were then invited to take the survey in Round 2 and 112 experts from 43 countries completed it. Finally, from those 112 experts who were asked to take the survey in Round 3, 106 experts from 41 countries completed it. Thus, the final Delphi panel consists of 106 experts, who are listed in the Acknowledgement section as contributors to this project.

Of the 23 associations that were contacted, eight responded and provided their support by either circulating the invitation to their members or agreeing to endorse this project and be cited as supporting organizations. The remaining 15 associations did not respond, and no associations explicitly declined to participate or provide their support. The names of the supporting associations, and the form of their support, are also shown in the Acknowledgement section.

3.2.2. Delphi results

In Round 1, participants rated 57 items (out of 63) as of high importance (median rating 8–10) while the remaining six items had a median rating of 5–7 (moderate importance). Based on the comments of the participants, the wording or description of some items was revised. Some items were split into two items or more so that 66 items were rated in Round 2. After the completion of Round 2, a consensus was achieved for 43 items with a median rating of 10. The remaining 23 items were re-rated in Round 3. Finally, in Round 3 consensus was reached for 14 items. The remaining nine items were set aside for further discussion in the next phase for possible inclusion or exclusion. Fig. 4 illustrates the flow of participants and reporting items through the Delphi process.

Generally, participants rated 57 items of high importance. Most items had narrow IQRs, suggestive of agreement between participants. Some items, however, had IQRs that spanned from recommendations to exclude the item (0–4) to suggestions to include it (8–10), such as item #3: The date and hour of examination, item #8: Qualification of the examiner, and item #10: Person/agency requesting the examination. The results for items regarded as of high and moderate or low importance are shown in Table 3 and 4, respectively.

3.2.3. Summary of comments

Participants were encouraged to provide general and item-specific comments throughout the Delphi process. A wide range of comments were received, the most significant of which are highlighted here. Many participants commented that institutional/local/regional guidelines are readily available but vary greatly in format, content, and completeness. International recommendations were still felt to be lacking and would be a welcomed addition to guide forensic pathologists in their daily practice. Many participants thought that the items in the PERFORM-P cover all essential aspects of an excellent forensic pathology report, that both objective findings and subjective opinion are represented, and that the PERFORM-P reflects the reporting recommendations of existing guidelines.

Some participants cautioned, however, that some items might not be applicable in all types of medicolegal jurisdictions/legal systems. Furthermore, some expressed concern about the possibility that standardized forms and guidelines might restrict professional freedom and are made to replace clinical expertise. Therefore, many participants expressed the wish that the PERFORM-P will still be flexible enough to allow for individual preference and the specific circumstances of the case at hand.

Item-specific comments were mostly related to reasons for choosing a specific rating, mainly when participants chose a low rating. Some also asked for clarification of items that were perceived to be vaguely worded. Other comments were influenced by socio-political backgrounds of the participants, such as the importance of reporting (apparent) ethnicity and gender, and how to report those items.

The most interesting comments were provided for items in the last section regarding opinion and justification/rationale. Many

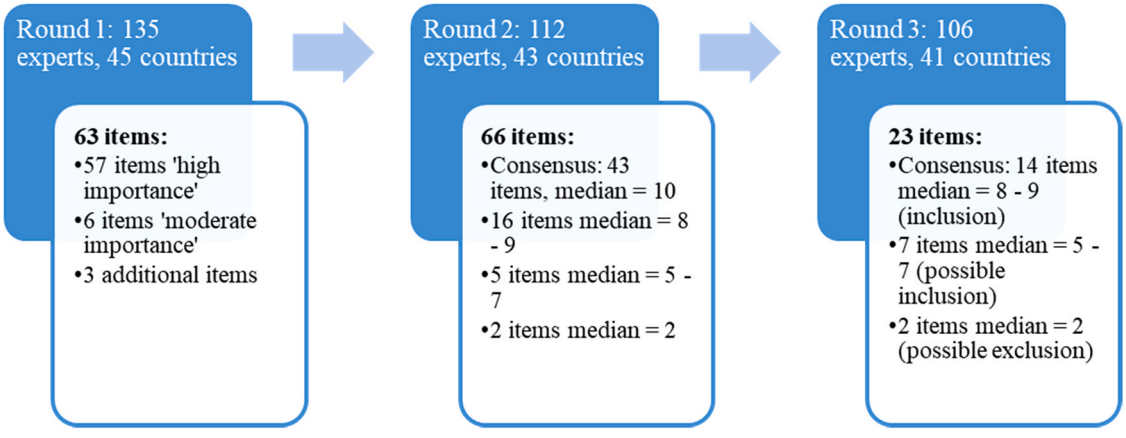

Fig. 4. Flow of participants and items through the Delphi process.

