CONFERD-HP: Recommendations for reporting COmpeteNcy FramEwoRk Development in Health Professions.

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Author Contributions
AB conceived the paper; gathered, analysed, and interpreted data, and drafted the initial manuscript. WT, TH, JR and BW aided with gathering, analysing and interpreting data. All authors critically revised the manuscript for important intellectual content and edited the manuscript. All authors read and approved the final manuscript. The CONFERD-HP Collaborators aided with gathering, analysing, and interpreting data, critically revised the guideline for important intellectual content, and edited the guideline. All collaborators read and approved the final guideline.

Keywords: competency framework, reporting guideline, reporting guideline, competency development.

Abstract
Competency frameworks outline the perceived knowledge, skills and other attributes required for professional practice. Competency frameworks have gained in popularity, in part for their ability to inform health professions education, assessment, professional mobility, and other activities. Previous research has shown inadequate reporting within reports describing their development and that may jeopardize their use and application. We aimed to develop a set of minimum criteria that provides guidance to authors (and consumers) in an effort to improve reporting of the development of competency frameworks. The checklist was developed by a 35-member expert panel and a five-

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member research team following published guidance from the Enhancing the QUAlity and Transparency Of health Research (EQUATOR) Network. The final checklist contains 20 essential reporting items including guidance on reporting title and abstract, framework development, the development process, testing and funding/conflicts of interest. The intent of the COmpeteNcy FramEwoRk Development in Health Professions (CONFERD-HP) reporting guideline is to help readers (including researchers, educators, regulators, health professionals, and patients) develop a greater understanding of relevant terminology, core concepts, and key items to report for competency framework development in health professions.

Introduction

Competency frameworks provide an outline of the perceived knowledge, skills, attitudes, and other characteristics required to competently enact professional practice within a given context (1). In health professions, these are developed for a number of reasons which can include defining the profession, ensuring a competent workforce, and facilitating curriculum development, systems of assessment, or professional mobility. While a significant number of competency frameworks are available (for example, our previous scoping review identified 190 frameworks) and more continue to be developed, their use and judgements of their quality may be compromised due to variability in reporting that describes clearly and sufficiently how the competency framework was developed (2). Poor, inconsistent, or insufficient reporting practices have led to concerns regarding the validity of outputs, and threaten their utility in informing downstream activities such as curriculum design (2,3). If competency frameworks are to meet their goal (i.e., why they are developed), consistent and sufficient reporting is one way to advance and improve their use and judgements of their quality.

Reporting guidelines are developed to help researchers improve the completeness and transparency of their research reports and limit the number of poorly reported studies (4). A reporting guideline is defined as *"a checklist, flow diagram, or explicit text to guide authors in reporting a specific type of research, developed using explicit methodology"* (4). Research demonstrates the use of reporting guidelines increases methodological transparency and uptake of research findings (5). Examples of reporting guidelines developed to improve the transparency and completeness of reporting include the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) (6) and the Guidance for Reporting Involvement of Patients and the Public 2 (GRIPP2) (7).

As part of a broader program of research on competency framework development, we previously identified the need for improved reporting guidance for those developing competency frameworks to improve the transparency and completeness of the development process (2). This guidance – in the form of a reporting guideline – could help to improve the utility and validity of reported competency frameworks (5). At the

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time of publication, we were not aware of any reporting guidelines specifically for reporting the development of a competency framework.

Research question

1. What are the essential items that should be included when reporting on the development of a competency framework in the health professions?

Objective

Our objective was to develop an evidence- and consensus-based, minimum set of essential items that should be included when reporting the development of competency frameworks in the health professions.

Target audience

The target audience of the reporting guideline and accompanying guidance includes authors, end-users peer-reviewers, and evaluators of health professions-focused competency frameworks.

