

Why do authors derive new cardiovascular clinical prediction rules (CPRs)?

A mixed methods study

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RESEARCH ARTICLE

Why do authors derive new cardiovascular clinical prediction rules in the presence of existing rules? A mixed methods study

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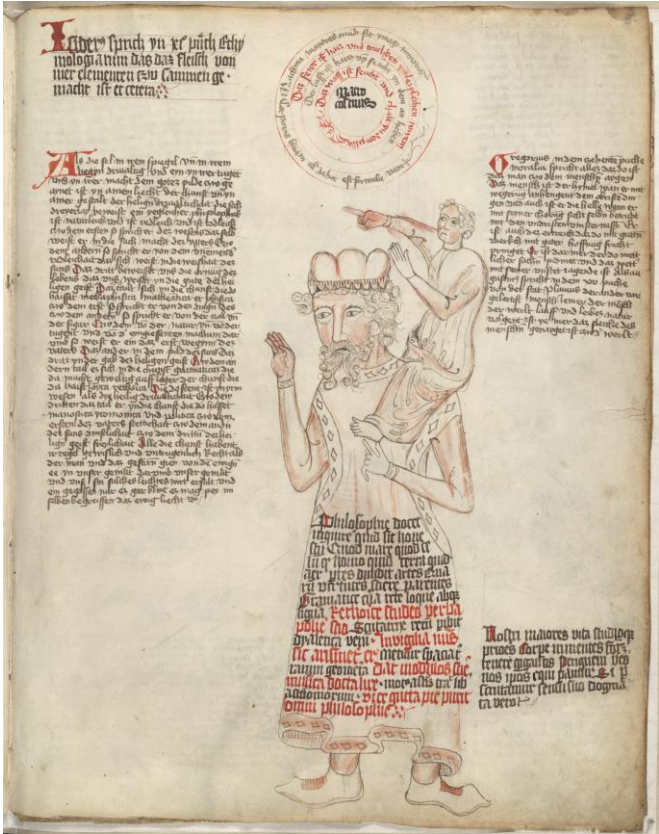
New research should be clearly justified

- “New research should not be done unless the questions it proposes to address cannot be answered satisfactorily with existing evidence.”

(Chalmers and Glasziou 2009)

- Transparent Reporting of a multivariable prediction model for individual Prognosis Or Diagnosis (TRIPOD) statement: present a rationale for developing a new clinical prediction rule (CPR) with references to existing CPRs.

(Collins, Reitsma et al. 2015)



nanos gigantum humeris insidentes

Inefficiencies in cardiovascular CPR development

- Many CPRs have been developed for same cardiovascular problems.
 - 114 CPRs for congestive heart failure (64 CPRs and 50 modifications) (Rahimi, Bennett et al. 2014)
 - 363 CPRs for cardiovascular disease risk (Damen, Hoof et al. 2016)
- Most without external validation, very few with impact study, seldom adopted by guidelines or used in practice.

