

Rapid review of existing question formulation frameworks

Methods

We performed a rapid review for currently available structures for formulating questions. This was not a comprehensive methodological review; we sought to map question variants and to examine their suitability for capturing a complexity perspective.

We combined four methods to identify variants used to formulate review questions:

- 1) We reviewed published list of questions variants^{S1, S2, S3}
- 2) We conducted keyword searches for “question*” in conjunction with formulat*, develop*, articulat*, and focus* in the Methodology Register of the Cochrane Qualitative and Implementation Methods Group
- 3) We repeated the above keyword searches in the Systematic Reviews Methodology subset of the PubMed database (i.e. sysrev_methods [sb])
- 4) We conducted Google Scholar citation searches for citations identified via the foregoing methods

The rapid review examined each question formulation framework against four criteria:

1. Does the framework recognise context, whether as Setting, Environment or Context?
2. Does the framework acknowledge the criticality of Perspective, as differentiated from the epidemiological characteristics of a target Population?
3. Does the framework include spatial and temporal variation i.e. specifying elements of time/timing and place?
4. Is the framework sensitive to qualitative data e.g. eliciting themes or findings rather than “hard” outcomes?

Results

The literature searches identified a total of 2465 citations. Following removal of duplicates 1481 references remained. Of these, 1368 references were discarded following abstract review. Full text of the remaining 113 citations was examined in detail; within these we identified 38 question formulation frameworks. Elements of each framework were documented (Table 2) and assessed against the four inclusion criteria (Table 3), with frameworks meeting each criterion being evaluated for their suitability to accommodate a complexity perspective.

Table S1 – Question formulation frameworks and their elements

Question formulation framework	Elements
1. 3WH ⁵⁴	Who; What; When; How [study conducted]
2. BeHEM ⁵⁵	Behaviour; Health context; Exclusions; Models or Theories
3. CHIP ⁵⁶	Context; How [study conducted]; Issues; People
4. CIMO ⁵⁷	Context; Intervention; Mechanisms; Outcomes
5. CoCoPop ⁵⁸	Condition, Context, Population
6. CPTM ⁵⁹	Construct of interest or the name of the measurement instrument(s), Population, Type of measurement instrument, Measurement properties
7. ECLIPSe ⁵¹⁰	Expectations (improvement, innovation or information); Client group (recipients of service); Location (where service is housed); Impact (change in service and how measured); Professionals involved; Service
8. EPICOT ⁵¹¹	Evidence; Population; Intervention; Comparison; Outcome; Timestamp
9. MIP ⁵¹²	Methodology, Issues, Participants
10. PCC ⁵¹³	Population; Concept; Context
11. PECO ⁵¹⁴	Patient/ Population; Exposure; Comparison; Outcomes
12. PECODR ⁵¹⁵	Population, Exposure, Comparison, Outcome, Duration, Results
13. PEICO(S) ⁵¹⁶	Person; Environment; Intervention; Comparison; Outcomes; (Stakeholders)
14. PEO ⁵¹⁷	Population and their problems; Exposure; Outcomes or Themes
15. PESICO ⁵¹⁸	Person; Environment; Intervention; Comparison; Outcomes; (Stakeholders)
16. PFO ⁵¹⁹	Population, Prognostic Factors (or models of interest), Outcome
17. PICO ⁵²⁰	Patient/ Population; Intervention; Comparison; Outcomes
18. PICo ⁵²¹	Population; phenomenon of Interest; Context
19. PICo ⁵²²	Population Intervention or Phenomena of Interest, Context (PICo)
20. PICOC ⁵²³	Patient/Population; Intervention; Comparison; Outcomes; Context
21. PICOCPRRST ⁵²	Population or problem; Intervention or exposure; Comparison; Outcome Context or environment or setting; Professionals; Results; Research – incorporating type of question and type of study design; Stakeholder or perspective or potential users; Timeframe or duration
22. PICOS ⁵²⁴	Patient/ Population; Intervention; Comparison; Outcomes; Study Type
23. PICOT ^{525 526}	Patient/ Population; Intervention; Comparison; Outcomes; Timeframe
24. PICOT-D ⁵²⁷	Population, Intervention, Comparison, Outcome, Time, Digital-data
25. PICOt ⁵²⁸	Patient/ Population; Intervention; Comparison; Outcomes; timing
26. PICOT ⁵²⁹	Population; Intervention; Comparator; Outcome; Timeframe
27. PICOTS ⁵³⁰	Patient/ Population; Intervention; Comparison; Outcomes; Timing; Setting