Methods

This study followed the key steps recommended by the "Enhancing the QUAlity and Transparency Of health Research" (EQUATOR) network for developing reporting guidelines in health research (4). This framework has been used successfully to develop reporting guidelines for other areas of health research (6,8). We developed the reporting guideline in four stages. The aims of these stages were:

Stage 1. Project launch – we aimed to establish a research team, recruit an expert advisor, draft a protocol, and apply for ethics approval.
Stage 2. Knowledge synthesis – we aimed to conduct a comprehensive literature and guideline review to inform and identify potential reporting items.
Stage 3. Delphi study and virtual workshops – we aimed to recruit an expert panel of developers, journal editors, regulators, and end-users to complete a Delphi study and virtual workshops.
Stage 4. Develop the reporting guideline – we aimed to draft the initial reporting guideline to solicit feedback from the expert panel, and then use this feedback to inform the creation of the final reporting guideline.

See figure 1 for a schematic of these stages. We describe the details on the activities at each stage below.

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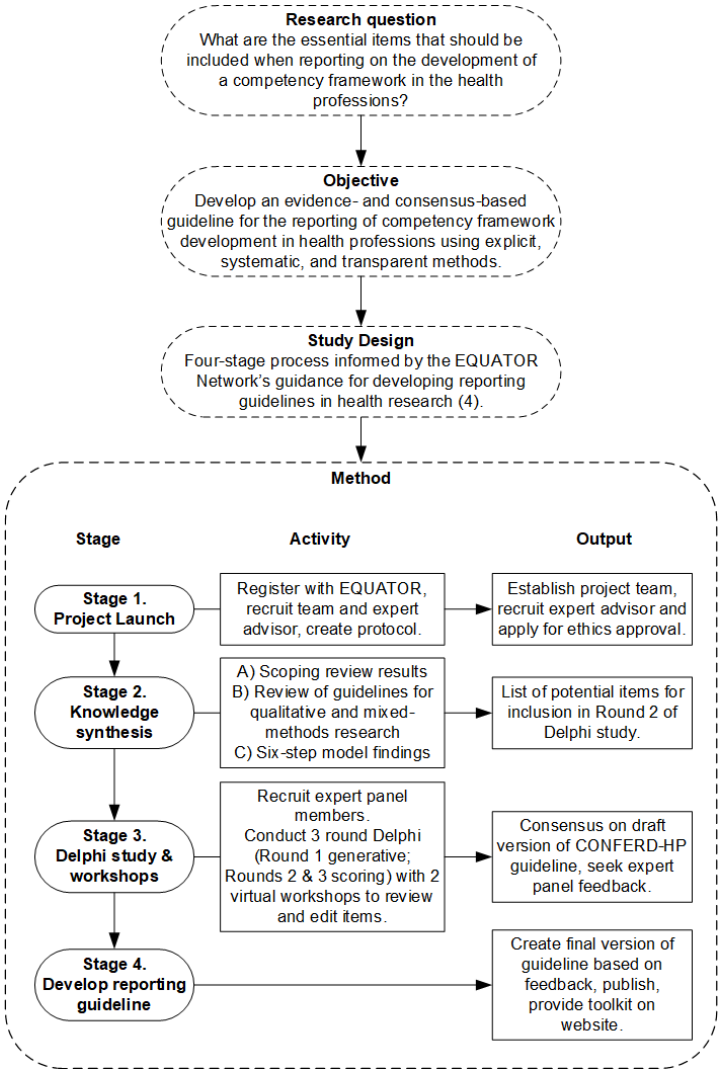

Figure 1. Stages of the CONFERD-HP study

Activities

Stage 1. Project launch

Establish Team, Expert Advisor and Protocol

We established a core project team (AB, WT, JR, and BW) responsible for the drafting of the protocol, and the day-to-day operations of the project. The team members provided expertise in competency framework development and evaluation, and competency-based education across health professions. The team engaged a methodological advisor (TH) to guide both the consensus methodology and development of the reporting guideline. This advisor guided the team in the conduct of this study, including the literature review; the nomination of participants for the Delphi study; reviewing the checklist items for inclusion in the Delphi study, providing feedback after each round of the survey (e.g., interpreted results of the previous round, approved content for the next round); and contributed to the production and reporting of the final reporting guideline. In keeping with the EQUATOR Network expectations outlined for reporting guideline development registration, we registered our intent to develop the

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CONFERD-HP reporting guideline on the EQUATOR Network website in November 2019 (9).

Ethics approval
The Monash University Human Research Ethics Committee provided ethics approval in June 2021 (#27484).

