Royal College of Surgeons in Ireland
Coláiste Ríoga na Máinleá in Éirinn

RCSI

Clinical prediction rules in cancer diagnosis

Tom Fahey
RCSI & HRB Centre for Primary Care Research

HRB Health Research Board
HRB Centre for Primary Care Research
Queen's University Belfast
Trinity College Dublin
RCSI

Outline of talk

- Clinical prediction rules (CPRs)
  - Definitions and uses
  - Cancer diagnosis

- Solutions to implementation
  - Cochrane Register of CPRs in primary care
  - Computer based clinical decision support systems (CDSSs)

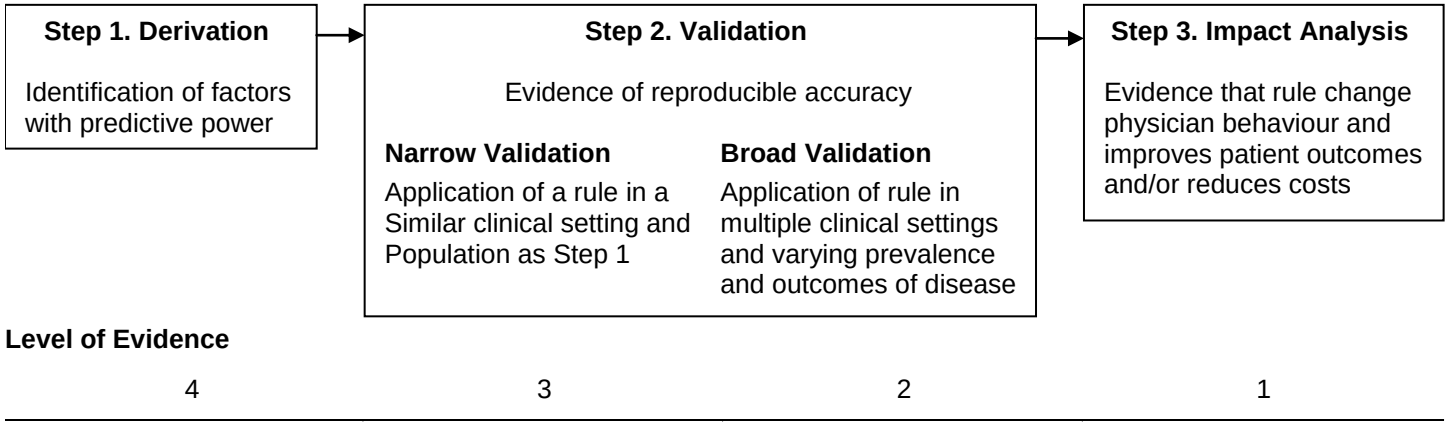
(1) Clinical prediction rules

- Definitions & uses
- Cancer diagnosis

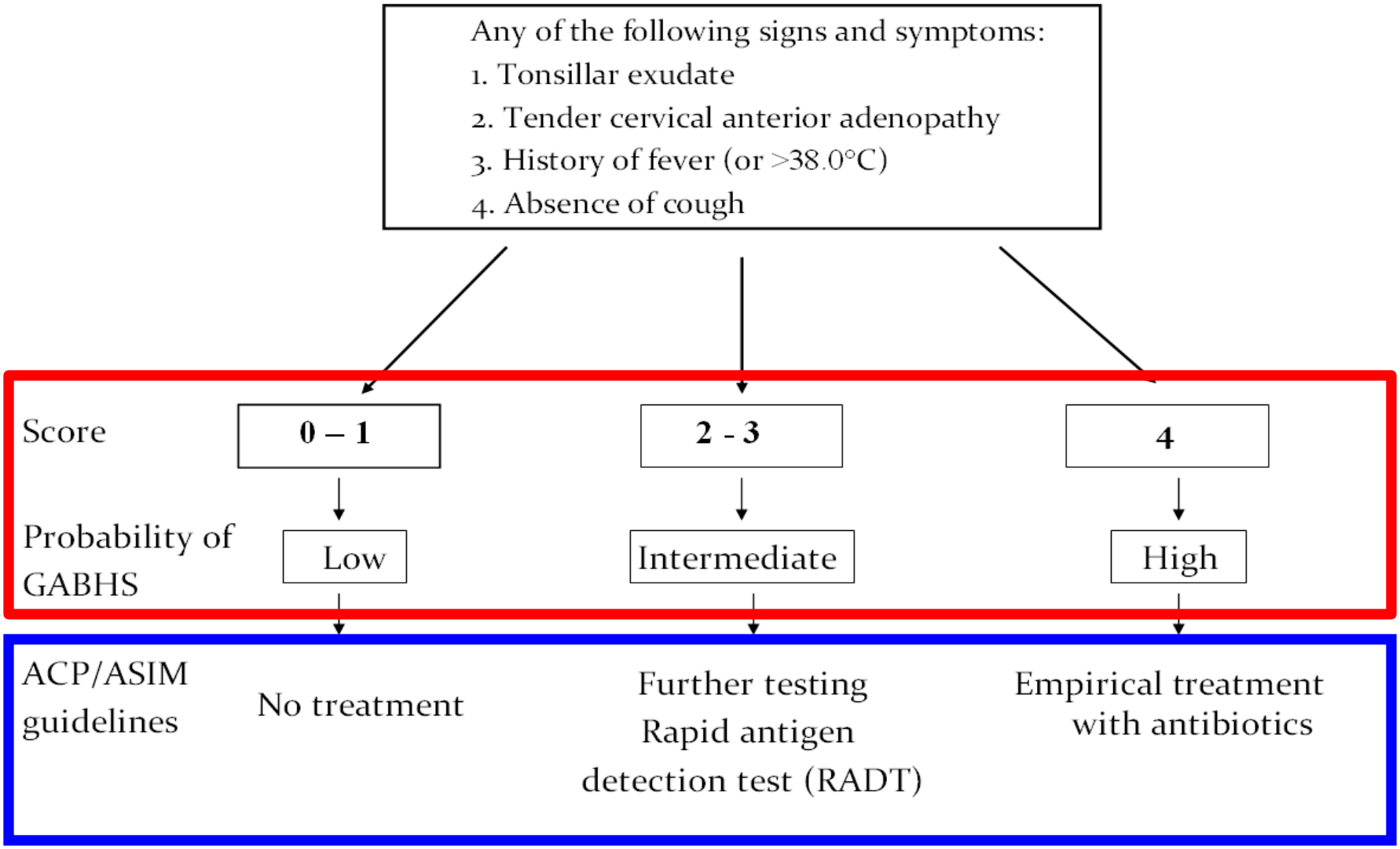
Definitions

- **Clinical Prediction Rule**
  - Clinical tools that quantify the contribution of
    - Patient History
    - Physical Examination
    - Diagnostic Tests
  - Stratify patients diagnosis
    - Probability of having target disorder.
  - Outcome can be in terms of diagnosis, prognosis, referral or treatment

Stages of development of CPR



Example of a CPR: The Centor Score



(1) Clinical prediction rules

- Definitions & uses

- Cancer diagnosis & prognosis
  - Breast- derivation & validation
  - Colorectal- systematic review derivation studies
  - Prostate- prognostic CPR

URGENT REFERRALS

- ☐ Discrete breast or axillary lump (unilateral, distinct, separate mass in patients over 35 years)
- ☐ Ulceration
- ☐ Skin distortion
- ☐ Nipple eczema
- ☐ Recent nipple retraction or distortion (less than 3 months)