Table 3
Proposed Reporting Items of High Importance (Median ≥ 8).

No.	Section and Item	Median (IQR)
	Administrative issues	
1	Report identification number	10 (10, 10)
2	Type of examination	10 (10, 10)
3	Date and hour of examination	10 (9, 10)
4	Place of examination	10 (9, 10)
5	Reported date and time of death/causative incident/ body found	10 (9, 10)
6	Place of death/injury/location where body/remains found	10 (9, 10)
7	Name of examiner	10 (10, 10)
8	Qualification of examiner	10 (8, 10)
9	Name of any other persons present/witness of the examination	8 (5, 10)
10	Person/agency requesting the examination	10 (8, 10)
11	Relevant information from requesting person/ agency	9 (7, 10)
	Identification	
12	Full name of the decedent	10 (10, 10)
13	Date of birth/age of the decedent	10 (9, 10)
14	Sex	10 (10, 10)
	External examination	
15	Clothing	9 (8, 10)
16	Height/body length	10 (9, 10)
17	Weight	10 (8, 10)
18	Physique/stature/body habitus	9 (8, 10)
20	Head and facial features	9 (7, 10)
21	Dentition	9 (7, 10)
22	Unique/unusual identification features	10 (9, 10)
23	Orifices	10 (8, 10)
24	External genitalia and perianal region	10 (9, 10)
25	Post-mortem changes	10 (10, 10)
26	Description of injuries and fractures	10 (10, 10)
27	Diagrams of injuries and fractures	9 (7, 10)
	Internal examination	
28	Skull, brain, meninges, cerebral vessels	10 (10, 10)
29	Orbital, nasal, auricular cavities	8 (6, 10)
30	Oral cavity, tongue	9 (8, 10)
31	Larynx, thyroid, other neck structures	10 (10, 10)
32	Ribs, chest wall	10 (10, 10)
33	Diaphragm, esophagus	10 (9, 10)
34	Pleural cavities, lungs, trachea, bronchi, mediastinum	10 (10, 10)
35	Heart, pericardial sac, large blood vessels	10 (10, 10)
36	Abdominal wall, peritoneal cavity	10 (10, 10)
37	Stomach and content	10 (10, 10)
38	Small intestines, large intestines, appendix, mesentery	10 (8, 10)
39	Pancreas	10 (8, 10)
40	Liver, gall bladder, biliary ducts	10 (9, 10)
41a	Spleen	10 (8, 10)
42a	Kidneys, ureters	10 (9, 10)
42b	Urinary bladder, urethra	10 (8, 10)
42c	Adrenal glands	10 (8, 10)
43	Abdominal aorta, inferior vena cava, portal veins	10 (9, 10)
44	Internal genitalia	10 (8, 10)
45	Muscle/soft tissue of limbs	8 (6, 9)
47	Vertebrae, spinal cord	8 (6, 9)
	Additional examinations	
48	Ancillary testing	10 (9, 10)
49	Results of ancillary testing	10 (9, 10)
50	Photographic documentation	10 (8, 10)
51	Exhibits handed over to law enforcement agency	10 (9, 10)
	Summary	10 (10, 10)
52	Summary of disease processes detected	10 (10, 10)
53	Summary of traumatic processes detected	10 (10, 10)
	Opinion & justification/rationale	
54	Opinion on the cause of death	10 (10, 10)
55	Opinion on time since death/age of injuries	8 (5, 10)
56	Opinion on the mechanism of death	9 (7, 10)
57	Opinion on the manner of death	9 (5, 10)

Table 4
Proposed Reporting Items of Moderate or Low Importance (Median ≤ 7).

	Section and item	Median (IQR)
	External examination	
19	Apparent ethnicity	7 (5, 9)
	Internal examination	
41b	Lymph nodes	7 (5, 8)
46	Joints	6 (5, 8)
	Opinion & justification/rationale	
58	Guidelines followed to perform the examination	5 (3, 8)
59	A statement certifying adherence to expert evidence guidelines	5 (2, 7)
60	A statement that a Quality Assurance process has been undertaken	5 (2, 8)
61	Reference list/Bibliography/databases used	5 (2, 8)
62	Calculation/assessment of probability	2 (0, 5)
63	Justification of methods used to calculate probability	2 (0, 5)

opined that while it is essential to provide the justification/rationale for a given opinion, it is not always practical or feasible in daily practice. Some commented that opinions on the cause/time/manner/mechanism of death should only be provided if specifically requested. Additionally, some suggested that calculations of probability and their rationale should only be included in the report if requested by the court and if the results were to be provided on a verbal scale (*e.g.*, unlikely, likely, or probable).