Stage 2. Knowledge synthesis
Conducted as part of a larger program of research, results from a scoping review of competency frameworks were used to inform our study (2). The scoping review aimed to understand how health professions developed competency frameworks and then to consider these activities against existing development guidance (i.e., were guidelines developed consistently against guidance) (2). We reviewed the major aspects and characteristics of the competency framework development process reported across 190 studies using a standardised data collection form, including items potentially relevant for inclusion in a reporting guideline (e.g., rationale for development, rationale for selection of methods, declaration of funding source) (2). Second, we reviewed all published checklists and guidelines on the EQUATOR Network website (n=421 at time of search, January 2020) to identify reporting guidelines related to qualitative and mixed-methods data collection. Finally, we were informed by elements of our six-step competency framework development model that did not feature in the existing literature (e.g., the use of theoretical or conceptual approaches) (1). We entered the data into a spreadsheet and generated a key list which was cross-referenced to each source.

Stage 3. Delphi study

Expert Panel
Our consensus approach was guided by traditional Delphi methodology and recognises that panel members should be sampled from the population that is intended and expected to use the guideline (i.e., intended users) (10,11). We also aimed to ensure diversity of representation across anticipated intended and end-users, professions, contexts, and stakeholders (10,12). To begin, we defined intended users as those who will use the reporting guideline (e.g., authors, journal editors, regulators), and end-users as those who will use the reported competency framework (e.g., readers, educators). We accomplished this by targeting authors of competency frameworks, editors of journals that publish competency frameworks, health professions regulators, and end-users (described below). Finally, we required a virtual approach that allowed experts who were dispersed globally to participate on their own time (13,14), as well as comply with ongoing COVID-19 restrictions. We employed a purposive sampling strategy and anticipated recruiting 30 panel members. Below we characterise who we sampled and how.

1. Intended users: Authors. We invited all authors of reports of competency framework development within the scoping review with an identified corresponding email address. We invited additional authors who were not represented in our scoping review but had authored a report of competency framework development since the

publication of the review. These authors were identified through database searches for papers related to competency framework development in health professions.

2. Intended users: Journal Editors. We identified the journals in which competency frameworks were published and ranked them according to the frequency of publication of frameworks. Editors from the top five most productive journals (having published >5 competency frameworks) were invited to participate.
3. Intended users: Health professions regulators. We invited representatives of a number of national regulatory bodies across health professions who developed or provided oversight for the development of competency frameworks. These were identified through the scoping review.
4. End-users. We sampled representatives of professional associations, health professionals, and educators/faculty members, identified through the research team and the results of the scoping review (e.g., associations that endorsed guidelines).

All participants were recruited through email invitation which outlined the objective of the study, study design, participation details, and level of commitment. We also included consent forms in the invitation.

Survey development

The Delphi study included an initial generative, open-ended survey-based round, and two subsequent rounds of scoring online surveys conducted via the edelphi.org website (with Google Form and Excel versions available in case of technical issues). Team members tested but did not participate in the survey rounds.

Round 1 of Delphi

Initially, we asked expert panel members one non-identifying demographic question related to their role in competency framework development. We asked this to gain insight into the composition of the panel in relation to their roles, and to ensure diversity in responses. We then asked that they suggest what they perceived to be the minimum, essential items that should be included when reporting the development of a competency framework. Specifically, we asked invitees: *"As a consumer, when reading a report/publication about the development of a competency-related framework, at a minimum, what elements would require reporting in order to imbue trust in the competency framework itself?"* In keeping with traditional approaches and as a means of reducing bias, we implemented this open-ended approach versus providing a list of items that were informed by Stage 2. Prior to deployment, we piloted the survey for content and clarity with the core project team and expert advisor and sent two weekly reminders to optimise participation.

Round 1 analysis

Results from Round 1 were analysed using continuous content analysis (15) to inductively generate categories of minimum required reporting items. The categorised list of reporting items was then synthesized by one member of the research team (AB) whereby redundant or repetitive concepts or items were collapsed into a single reporting item. We added the potential reporting items generated during Stage 2 to the list presented to the panel in Round 2 of the Delphi. We elected to implement this approach

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to harness the expertise of the panel in generating essential items rather than provide a list of reporting items we generated that might bias or limit response. The revised list of reporting items and brief explanations was then distributed among the research team and expert advisor for review and feedback. After feedback and re-wording of reporting items, a list was agreed upon by the research team for presentation to the panel in Round 2.