- ☐ Blood-stained nipple discharge
- ☐ Patients with an acute abscess should be referred immediately to the next available breast clinic

URGENT REFERRALS

(to be seen within 2 weeks)

Duration of Symptoms ☐

EARLY REFERRALS

- ☐ Inflammation that persists after antibiotics
- ☐ Persistently refilling or recurrent cyst
- ☐ Unilateral discharge (not blood-stained)
- ☐ Intractable breast pain
- ☐ Discrete lump in women under 35 years
- ☐ Asymmetrical nodularity that persists at review after menstruation

EARLY REFERRALS

(to be seen within 6 weeks)

Duration of Symptoms ☐

ROUTINE REFERRALS

A patient whom the referring doctor considers to require a specialist opinion e.g.

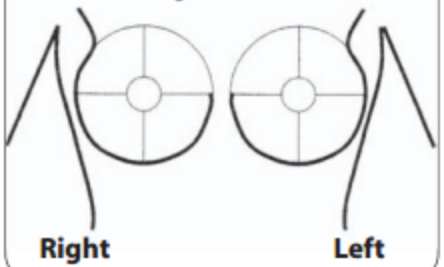
- ☐ Minor or moderate degrees of persistent breast pain (no discrete palpable lesion)
- ☐ Persistent bilateral nipple discharge (not blood-stained)
- ☐ Other

ROUTINE REFERRALS

(to be seen within 12 weeks)

Duration of Symptoms ☐

Clinical Findings – Breast Examination



Past medical history:

Anticoagulants: Yes ☐ No ☐

Allergies: Yes ☐ No ☐

Comments:

Tentative Diagnosis:

Date of referral: _____

Previous attendance at Breast Clinic: Yes ☐ No ☐

Date: _____ Hospital: _____

Previous breast disease ☐

Details: _____

Date: _____ Hospital: _____

Previous mammogram Date: _____ Hospital: _____

Normal: ☐ Abnormal: ☐

FOR HOSPITAL USE:

Date of referral receipted: _____

Date of appointment offered: _____

Reason patient did not accept first appointment offered: _____

Seen within Guidelines:

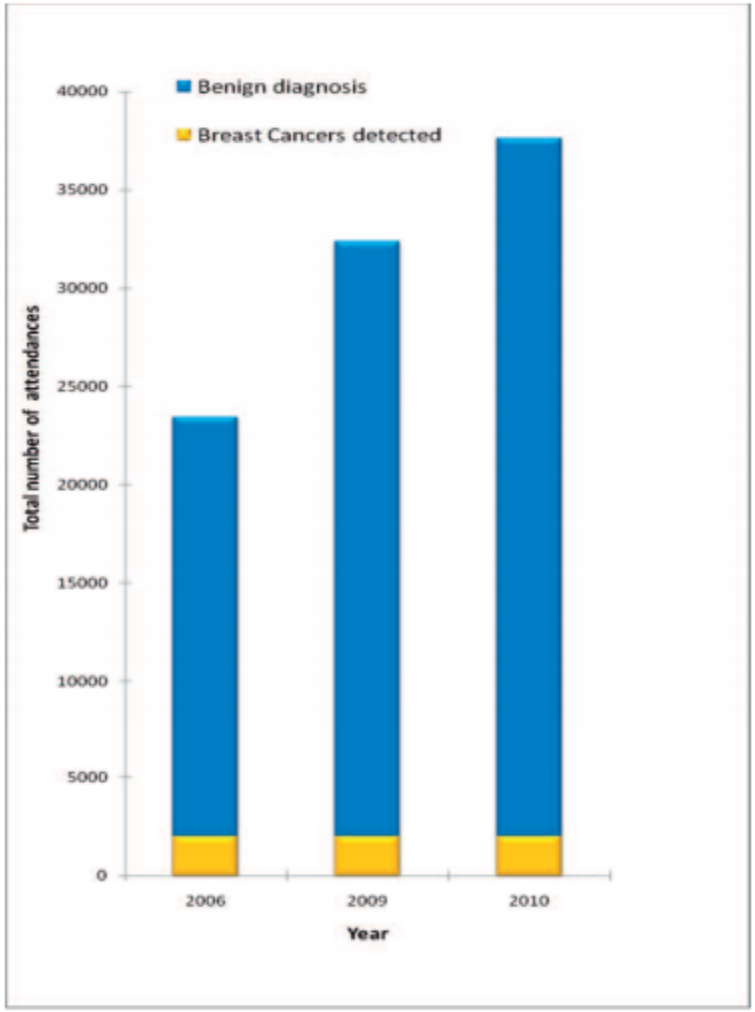
Yes ☐

No ☐

Breast Clinic Triage

- ☐ Urgent Referral *(to be seen within 2 weeks)*
- ☐ Early Referral *(to be seen within 6 weeks)*
- ☐ Routine Referral *(to be seen within 12 weeks)*

Published April 2009 for full review in April 2012



Data Source: National Cancer Control Programme (2) (3)

Year	2006	2009	2010
Benign diagnosis	21,438	30,370	35,619
Breast cancers detected	2,137	1,879	2,012
Ratio Benign diagnosis: Breast cancer	10	16	18
Percentage of new referrals with cancer detected	9.1%	5.8%	5.3%
Number of hospitals included in data	18	9	9
Total new attendances	**23,575**	**32,249**	**37,631**

Colin McCowan, Peter T Donnan, John Dewar, Alastair Thompson and Tom Fahey

Identifying suspected breast cancer:

development and validation of a clinical prediction rule

Abstract

Background
An evidence-based approach is needed to identify women with breast symptoms who are most likely to have breast cancer so that timely and appropriate referral can take place.

Aim
To report the development and validation of a clinical prediction rule for the diagnosis of breast cancer.

Design and setting
Cohort study with two prospective groups of women: those presenting to a symptomatic breast clinic (derivation cohort) and a separate cohort presenting to 11 general practices (validation cohort) in Tayside, Scotland.

INTRODUCTION

Breast cancer affects nearly one in every 11 women in the UK and is responsible for 21 000 deaths a year. Of the 36 000 new cases of breast cancer each year in England and Wales, most patients will present with primary operable disease.[1] Around three-quarters of breast cancer cases are diagnosed from patients who are symptomatic.[2]

GPs act as gatekeepers responsible for clinical assessment and have to prioritise patients for referral to specialist breast clinics. It is estimated that a GP will see between six and 34 new patients with symptomatic breast problems every year.

Department of Health, which set targets for clinics to see patients with suspected breast cancer within a 2-week period, prioritising patients as being 'urgent' and other referrals as 'routine'.[11] An improvement in the diagnostic process from this initiative has not been realised; observational research shows that the number of cases of breast cancers in the 2-week rule population has fallen, while the number of those in the routinely referred group has increased.[12] Furthermore, over a third of referrals are deemed to be inappropriate and large differences in GP referral patterns persist.[13,14–19] This poor performance of breast cancer referral