3.3. Phase 3

In Phase 3, the findings from the previous phases were discussed with the steering committee. Overall, all items rated as highly important were retained. The items regarding the opinion on the cause of death and the mechanism of death were, however, combined to avoid confusion. Furthermore, because the PERFORM initiative aims at improving evidence-based practice in producing reports, several items related to the formulation of evidence-based expert opinions were also retained despite not having been rated as of high importance. The final PERFORM-P prototype consists of a list of 61 items to be included in a forensic pathology report, which is shown in Table 5 below. The recommendations, together with their explanation and elaboration document (E&E), can also be found at www.perform-statement.org.

4. Discussion

To prepare forensic pathology reports that assist the making of evidence-based conclusions and opinions, recommendations based on broad international consideration and acceptance, such as the PERFORM-P, might be helpful. The PERFORM-P contains recommendations for the necessary elements to include in a forensic pathology report. Furthermore, these recommendations are meant to apply to various cases requiring forensic pathological analysis, which are demonstrably accepted by forensic pathologists, both nationally and internationally. The PERFORM-P is also accompanied by a user manual containing examples and elaborations on how each reporting item should be formulated based on the best available evidence. This explanation and elaboration (E&E) document, which is an inseparable part of the list of items, is another positive feature of the PERFORM-P.

Conclusions should be justified by reference to specific methods, data, or literature to enable readers to follow the reasoning of the report author, thereby improving the reliability of the reports. This practice will allow the reader to understand how the author arrived at a conclusion given the specific circumstances of the case. Thereby, the level of transparency and the average quality of forensic pathology reports will be improved and peer review efforts will be facilitated. [17,18]

Because the PERFORM-P was developed with input from forensic pathologists from various countries, and under the guidance of a

Table 5
PERFORM-P recommended reporting items to be included in a forensic pathology report.