Round 2 of Delphi

Using a 7-point Likert scale (1 = strongly disagree (exclude item), 7 = strongly agree (include item) we again asked Delphi panel members to assess their perceived agreement with each of the proposed reporting items generated from Round 1, plus additional items identified in the knowledge synthesis exercise (Stage 2, described above). Each proposed reporting item included detail on whether it originated from the knowledge synthesis exercise (Stage 2) or Round 1, and if from Round 1, how many panel members suggested the item. We also included an optional text box response option where respondents could provide feedback to improve the clarity of wording for each item. This feedback was visible to other members of the panel in an anonymous format. We used the feedback to clarify wording for subsequent rounds, identify items considered duplicate by panel members, and distributed it to all panel members in advance of the virtual workshops. Prior to deployment, we piloted the survey for content and clarity before administering it and sent two weekly reminders to optimise participation.

Round 3 of Delphi

A third round of scoring was conducted for which we reworded and clarified discrepant items from Round 2 based on panel feedback. We asked expert panel members to rate their agreement with each of the reworded items using the same 7-point Likert scale as above. Each survey item included an optional text box where respondents could provide comments. Prior to deployment, we piloted the survey for content and clarity before administering it and sent one reminder to optimise participation.

Round 2 and Round 3 analysis

The approach to Round 2 and 3 survey analysis involved calculating the average scores for the group to feedback to individual participants in the following Delphi round. Seventy percent (70%) agreement was established a priori for each of the reporting items as a threshold for consensus among the expert panel members. This rule required that at least 70% of the respondents indicated that they either “agreed” or “strongly agreed” (values of 6 or 7 on the Likert scale) with the inclusion of the item as a minimum requirement within the reporting guideline. If agreement was less than 70% the item was considered discrepant and brought forward for discussion at the workshops. If agreement was ≥70% but the distribution of responses was not clearly in favour of agreement, the item was brought forward for discussion at workshops. In addition, the free-text comments provided by panel members were analysed and used to inform decisions for either the merging or rewording of draft items generated at the end of each round. The panel members were provided with a detailed report at the end

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of each round, which contained the level of agreement for each item and a summary of the free-text comments.

Workshops
The aim of this stage in reporting guideline development was to discuss and gain consensus on the items for inclusion in the final reporting guideline (4). To this end, we held two, 2-hour online virtual workshops in November 2021, facilitated by several members of the research team (AB, JR and WT) and the expert advisor (TH). We invited all participants who participated in at least one of the steps above, and attendees reviewed the items from the Delphi rounds and provided feedback on the wording to promote clarity, and sequence of each item. Workshops were held via Zoom to facilitate attendance across multiple time zones and comply with COVID-19 restrictions. Workshops were recorded and detailed notes were taken by the research team.

Draft guideline
We generated a draft reporting guideline based on the results of the Delphi rounds, feedback from workshop participants, and notes taken by the research team. We circulated the draft to the Delphi participants to receive further feedback on item wording, clarity, sequence of items, and categories within the checklist. The feedback provided by panel members on the draft guideline was then used by the research team to inform the final reporting guideline.

Measures to improve trustworthiness
The four aspects of trustworthiness are dependability, credibility, confirmability and transferability (16). We aimed to ensure credibility in the process by providing ongoing feedback from panel members to other members as a form of member checking (10,17). We aimed to ensure diversity in representation across users, professions, contexts, and stakeholders to improve dependability (10). We reported the Delphi study data collection and analysis in detail to improve confirmability. Finally, we reported the Delphi study process and results in line with the Guidance on Conducting and REporting DElphi Studies (CREDES) reporting guideline (18).

Participant stipends and payments
Participants were not remunerated for their participation in this study.

Results

Stage 2 - Knowledge synthesis
Analysis of the scoping review findings related to reporting quality revealed several inconsistencies in the reporting of competency framework development (see Table 1) (2). Our search of the EQUATOR Network website for mixed-methods and qualitative reporting guidelines resulted in the identification of six relevant guidelines (18–23). We abstracted individual items from each guideline. Finally, we reviewed competency framework development guidance for potential reporting items (1,2). We entered each item into a spreadsheet and cross-referenced the list. This resulted in a synthesised list of 17 potential reporting items for mapping against the panel responses from Round 1.