Objective: reason for deriving another cardiovascular CPR

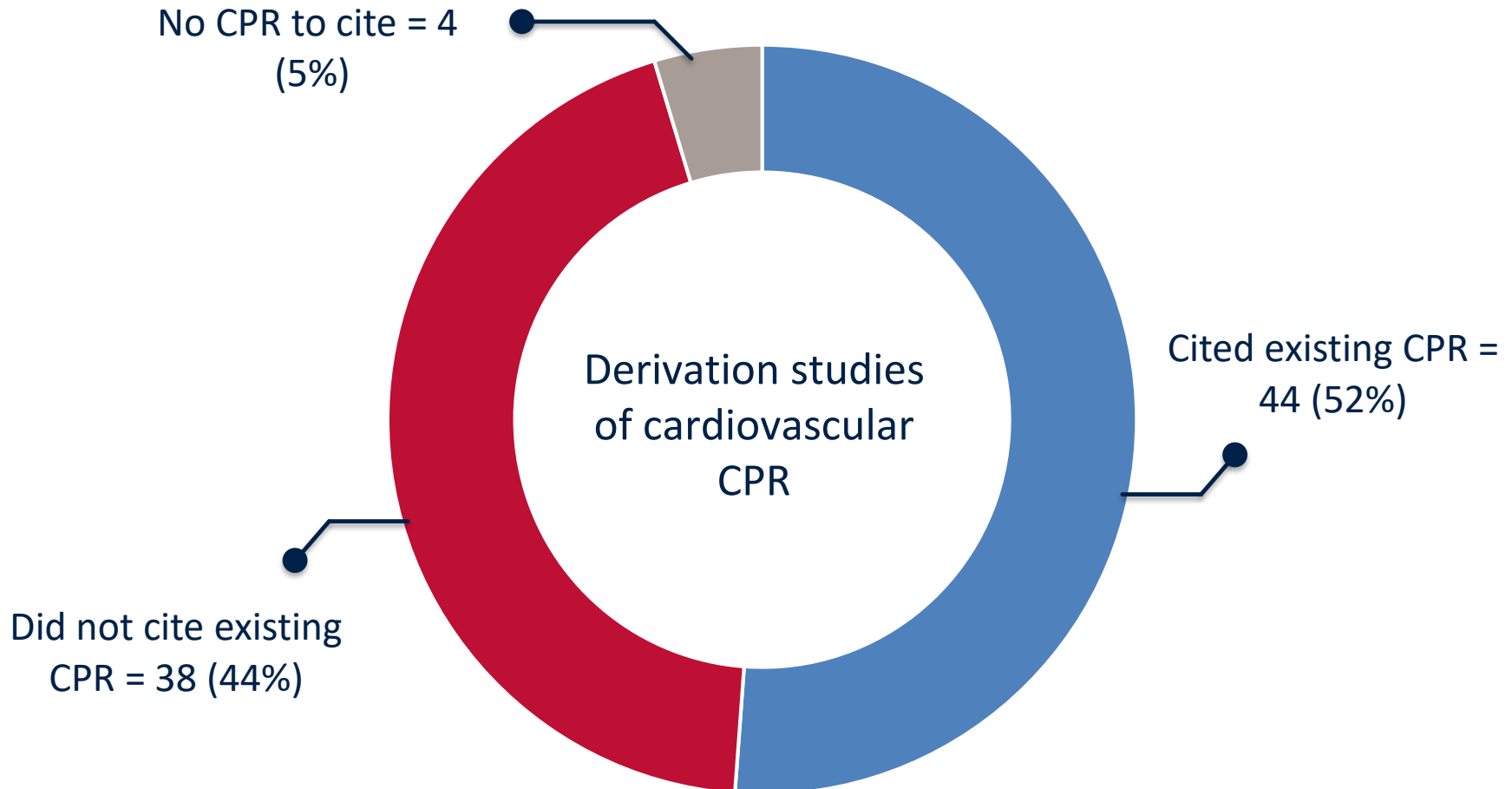
1. Did authors cite existing cardiovascular CPRs in derivation studies?
2. What were the insufficiencies of existing cardiovascular CPRs, stated in derivation studies?
3. Why did some authors cite existing cardiovascular CPRs and others did not?