No.	Section and item	Brief description
	Administrative issues	
1	Report number	Registration number as identification of the report
2	Type of examination	E.g., external examination only/full autopsy
3	Date and time of examination	Date and hour (start and finish) of examination
4	Place of examination	Name of mortuary/medical examiner office/forensic pathology unit/hospital
5	Reported date and time of death/causative incident/ body found	According to the police report/witness account
6	Place of death/injury/location where body/remains found	According to the police report/witness account
7	Name of examiner	Full name
8	Qualification of examiner	Title, job position
9	Names of any other persons present/witness of the examination	E.g., other forensic pathologists, autopsy technicians, police personnel
10	Person/agency requesting the examination	Name, job position (authority), name of the agency
11	Relevant information from requesting person/agency	Any information relevant to the case
	Identification	
12	Full name of the decedent	The legal name of the decedent (if known) and any aliases
13	Date of birth/age of the decedent	As per official identification (if known) or estimation of age
14	Sex	Biological sex as per phenotype
	External examination	
15	Clothing	Description of the clothes worn by the decedent/attached on body/body part when found
16	Body length	As per measurement
17	Weight	As per measurement
18	Physique/stature/body habitus	Description of body type/stature/nutritional state/BMI
19	Apparent ethnicity/ancestry	Apparent racial ancestry of the decedent as per phenotype
20	Head and facial features	Description of hair, scalp, eyes, nose, mouth, ears
21	Dentition	Description of the teeth and gums (such as number, broken/missing teeth, cavities, and fillings)
22	Unique/unusual identification features	Description of tattoos, scars, deformities
23	Orifices	Description of excretions from the nasal/oral/auricular/genital/anal orifices
24	External genitalia and perianal region	Description of the external genitalia and perianal region, including any injuries
25	Post-mortem changes	Description of livor mortis, rigor mortis, algor mortis, and signs of decomposition
26	Description of injuries and fractures	Description of externally visible injuries and fractures
27	Diagrams of injuries and fractures	Diagrams of externally visible/palpable fractures on standardized body diagrams
	Internal examination	
28	Skull, brain, meninges, cerebral vessels	Description of abnormalities/injuries
29	Orbital, nasal, auricular cavities	Description of abnormalities/injuries
30	Oral cavity, tongue	Description of abnormalities/injuries/foreign matter
31	Larynx, thyroid, other neck structures	Description of abnormalities/injuries
32	Ribs, chest wall	Description of abnormalities/injuries
33	Diaphragm, esophagus	Description of abnormalities/injuries
34	Pleural cavities, lungs, trachea, bronchi, mediastinum	Description of abnormalities/injuries/foreign matter
35	Heart, pericardial sac, large blood vessels	Description of abnormalities/injuries
36	Abdominal wall, peritoneal cavity	Description of abnormalities/injuries
37	Stomach and content	Description of abnormalities and content
38	Small intestines, large intestines, appendix, mesentery	Description of abnormalities/injuries
39	Pancreas	Description of abnormalities/injuries
40	Liver, gall bladder, biliary ducts	Description of abnormalities/injuries
41	Spleen	Description of abnormalities/injuries
42	Lymph nodes	Description of abnormalities/injuries
43	Kidneys, ureters	Description of abnormalities/injuries
44	Urinary bladder, urethra	Description of abnormalities/injuries
45	Adrenal glands	Description of abnormalities/injuries
46	Abdominal aorta, inferior vena cava, portal veins	Description of abnormalities/injuries
47	Internal genitalia	Description of abnormalities/injuries
48	Muscle/soft tissue of limbs	Description of abnormalities/injuries
49	Joints	Description of abnormalities/injuries
50	Vertebrae, spinal cord	Description of abnormalities/injuries
	Additional examinations	
51	Ancillary testing	Description of the type of any ancillary testings performed (such as laboratory tests and imaging tests), and specimens provided/collected for them
52	Results of ancillary testing	Results of any ancillary testing (such as laboratory tests and imaging tests)
53	Photographic documentation	Description of photographic documentation of findings
54	Exhibits handed over to law enforcement agency	Description of any items handed over to law enforcement agency
	Summary	
55	Summary of disease processes detected	A summary of important disease processes detected from the external and internal examinations
56	Summary of traumatic processes detected	A summary of any traumatic processes detected from the external and internal examinations
	Opinion & justification/rationale	
57	Opinion on the cause of death	Evidence-based conclusion regarding the cause of death
58	Opinion on time since death/age of injuries	Evidence-based conclusion regarding the time since death or the age of injuries
59	Opinion on the manner of death	Evidence-based conclusion on the most probable manner of death (such as accidental/intentional or natural/unnatural)
60	Guidelines followed to perform the examination	The name, author, and version of any specific guidelines followed to perform the examination
61	Reference list/Bibliography/databases used	The types, titles, and sources of literature/databases used to formulate an opinion

steering committee of international experts, it serves as a general recommendation. In implementing the PERFORM-P, forensic pathologists should check that the recommendations do not conflict with local laws and regulations, as well as other international consensus documents which have become accepted by practitioners and courts on a multi-jurisdictional basis (*e.g.,* the Minnesota Protocol and the Istanbul Protocol).

4.1. Operational definition of the forensic pathology report

Despite its central role in the work of the forensic pathologist, there is no single definition of the forensic pathology report. For the PERFORM-P, the forensic pathology report was defined as a document containing the objective findings from the autopsy and other associated examinations, as well as the conclusions and opinions of the forensic pathologist based on the findings. It is the primary work product of the forensic pathologist. [10] Hence, forensic pathology reports must be made to communicate with their readers in a clear, well-organized, and unambiguous manner. The forensic pathology report should document the observations and the cognitive processes of the forensic pathologist, both while performing the autopsy and afterwards when formulating the conclusions and opinions. Subjective opinions should be clearly distinguished from objective findings and supported by a rationale to justify and defend them. An excellent forensic pathology report should be comprehensive but not necessarily be a stand-alone in the death investigation process as a whole.

The primary purpose of the forensic pathology report is to serve as expert evidence in legal proceedings. Thus, it must be helpful to legal factfinders and address the questions that they might pose. More importantly, the justification and limitations of those opinions should be provided to enable the comparison of dissenting opinions from two or more experts.

4.2. Scope of the PERFORM-P

The PERFORM-P contains recommendations for necessary elements to include in a forensic pathology report, which is meant to apply to various cases requiring forensic pathological analysis. The primary scope of the PERFORM-P is forensic pathology examinations of unnatural and suspected unnatural deaths (sometimes called “suspicious deaths”). The PERFORM-P can also be applied to all types of death investigations that come to the attention of the forensic pathologist in the jurisdiction.