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Table 1. Reporting of items in scoping review.

Potential reporting item described	Competency frameworks reporting the item n (%)
Geographic location identified	190 (100)
Intended profession	190 (100)
Rationale for developing framework	190 (100)
Funding source(s) declared	110 (58)
Timeframe for development of framework	81 (43)
Rationale for choice of method(s) used	79 (42)
Title contains term ‘competency’	70 (37)
Evaluation planned or recommended	66 (35)
Title contains term ‘competencies’	65 (34)
Title contains term ‘competency framework’	30 (16)
Partial rationale for choice of methods	27 (14)
Patient engagement in development process	21 (11)
Triangulation of data	18 (9)
Title contains term ‘competency model’	9 (5)
Title contains term ‘competency standard’	9 (5)
Evaluation conducted	7 (4)

Stage 3 – Delphi Study

We invited 155 individuals to participate on the panel. A total of 35 individuals completed Round 1 (generative phase) of the Delphi study (23% response rate). Subsequently, 30 of the 35 completed Round 2 (86% response rate), and 17 completed Round 3 (48.5% response rate). Several participants identified as having multiple roles related to competency framework development (see Table 2). See Figure 2 for detail on each round of the Delphi study.

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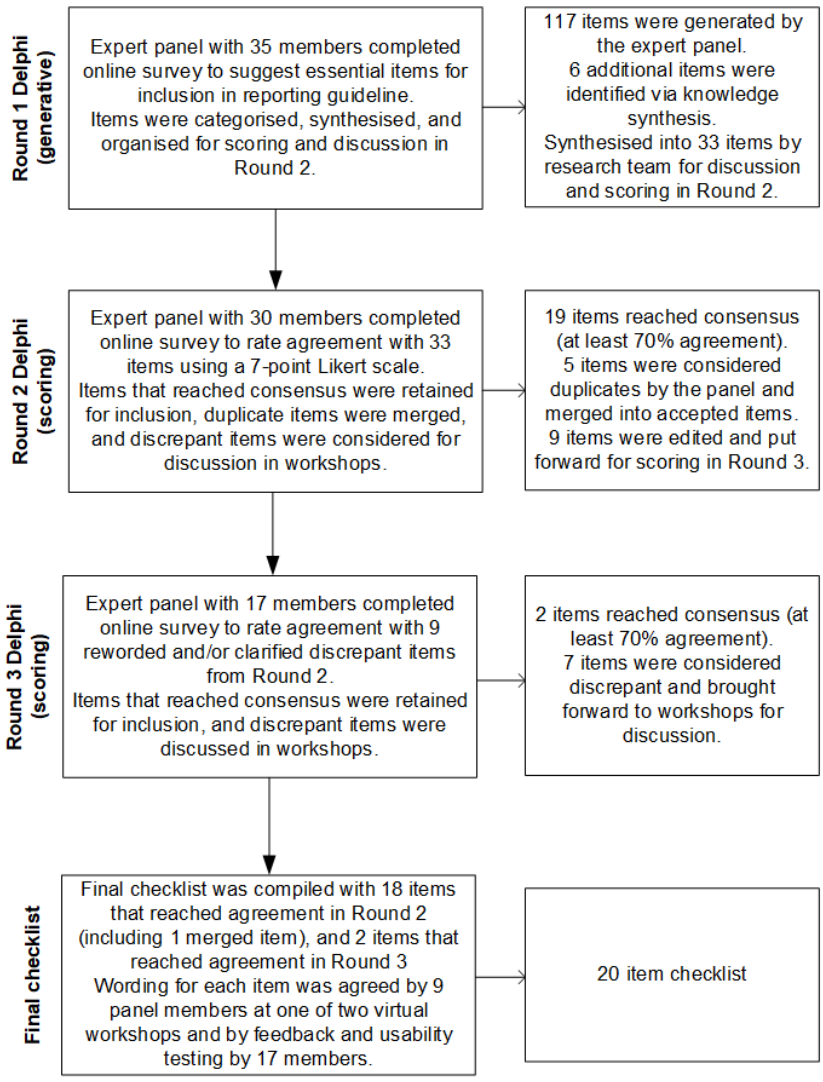

Figure 2. Results of the Delphi study and virtual workshops.