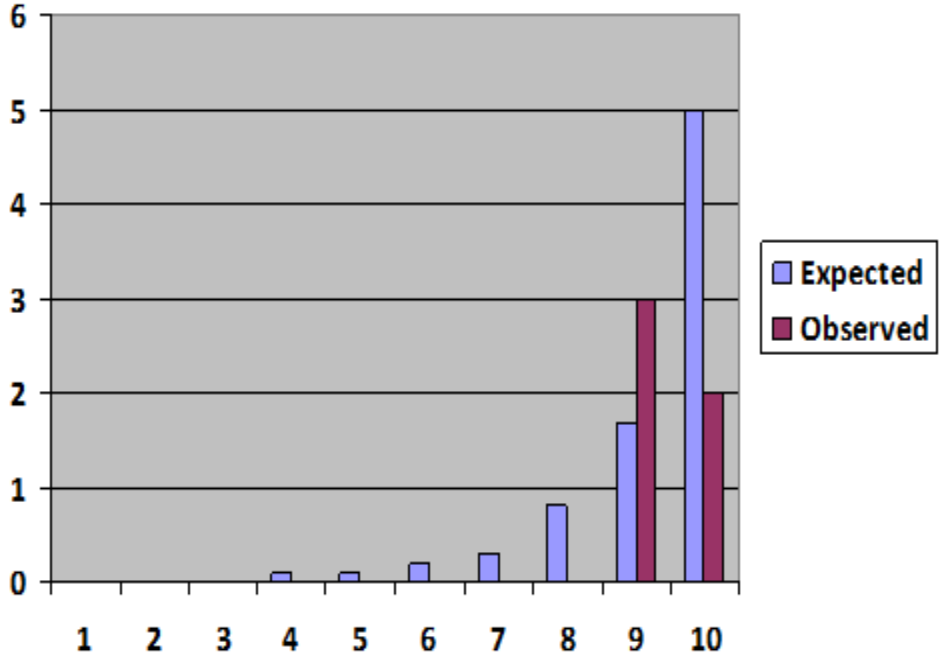
Table 2

Independent associations between explanatory variables and breast cancer

Explanatory variable	Adjusted OR (95% CI)
Increasing age (additional year)	1.10 (1.07-1.13)
Discrete Lump	15.20 (4.88-47.34)
Breast thickening	7.64 (2.23-26.11)
Lymphadenopathy	3.63 (1.33-9.92)
Size of lump	
<2cm	1.0
≥2cm	5.41 (2.36-12.38)

Figure 1

Expected versus observed breast cancers by decile of predicted risk in the validation cohort



Irish derivation & validation study

- Routinely collected data from a national Symptomatic Breast Clinic
- January 2011-December 2012 (n=7,501)
  - information on clinical, radiological and pathological data for patients attending the SBU
- Derivation cohort – (Jan 11-June 12)
- Validation cohort - (July 12-Dec 12)

Adjusted ORs and regression coefficients for the presence of breast cancer from derivation

RCSI
ROYAL COLLEGE OF SURGEONS IN IRELAND
COLÁISTE RÍOGA NA MÁINLEÁ IN ÉIRINN

Explanatory variable	Adjusted OR 95%CI	Regression coefficient	P-Value
Increasing age (additional year)	1.079 (1.071-1.088)	0.08	<0.0001
Presence of a Lump	5.634 (4.197-7.563)	1.73	<0.0001
Nipple Change	2.771 (1.676-4.582)	1.02	<0.0001
Nipple Discharge	2.086 (1.095-3.974)	0.74	0.0254

Diagnostic accuracy systematic review of rectal bleeding in combination with other symptoms, signs and tests in relation to colorectal cancer

M Olde Bekkink[*,1,2], C McCowan[3], GA Falk[1], C Teljeur[4], FA Van de Laar[2] and T Fahey[1,3]

[1]Department of General Practice, Royal College of Surgeons in Ireland Medical School, Beaux Lane House, Lower Mercer Street, Dublin 2, Republic of Ireland; [2]Department of Primary and Community Care, Radboud University Nijmegen Medical Centre, P.O. 9101, 6500 HB, Nijmegen, The Netherlands; [3]Health Informatics Centre, Division of Clinical & Population Sciences & Education, University of Dundee, MacKenzie Building, Kirsty Semple Way, Dundee, DD2 4BF, Scotland; [4]Department of Public Health and Primary Care, Trinity College Dublin, Trinity Centre for Health Sciences, AMiNCH, Tallaght, Dublin 24, Ireland

BACKGROUND: Rectal bleeding is a recognised early symptom of colorectal cancer. This study aimed to assess the diagnostic accuracy of symptoms, signs and diagnostic tests in patients with rectal bleeding in relation to risk of colorectal cancer in primary care.

METHODS: Diagnostic accuracy systematic review. Medline (1966 to May 2009), Embase (1988 to May 2009), British Nursing Index (1991 to May 2009) and PsychINFO (1970 to May 2009) were searched. We included cohort studies that assessed the diagnostic utility of rectal bleeding in combination with other symptoms, signs and diagnostic tests in primary care. An eight-point quality assessment tool was produced to assess the quality of included studies. Pooled positive likelihood ratios (PLRs), sensitivities and specificities were calculated.

RESULTS: Eight studies incorporating 2323 patients were included. Average weighted prior probability of colorectal cancer was 7.0% (range: 3.3–15.4%, median: 8.1%). Age ⩾60 years (pooled PLR: 2.79, 95% confidence interval (CI) 2.00–3.90), weight loss (pooled PLR: 1.89, 95% CI: 1.03–3.07) and change in bowel habit (pooled PLR: 1.92, 95% CI: 0.54–3.57) raise the probability of colorectal cancer into the range of referral to secondary care but do not conclusively 'rule in' the diagnosis. Presence of severe anaemia has the highest diagnostic value (pooled PLR: 3.67, 95% CI: 1.30–10.35), specificity 0.95 (95% CI: 0.93–0.96), but still only generates a post-test probability of 21.6%.

CONCLUSIONS: In patients with rectal bleeding who present to their general practitioner, additional 'red flag' symptoms have modest diagnostic value. These findings have implications in relation to recommendations contained in clinical practice guidelines.