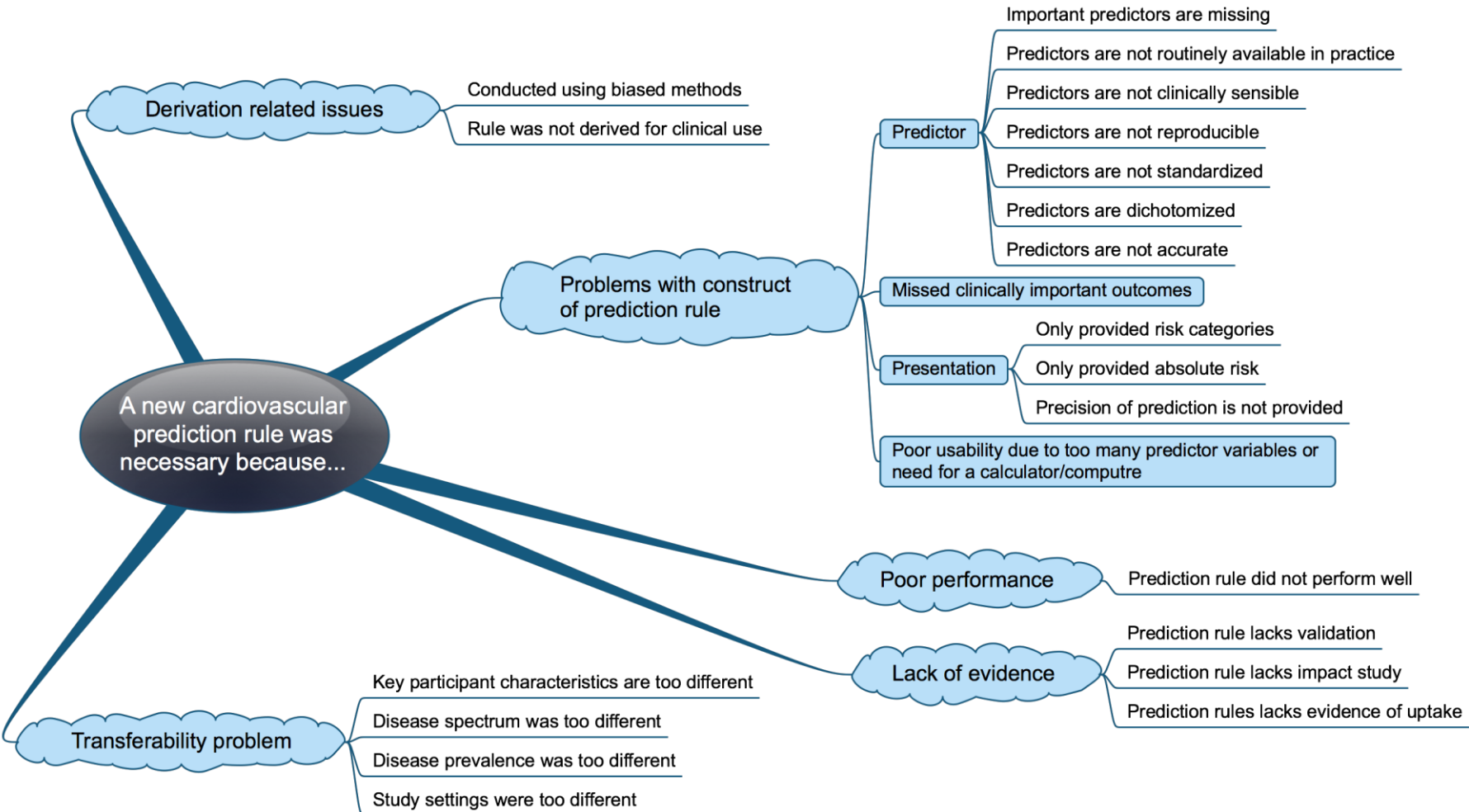
Methods: reason for deriving another cardiovascular CPR

1. Did authors cite existing cardiovascular CPRs in derivation studies?
 - ▮ Review of citation to existing CPRs in derivation studies
2. What were the insufficiencies of existing cardiovascular CPRs, stated in derivation studies?
 - ▮ Thematic content analysis of existing CPRs insufficiencies stated in the derivation studies
3. Why did some authors cite existing cardiovascular CPRs and others did not?
 - ▮ Survey of authors