Table 2. Characteristics of e-Delphi panel in Round 1.

Role in competency frameworks	**Number of participants fulfilling role (% of panel)**
Developer	25 (70)
Journal Editor	9 (27)
Regulator of a healthcare profession	4 (12)
End-user (e.g., educator, healthcare professional)	19 (55)
Participant profession/area of focus	
Medicine (incl. surgery)	15 (43)

Nursing	7 (20)
Multidisciplinary	7 (20)
Allied health professions (pharmacy, dietetics, paramedic, occupational therapy)	6 (17)
Participant geographical location	
North America	15 (43)
Australasia	8 (23)
Europe	9 (25)
Asia	2 (6)
South America	1 (3)

Note: Subsequent rounds were anonymous and no demographic information was gathered.

Results: Round 1
An initial list of 117 suggested reporting items was generated. Following categorisation and synthesis, a list of 27 reporting items was identified. This list was mapped against our knowledge synthesis findings (Stage 2), which resulted in an additional six unique items for a total of 33 potential reporting items.

Results: Round 2
A panel of 30 expert participants scored 33 potential reporting items from Round 1. Five participants did not complete the survey. Overall, 19 items reached 70% agreement, 5 items were considered duplicate and were merged with agreed items (e.g., the panel suggested merging four items on the reporting of different methods to one tiered item addressing 'methods' – item 9c). Nine items were considered discrepant and brought forward for consideration in Round 3. Edits were suggested to the wording of all but one item (item 1a).

Results: Round 3
A panel of 17 expert participants scored 9 discrepant reporting items from Round 2. Overall, 2 items (both rephrased based on Round 2 feedback) reached 70% agreement (items 2 and 7). Seven items remained discrepant and were brought forward for discussion in the workshops.

Workshops and initial draft
A total of nine participants attended one of two virtual workshops. Participants were exclusively female, largely held senior academic ranks (e.g., Associate Professor, Professor, Chair), and represented multiple health professions (e.g., medicine, nursing, dietetics, pharmacy). In these workshops which were facilitated by the expert advisor and members of the research team, an initial draft guideline was presented, and revisions were suggested to the wording of items. Revisions were suggested to the wording of all but four of the items between both workshops (items 1a, 3, 11, 14). Two items were merged (resulting in item 10) based on workshop feedback.

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Revised draft guideline and feedback

A revised draft guideline was generated that contained 20 reporting items, and this was circulated to the expert panel for feedback. Feedback was received from 17 experts across roles and disciplines, and 16 further elected to be identified as collaborators on the guideline. A sample of participants who volunteered (n=4) 'tested' the reporting guideline for usability by applying it with development, peer-review, and quality appraisal contexts in mind. All items were reviewed and edited for clarity and sequence based on the feedback from the expert panel. A copyeditor edited the final checklist to ensure clarity, consistency, and grammatical accuracy.

Discussion and conclusion

The CONFERD-HP reporting guideline was developed using an evidence-informed, rigorous approach as outlined by the EQUATOR Network (4). The CONFERD-HP reporting guideline is intended to guide the essential items that should be reported when describing the development of competency frameworks in the health professions. The final reporting guideline checklist is presented in Table 3 and includes 20 items. It consists of 18 items that reached agreement in Round 2, along with 2 items that were modified for inclusion after Round 3. The checklist items encompass the following categories: basic information (e.g., title); background information (e.g., purpose); development process (e.g., methods); testing; funding and conflicts of interest. An explanation and elaboration statement is being prepared, which will provide readers with a comprehensive explanation and rationale, as well as examples of good reporting for each item in the reporting guideline.

The reporting guideline can assist those developing competency frameworks in the development process, support journal editors and peer-reviewers when considering frameworks for publication, and help end-users (e.g., educators, professionals, regulators) understand the scope, rigour, and trustworthiness of a competency framework, and inform decisions around its utility and applicability for their purposes. It provides those who use and evaluate competency frameworks with a clear, explicit description of processes and procedures that were used when developing a competency framework, and access to the resources and evidence used to formulate each recommended item. The CONFERD-HP reporting guideline is not intended to be a prescriptive or linear format for reporting competency framework development. Rather, each item should be presented, and sufficient elaboration provided somewhere in the reporting of the competency framework development process.