28. PICOTT ^{S31}	Patient/ Population; Intervention; Comparison; Outcomes; Type of Question; Type of Study Design
29. PIE ^{S32}	Patient; Intervention/Interest; Evaluation
30. PIPOH ^{S33}	Population [receiving intervention]; Intervention; Professionals [delivering intervention]; Outcome; Health setting [in which Guideline is to be implemented]
31. PIPOS ^{S2}	Population [receiving intervention]; Intervention; Professionals [delivering intervention]; Outcome; Setting [in which Guidance is to be implemented]
32. PIRD ^{S34}	Population, Index Test, Reference Test, Diagnosis of Interest
33. PO ^{S35}	Population/Phenomena; Outcome
34. PS ^{S36}	Population, Situation
35. ProPheT ^{S37}	Problem; Phenomenon of interest; Timing
36. SDMO ^{S38}	Types of Studies, Types of Data, Types of Methods, Outcomes
37. SPICE ^{S39}	Setting; Perspective; (<i>Intervention/Interest</i>, of Phenomenon; [Comparison]; Evaluation
38. SPIDER ^{S40}	Sample; Phenomenon of Interest; Design; Evaluation; Research type

Of the 38 identified question frameworks 17 recognised contextual elements, most typically Context but also Environment, Health Setting, Setting and Situation. Variants included amongst these 17 frameworks include formulations such as PICOC^{S23} and SPICE^{S39}, and a further PICo where "Co" represents Context^{S21}. However only five of these 17 frameworks acknowledged a particular Perspective (Perspective (n = 1), People (n = 1), or Stakeholders (n = 3)) with the remaining 12 defining Populations/Patients in conventional epidemiological terms. Of the five remaining frameworks only two (SPICE^{S39} and CHIP^{S6}) reflected sensitivity to qualitative data by avoiding the term Outcomes (i.e. Evaluation and Issues). However, SPICE^{S39} and CHIP^{S6} interpret Setting and Context simply in spatial, not temporal terms.

Conclusion

We therefore concluded that none of the existing frameworks was entirely suited to capture a complexity perspective when addressing questions potentially answerable by qualitative evidence syntheses.

Table 1 – Assessment of question formulation frameworks against inclusion criteria

Criterion	Met criterion	Did not meet criterion
Recognition of contextual elements, e.g. Setting, Environment or Context.	n=17 BeHEMOTH, CHIP, CIMO, CoCoPop, ECLIPSe, PCC, PEICO(S), PESICO, PICo,	n=21 3WH, CPTM, EPICOT, MIP, PECO, PECODR, PEO, PFO, PICO, PICOS, PICOT,

	PICo, PICOC, PICOCPRRST, PICOTS, PIPOH, PIPOS, PS, SPICE	PICOT-D, PICOTT, PIE, PIRD. PO, ProPheT, SDMO, SPIDER
Acknowledgement of Perspective	n=5 CHIP, PEICO(S), PESICO, PICOCPRRST, SPICE	n=12 BeHEMoth, CIMO, CoCoPop, ECLIPSe, PCC, PICo, PICo, PICOC, PICOTS, PIPOH, PIPOS, PS,
Sensitivity to qualitative data	n=2 CHIP, SPICE	n=3 PEICO(S), PESICO, PICOCPRRST
Includes spatial and temporal variation	n=0	n=3 CHIP, PS, SPICE

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