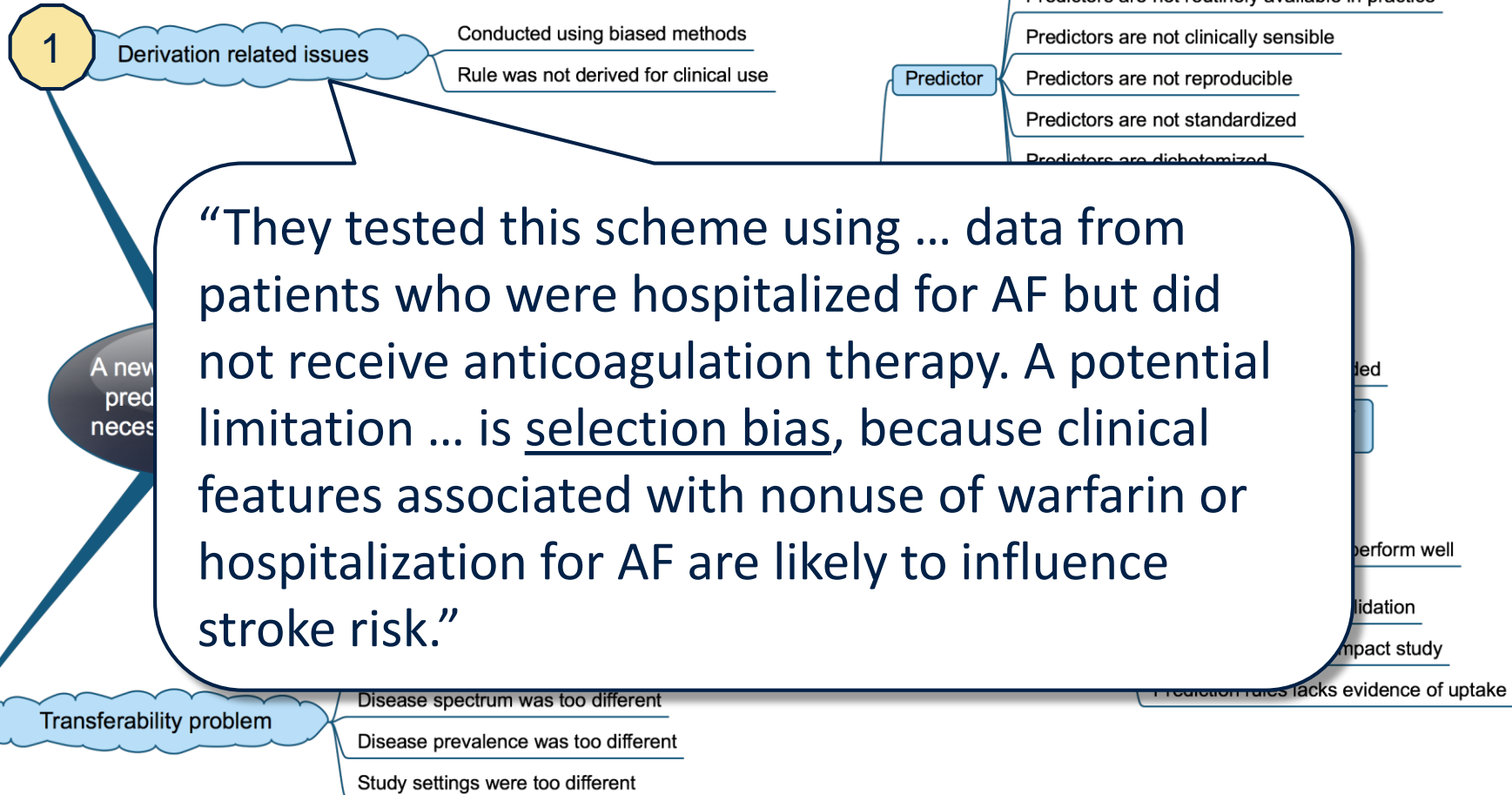
Results: citation of existing CPR



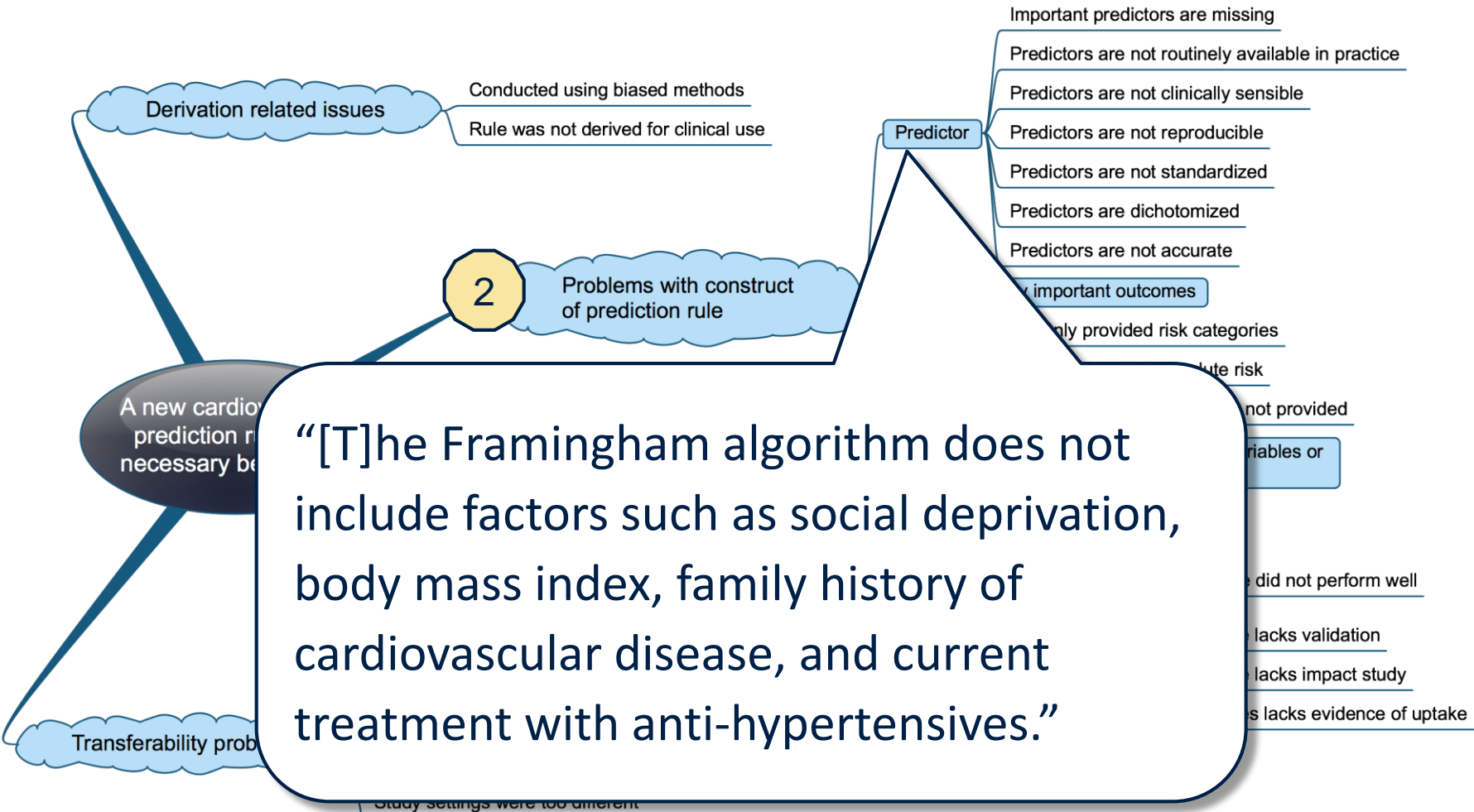
Results: thematic content analysis



Results: thematic content analysis



Results: thematic content analysis



“[T]he Framingham algorithm does not include factors such as social deprivation, body mass index, family history of cardiovascular disease, and current treatment with anti-hypertensives.”

Results: thematic content analysis

“[T]he modified Wells score has limitations in discriminating patients likely to have DVT and those unlikely to have DVT...This is despite the ambulatory population, which is expected to have a lower risk for DVT than hospital inpatients.”

- not predictors are missing
- are not routinely available in practice
- are not clinically sensible
- are not reproducible
- are not standardized
- are dichotomized
- are not accurate
- outcomes
- vided risk categories
- vided absolute risk
- n of prediction is not provided
- many predictor variables or
compute

3

Poor performance

Prediction rule did not perform well

Lack of evidence

Prediction rule lacks validation

Prediction rule lacks impact study

Prediction rules lacks evidence of uptake

Transferability problem

Key participant characteristics are too different

Disease spectrum was too different

Disease prevalence was too different

Study settings were too different

Results: thematic content analysis

“Although pregnancy is recognized as a risk factor for venous thrombosis, no prospective studies validated the use of current diagnostic strategies for DVT.”

Derivation related issues

- Conducted using biased methods
- Rule was not derived for clinical use

Predictor

- Important predictors are missing
- Predictors are not routinely available in practice
- Predictors are not clinically sensible
- Predictors are not reproducible
- Predictors are not standardized
- Predictors are dichotomized
- Predictors are not accurate
- Only important outcomes
- Only provided risk categories
- Only provided absolute risk
- Precision of prediction is not provided
- Due to too many predictor variables or calculator/compute