Table 3. CONFERD-HP Checklist

Section/topic	Item	Checklist item
Title and abstract		
Title	**1a**	Identification as a competency framework in the title.
	1b	Identification of intended profession and level of practice/stage of training in title.
Structured abstract/summary	**2**	Structured summary that includes intended user(s) and use(s) of the framework, the purpose of the framework, the development process and methods used.
Definition(s)	**3**	Defined or referenced definitions for competence, competency and other key terms used to promote understanding of the framework.

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Framework development		
Rationale and justification	**4**	Description of rationale and justification for the development of the framework including supportive references where possible.
Purpose and use	**5a**	Description of the purpose of the framework.
	5b	Description of the intended use(s) of the framework.
	5c	Description of the intended user(s) of the framework.
Developer group	**6**	Description of the qualifications and expertise of those leading the development of the framework.
Oversight/governance group	**7**	Description of the group that had oversight of the framework, the purpose and expertise of the group members, how they reviewed the work and/or contributed to the development.
Theoretical/conceptual approach(es)	**8**	Description of theoretical/conceptual approach(es) used to develop the framework including references and rationale for their use.
Development process		
Process and methods	**9a**	Description of each step of the development process.
	9b	Description of how existing literature was gathered and used to inform the competency framework development. Provide a list of references used.
	9c	Description of all methods used throughout the development process including associated reference(s) and details of any modifications.
End-user contributions	**10**	Description of all stakeholders, including end users of both the framework (e.g., the professional group consulted) and the services (e.g., patients/consumers and other healthcare professionals) who contributed to the development process, how they were selected (with considerations of equity, diversity and inclusion), and how they participated.
Ethics	**11**	Description of ethical considerations and approvals obtained where applicable.
Evaluation and implementation		
Evaluation	**12**	Description of the approach for evaluating the draft competency framework, including how feedback from stakeholders was gathered and used.
Implementation	**13**	Suggestion for how the framework should be implemented and in what settings.
Funding and COI		
Funding	**14**	Description of all funding sources and other support received for the development of the framework and the role of the funder(s).
Conflict of interest	**15**	Description of how conflicts of interest were considered and managed in the development process.

The CONFERD-HP study should be interpreted in light of some limitations. First, the Delphi panel response rate represented 23% of those invited. While there is no sample size calculation for the Delphi method, it is generally accepted that a larger sample may increase the reliability of the group's judgments, and more than 12 participants are recommended (24) – a threshold which was met in all three rounds. More importantly, panel members represented a diverse sample of all potential end-users of the reporting guideline, reflecting the full range of the population the guidance is intended to influence (24). Second, not all panel members were able to participate in all rounds of the Delphi. Unfortunately, schedule and COVID-19 demands placed on panel members made this a challenge. We aimed to reduce the effects of this by engaging with all members of the panel at several points - Delphi rounds, workshops, and opportunity to provide final feedback. Third, we may have missed important items when we conducted our initial literature review (Stage 2), but we made every effort to minimise this possibility by

examining relevant reporting guidelines and engaging the expertise of the panel in Round 1 of the Delphi study. Finally, like any other reporting guideline, the CONFERD-HP reporting guideline is an evolving document that will require ongoing evaluation, improvement and updating. We will revise the statement in the future based on user feedback, results of evaluations, and improved guidance on reporting guidelines. We encourage those who use the CONFERD-HP reporting guideline to submit comments to us via the CONFERD-HP website (www.conferd-guideline.org).

We intend to promote the use of the CONFERD-HP reporting guideline by contacting the editors of journals that have published competency frameworks to elicit their support and inform national and international competency framework developers about the reporting guideline.

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Conflicts
No conflicts to declare.

Reproducible Research Statement
Study protocol: Available at the EQUATOR (9) and CONFERD-HP websites (www.conferd-guideline.org).
Data set: available from Alan Batt (alan.batt1@monash.edu)

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