British Journal of Cancer (2010) **102,** 48–58. doi:10.1038/sj.bjc.6605426 www.bjcancer.com
Published online 24 November 2009

Keywords: rectal bleeding; diagnosis; colorectal cancer; primary care

Table 3 Clinical value of symptoms and signs in patients presenting with rectal bleeding in terms of colorectal cancer

	No of studies[a]	No of patients	Sens	(95% CI)	Spec	(95% CI)	Pooled PLR	(95% CI)
Patient characteristics								
Male	5	1253	0.58	(0.48–0.67)	0.52	(0.48–0.56)	1.21	(1.00–1.46)
Age <40 years[b]	2	745	0.03	(0.00–0.16)	0.73	(0.69–0.76)	0.32	(0.05–2.21)
Age 40–59 years[b]	4	1387	0.09	(0.04–0.19)	0.79	(0.70–0.86)	0.41	(0.18–0.90)
Age ⩾ 60 years[b]	6	1760	0.66	(0.45–0.83)	0.76	(0.68–0.83)	2.79	(2.00–3.90)
Family history colorectal cancer	3	886	0.15	(0.06–0.28)	0.85	(0.82–0.87)	1.05	(0.16–6.88)
Symptoms								
Dark red blood[c]	4	949	0.22	(0.13–0.34)	0.84	(0.69–0.93)	1.37	(0.59–3.30)
Weight loss	7	1737	0.17	(0.06–0.37)	0.91	(0.83–0.96)	1.89	(1.03–3.07)
Abdominal pain	7	1739	0.25	(0.04–0.62)	0.73	(0.52–0.89)	0.94	(0.19–1.59)
Changed bowel habit	5	1254	0.62	(0.18–0.94)	0.68	(0.53–0.80)	1.92	(0.54–3.57)
Blood mixed with the stool	5	1225	0.40	(0.04–0.93)	0.81	(0.23–0.98)	1.91	(0.75–5.51)
Previous history of rectal bleeding[d]	2	425	0.30	(0.05–0.41)	0.66	(0.63–0.71)	0.58	(0.14–1.41)
Perianal symptoms – pain on defecation	2	411	0.22	(0.13–0.36)	0.41	(0.22–0.78)	0.49	(0.25–0.97)
Perianal symptoms – itch/eczema	2	414	0.17	(0.07–0.33)	0.87	(0.73–0.95)	1.31	(0.25–6.21)
Signs and diagnostic tests								
Rectal palpation – haemorrhoid	2	354	0.24	(0.09–0.45)	0.73	(0.46–0.91)	0.51	(0.09–2.97)
Anaemia (Hb ♀ <12.0 g per 100 ml ♂ <13.3 g per 100 ml)	2	700	0.17	(0.05–0.35)	0.95	(0.93–0.96)	3.67	(1.30–10.35)

Abbreviations: CI = confidence interval; Hb, haemoglobin; PLR = positive likelihood ratio. [a]Norrelund and Norrelund (1996) consists of two independent sub-studies, and therefore are independently assessed. In the column 'no of studies' these two substudies are counted as two separate studies. [b]There is a slight age overlap between the individual studies. [c]The reference category of dark red blood consists of patients having bright red blood or a colour in between. [d]The reference category of previous history of rectal bleeding consists of patients having a first episode of rectal bleeding.

cancer yield varying and inconsistent likelihood ratios (Mant *et al*, 1989; Fijten *et al*, 1995; Heintze *et al*, 2005). Heintze *et al* (2005) calculated a PLR of 3.65, whereas Fijten *et al* (1995) and Mant *et al*, 1989) reported a PLR <1. More research is needed regarding the definition of positive family history, how it might relate to risk of colorectal cancer and the impact of using family history as a preliminary screening question prior to Faecal Occult Blood (FOB) screening programs (Polmear and Glasziou, 2008).

Limitations of the present study

systematic review may be susceptible to publication bias (Irwig *et al*, 1994, 1995; Deeks, 2001). The quality of the review is dependent on the quality of the included cohort studies. Several dimensions that relate to the quality of the included studies are unclear or inadequately reported (Table 2, online). This finding is not intended as a criticism of the original studies, but is more a reflection on the considerable challenges of undertaking cohort studies in primary care settings that rely on complete identification and follow-up of all eligible incident cases of rectal bleeding. For instance, in one included study, general practitioners were a to include a maximum of three to four patients (Norrelund

BJUI
BJU INTERNATIONAL

Prognostic value of the CAPRA clinical prediction rule: a systematic review and meta-analysis

Pieter Meurs*†, Rose Galvin*, Deirdre M. Fanning‡ and Tom Fahey*

**HRB Centre for Primary Care Research, Department of General Practice, Royal College of Surgeons in Ireland, †Beaumont Hospital, Dublin, Republic of Ireland, and ‡Radboud University Nijmegen, Nijmegen, The Netherlands*

Accepted for publication 31 May 2012

Study Type – Prognosis (systematic review)
Level of Evidence 1a

What's known on the subject? and What does the study add?
Prostate cancer is a significant cause of mortality among men. A number of prognostic instruments exist to predict the risk of recurrence among patients with localised prostate cancer. This systematic review examines the totality of evidence in relation to the predictive value of the CAPRA clinical predication rule by combining all studies that validate the rule.