Because the PERFORM-P only covers the minimum items to be included in a report, in some types of cases additional items could be incorporated. The PERFORM-P relates principally to the content of the report and not its format as a document, which is usually subject to institutional or local regulations and standard operational procedures. It does, however, recommend certain formatting conventions to facilitate peer review or auditing processes.

Lastly, the PERFORM-P does not stipulate how a forensic pathology examination should be performed. Consequently, they should not be used to judge the quality of the forensic pathology examination itself. Nonetheless, the application of the PERFORM-P could help improve the validity, quality, and completeness of the examination by reminding forensic pathologists about the minimum items to be reported.

4.3. Relation to existing recommendations

The PERFORM-P was developed through a systematic process and consultation with an international panel of forensic pathologists. Consequently, it builds on existing recommendations on writing forensic pathology reports. The primary recommendations that influence the reporting items in the PERFORM-P consist of the Forensic Autopsy Performance Standards of the National Association of Medical Examiners (NAME) [7] and the European Council of Legal Medicine (ECLM) guideline for Accreditation of Forensic Pathology Services in Europe. [8].

Additionally, local guidelines from the *Deutsche Gesellschaft für Rechtsmedizin* (DGRM) [9] and the *Schweizerische Gesellschaft für Rechtsmedizin* (SGRM) were also incorporated. [16] Because those guidelines are also in line with the ECLM recommendations, they provide examples of local specificities while still adhering to international documents.

The format and content of the PERFORM-P were also inspired by the “Guidelines for Reports by Autopsy Pathologists”. [10] This book was chosen because it aims at helping forensic pathologists produce reports that communicate well, which is the primary goal of the PERFORM-P as well. Lastly, the PERFORM-P was developed not to replace but rather to enrich existing standards/guidelines by obtaining recommendations that incorporate a more international perspective.

4.4. Potential effect

The PERFORM-P could be valuable for a variety of stakeholders. First, forensic pathologists from around the world could use the recommendations for improving the quality of their reports. It could serve as a reminder of the minimum items to include in the report. The validity of the report could also be increased, especially in terms of the transparency of methods and rationale of the opinion part of the reports.

Peer review, auditing, and quality assurance processes could also benefit from it. [17–20] Reports written per the PERFORM-P should be more comparable because they contain the same minimum reporting items. Because the recommended items also include the reporting of the justification or rationale of an opinion, adherence to the PERFORM-P could provide insight into the cognitive process of the report’s creator. Thereby, the separation of objective findings and subjective opinions - and the transition from the former to the latter - could be readily recognized and assessed by reviewers or auditors.

There are potential benefits of the PERFORM-P for legal proceedings as well. The standardization of report content (and format) could reduce the variability in the quality of the reports produced by different forensic pathologists. Thereby, legal factfinders can focus on the message contained in the reports instead of trying to navigate the different formats currently used. Furthermore, by creating evidence-based reports that communicate well forensic pathologists could assist legal factfinders in reading and comprehending the reports to be used as “evidence-based evidence” [21] in legal decision-making. Judges and juries could also refer to the PERFORM-P when evaluating the completeness or quality of a report.

The PERFORM-P needs the support of various stakeholders to maximize its impact. The widespread adoption of the PERFORM-P will facilitate the drafting of expert opinions and ultimately will contribute to better legal decision making. Therefore, in addition to journal publications, a dedicated website (www.perform-statement.org) will also be launched. This website contains the PERFORM-P, reference to the publications, a list of the participants and funders, official statements from professional organizations that support the PERFORM-P, and a feedback and criticism section that can help improve it further. Finally, the PERFORM-P will be linked to the EQUATOR Network (Enhancing the QUAlity and Transparency Of health Research, http://www.equator-network.org) to facilitate standardization in reporting research in forensic pathology. Additionally, validation studies in different countries with different languages are needed. Apart from assuring that the PERFORM-P be appropriately translated into the official language(s) of the country, this validation process is also meant to ensure that it fits the local condition of forensic medical practice and legal system.

5. Conclusion

The "PERFORM-P (Principles of Evidence-based Reporting in FORensic Medicine-Pathology version)" provides recommendations for necessary elements to include in a forensic pathology report, which are demonstrably accepted by an international panel of forensic pathologists. The goal of the PERFORM-P is to provide common practice standards despite a diversity of local specificities, thereby promoting evidence-based practice in forensic pathology.

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Declaration of Competing Interest

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Further reading

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