

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 ^{S4}	Who; What; When; How [study conducted]
2. BeHEMoth ^{S5}	Behaviour; Health context; Exclusions; Models or Theories
3. CHIP ^{S6}	Context; How [study conducted]; Issues; People
4. CIMO ^{S7}	Context; Intervention; Mechanisms; Outcomes
5. CoCoPop ^{S8}	Condition, Context, Population
6. CPTM ^{S9}	Construct of interest or the name of the measurement instrument(s), Population, Type of measurement instrument, Measurement properties
7. ECLIPSe ^{S10}	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 ^{S11}	Evidence; Population; Intervention; Comparison; Outcome; Timestamp
9. MIP ^{S12}	Methodology, Issues, Participants
10. PCC ^{S13}	Population; Concept; Context
11. PECO ^{S14}	Patient/ Population; Exposure; Comparison; Outcomes
12. PECODR ^{S15}	Population, Exposure, Comparison, Outcome, Duration, Results
13. PEICO(S) ^{S16}	Person; Environment; Intervention; Comparison; Outcomes; (Stakeholders)
14. PEO ^{S17}	Population and their problems; Exposure; Outcomes or Themes
15. PESICO ^{S18}	Person; Environment; Intervention; Comparison; Outcomes; (Stakeholders)
16. PFO ^{S19}	Population, Prognostic Factors (or models of interest), Outcome
17. PICO ^{S20}	Patient/ Population; Intervention; Comparison; Outcomes
18. PICo ^{S21}	Population; phenomenon of Interest; Context
19. PICo ^{S22}	Population Intervention or Phenomena of Interest, Context (PICo)
20. PICOC ^{S23}	Patient/Population; Intervention; Comparison; Outcomes; Context
21. PICOCPRRST ^{S2}	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 ^{S24}	Patient/ Population; Intervention; Comparison; Outcomes; Study Type
23. PICOT ^{S25 S26}	Patient/ Population; Intervention; Comparison; Outcomes; Timeframe
24. PICOT-D ^{S27}	Population, Intervention, Comparison, Outcome, Time, Digital-data
25. PICOt ^{S28}	Patient/ Population; Intervention; Comparison; Outcomes; timing
26. PICOT ^{S29}	Population; Intervention; Comparator; Outcome; Timeframe
27. PICOTS ^{S30}	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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