OBJECTIVES

- To perform a systematic review with meta-analysis that assesses the 3- and 5-year predictive value of the CAPRA rule, a clinical prediction rule derived to predict biochemical-recurrence-free survival in men with localized prostate cancer after radical prostatectomy.
- To examine the predictive value of the CAPRA rule at 3 and 5 years stratified by risk group (0–2 low risk, 3–5 intermediate risk, 6–10 high risk).

PATIENTS AND METHODS

- A systematic literature search was performed to retrieve papers that validated the CAPRA score.
- Seven validation studies ($n = 12\,693$) predict recurrence-free survival at 5 years after radical prostatectomy. The CAPRA score significantly under-predicts recurrence-free survival across all three risk under-prediction (RR <1) of biochemical-recurrence-free survival at 3 and 5 years.
- A chi-squared test for trend was computed to determine if there was a decreasing trend in survival across the three CAPRA risk categories.

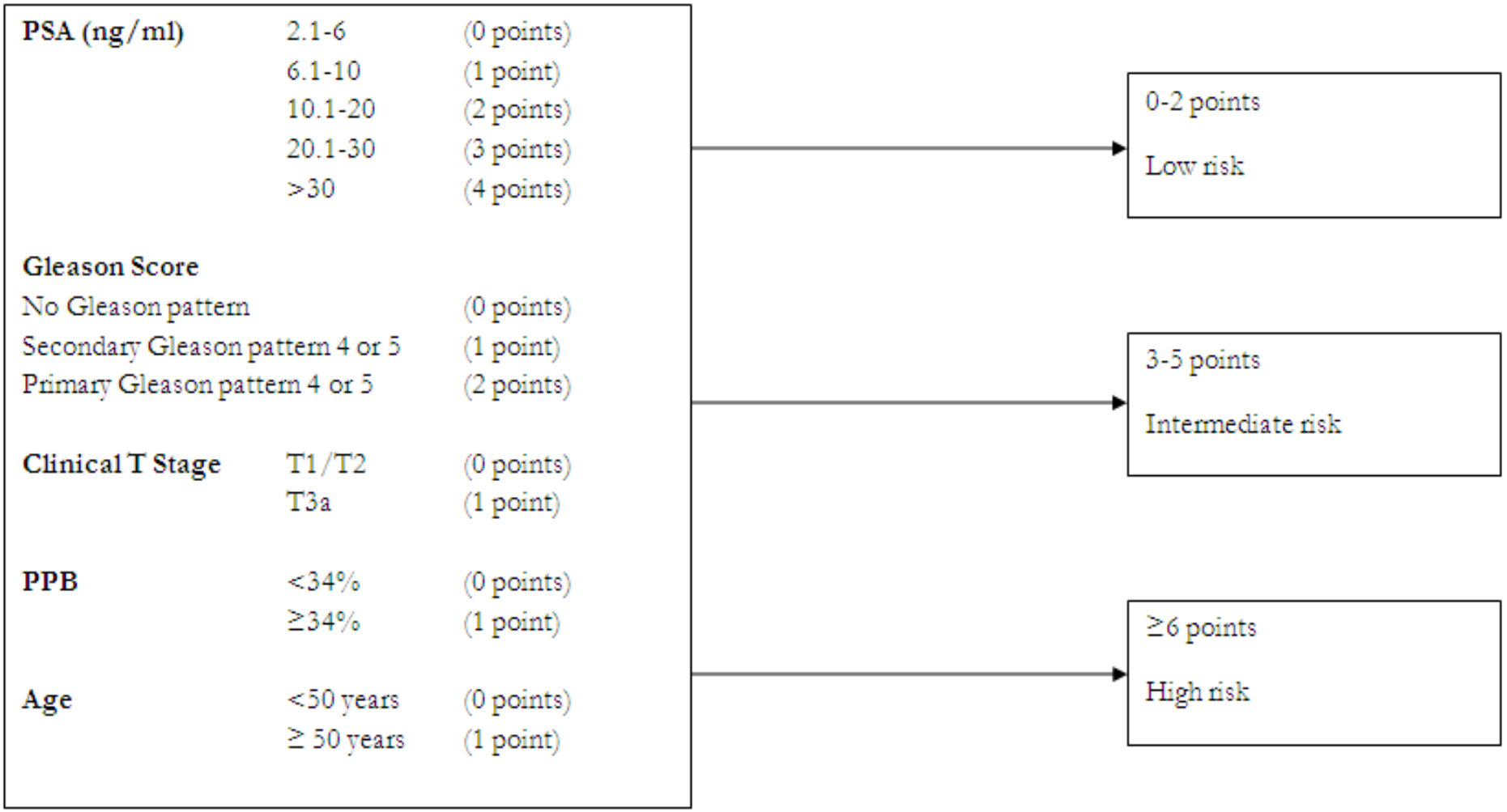
RESULTS

- Seven validation studies ($n = 12\,693$) predict recurrence-free survival at 5 years after radical prostatectomy. The CAPRA score significantly under-predicts recurrence-free survival across all three risk 0.99–1.08; high risk, RR 0.87, 95% CI 0.73–1.05).
- The chi-squared trend analysis indicates that, as the trichotomized CAPRA score increases, the probability of survival decreases ($P < 0.001$).