Poor performance

- Prediction rule did not perform well

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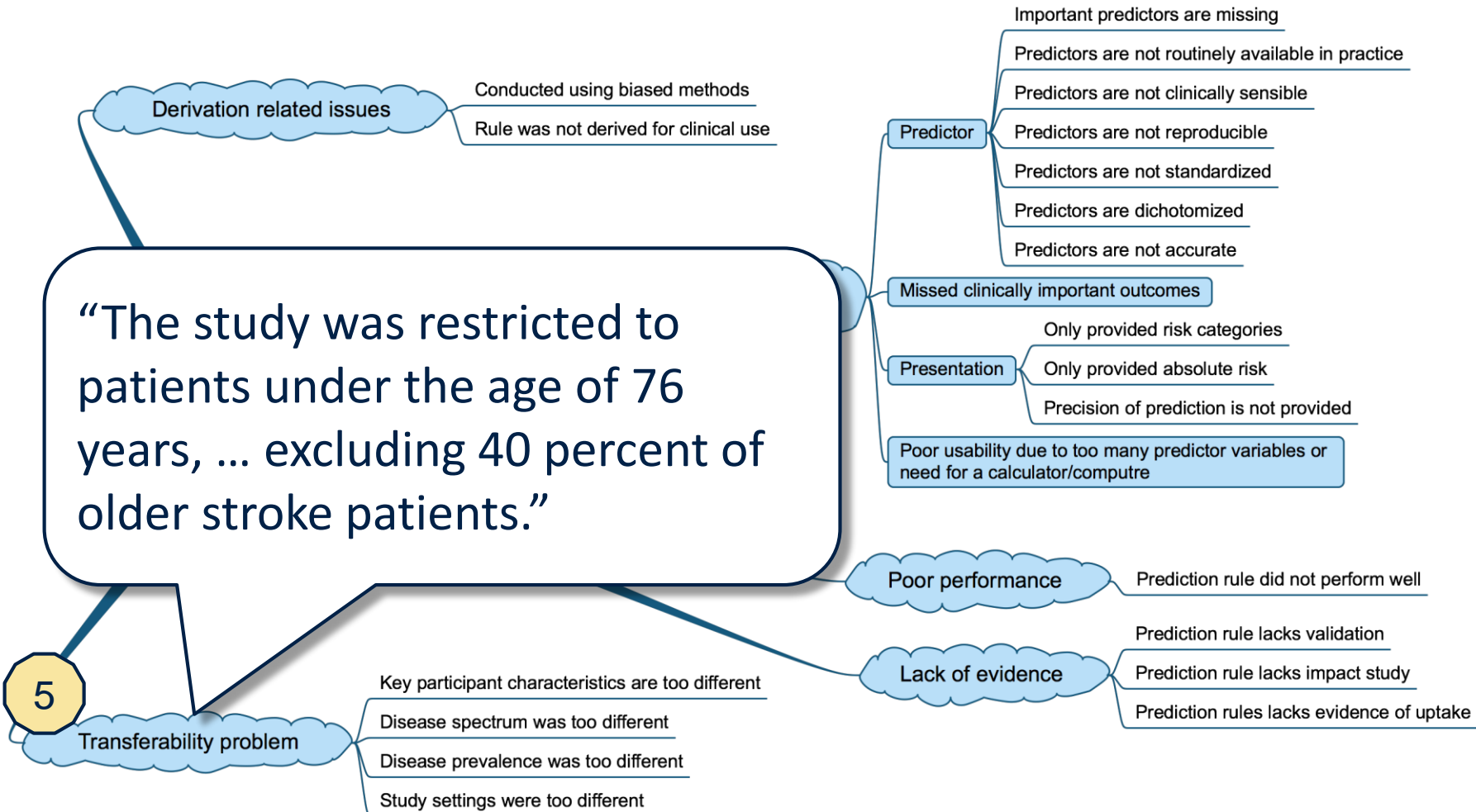
Lack of evidence

- Prediction rule lacks validation
- Prediction rule lacks impact study
- Prediction rules lacks evidence of uptake

Transferability problem

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Results: thematic content analysis



Results: survey of authors

QUESTION / ANSWER	CITED EXISTING CPR, N = 34	DID NOT CITE EXISTING CPR, N = 18	NO EXISTING CPR TO CITE, N = 2	TOTAL, N = 54 (%)
1. At the time of derivation, were you aware of any existing CPRs that addressed the same problem?				
Yes	19	6	0	25 (47)
No	14	12	2	28 (53)
2. How did you become aware of existing CPRs that addressed the same clinical problem?				
Systematic review	18	9	2	29 (55)
No systematic review	7	8	0	15 (28)
No search	8	1	0	9 (17)
3. How important do you think it is to cite existing CPRs for the same problem when deriving a new prediction rule?				
Important	30	17	2	49 (91)
Unimportant	4	1	0	5 (9)

Conclusions: Why do authors derive new cardiovascular CPRs?

1. Cardiovascular CPRs are often developed without citing existing CPRs although most authors agree it is important.
2. Common justifications for new CPRs concerned construct, transferability, and lack of evidence.
3. Developers should clearly justify why new CPRs are needed with references to existing CPR to avoid unnecessary duplications.
4. Limitation: applicability to CPRs in other clinical domains.