CONCLUSIONS

- The results of this pooled analysis confirm the ability of the CAPRA rule to correctly predict biochemical-recurrence-free survival at 3 years after radical prostatectomy.

Figure 1: Overview of the CAPRA score



PSA-Prostate Specific Antigen - the PSA value used is the highest value recorded in the nine months prior to diagnosis.

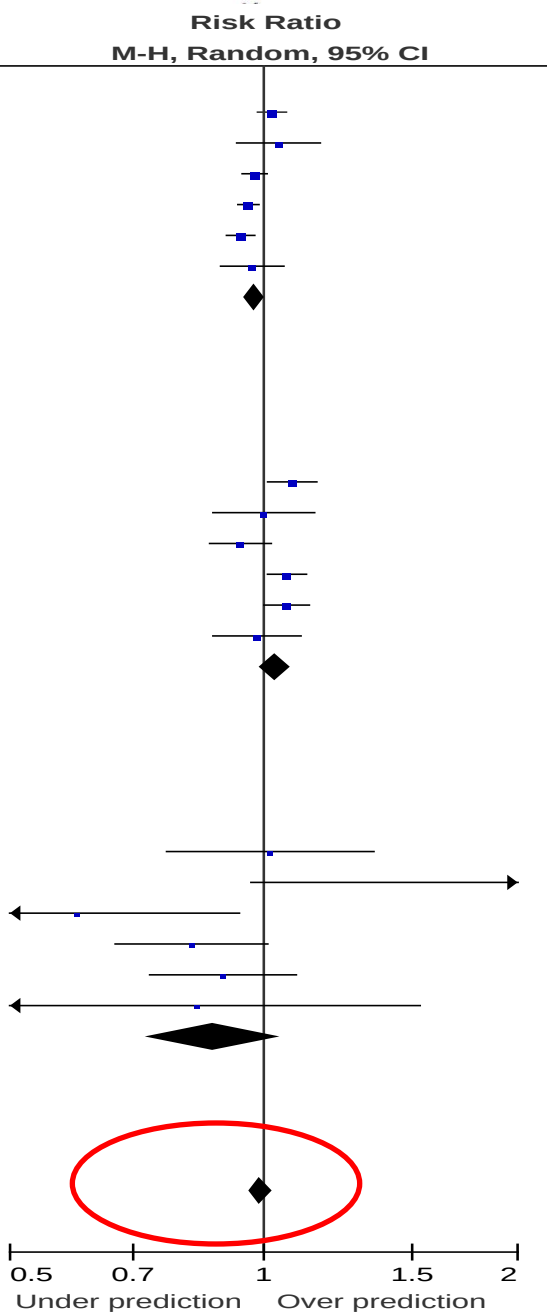
Gleason scores are recorded from the diagnostic biopsy cores with the highest total and highest primary scores.

The clinical TNM (Tumour Node Metastasis) stage is the highest reported from 1 month prior to 3 months after the date of diagnosis.

Percentage positive biopsy (PPB) is calculated from the biopsy pathological report.

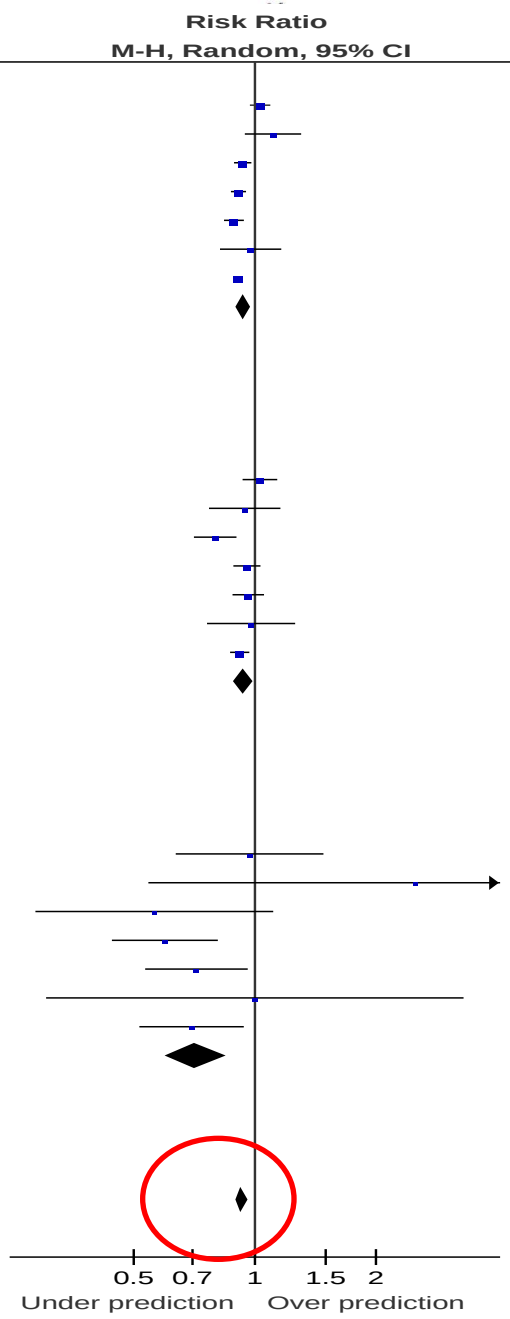
Recurrence free survival at 3 years

Study or Subgroup	Predicted Events	Predicted Total	Observed Events	Observed Total	Weight	Risk Ratio M-H, Random, 95% CI
2.1.1 Low risk group (0-2 points)						
Cooberberg et al 2006	587	653	574	653	10.2%	1.02 [0.98, 1.06]
Ishizaki et al 2011	76	85	73	85	4.8%	1.04 [0.93, 1.17]
Loeb et al 2010	633	704	649	704	10.6%	0.98 [0.94, 1.01]
Lughezzani et al 2010	816	908	851	908	11.0%	0.96 [0.93, 0.99]
May et al 2007	384	427	409	427	10.3%	0.94 [0.90, 0.97]
Tamblyn et al 2011	94	105	97	105	6.5%	0.97 [0.89, 1.06]
Subtotal (95% CI)		**2882**		**2882**	**53.4%**	**0.98 [0.95, 1.00]**
Total events	2590		2653			
Heterogeneity: Tau² = 0.00; Chi² = 12.71, df = 5 (P = 0.03); I² = 61%						
Test for overall effect: Z = 1.67 (P = 0.09)						
2.1.2 Intermediate risk group (3-5 points)						
Cooberberg et al 2006	441	557	408	557	8.0%	1.08 [1.01, 1.15]
Ishizaki et al 2011	84	106	84	106	3.8%	1.00 [0.87, 1.15]
Loeb et al 2010	198	250	211	250	6.7%	0.94 [0.86, 1.02]
Lughezzani et al 2010	684	863	642	863	9.1%	1.07 [1.01, 1.12]
May et al 2007	497	627	467	627	8.4%	1.06 [1.00, 1.13]
Tamblyn et al 2011	107	135	109	135	4.5%	0.98 [0.87, 1.11]
Subtotal (95% CI)		**2538**		**2538**	**40.4%**	**1.03 [0.99, 1.08]**
Total events	2011		1921			
Heterogeneity: Tau² = 0.00; Chi² = 9.85, df = 5 (P = 0.08); I² = 49%						
Test for overall effect: Z = 1.43 (P = 0.15)						
2.1.3 High risk group (6-10 points)						
Cooberberg et al 2006	57	136	56	136	1.2%	1.02 [0.77, 1.35]
Ishizaki et al 2011	8	20	2	20	0.1%	4.00 [0.97, 16.55]
Loeb et al 2010	15	36	25	36	0.5%	0.60 [0.39, 0.93]
Lughezzani et al 2010	87	205	106	205	2.0%	0.82 [0.67, 1.01]
May et al 2007	102	242	114	242	2.2%	0.89 [0.73, 1.09]
Tamblyn et al 2011	10	23	12	23	0.3%	0.83 [0.45, 1.53]
Subtotal (95% CI)		**662**		**662**	**6.2%**	**0.87 [0.73, 1.05]**
Total events	279		315			
Heterogeneity: Tau² = 0.02; Chi² = 8.80, df = 5 (P = 0.12); I² = 43%						
Test for overall effect: Z = 1.48 (P = 0.14)						
Total (95% CI)		**6082**		**6082**	**100.0%**	**0.99 [0.96, 1.02]**
Total events	4880		4889			
Heterogeneity: Tau² = 0.00; Chi² = 54.68, df = 17 (P < 0.00001); I² = 69%						
Test for overall effect: Z = 0.49 (P = 0.63)						
Test for subgroup differences: Not applicable						



Recurrence free survival at 5 years

Study or Subgroup	Predicted Events	Predicted Total	Observed Events	Observed Total	Weight	Risk Ratio M-H, Random, 95% CI
1.1.1 Low risk group (0-2 points)						
Cooberberg et al 2006	542	653	526	653	9.3%	1.03 [0.98, 1.08]
Ishizaki et al 2011	71	85	64	85	3.2%	1.11 [0.95, 1.29]
Loeb et al 2010	584	704	626	704	10.0%	0.93 [0.89, 0.97]
Lughezzani et al 2010	753	908	827	908	10.5%	0.91 [0.88, 0.94]
May et al 2007	354	427	399	427	9.4%	0.89 [0.84, 0.93]
Tamblyn et al 2011	41	49	42	49	2.8%	0.98 [0.82, 1.16]
Zhao et al 2008	3926	4733	4313	4733	11.8%	0.91 [0.90, 0.92]
Subtotal (95% CI)		**7559**		**7559**	**57.1%**	**0.94 [0.90, 0.98]**
Total events	6271		6797			
Heterogeneity: Tau² = 0.00; Chi² = 29.78, df = 6 (P < 0.0001); I² = 80%						
Test for overall effect: Z = 3.03 (P = 0.002)						
1.1.2 Intermediate risk group (3-5 points)						
Cooberberg et al 2006	350	557	340	557	6.1%	1.03 [0.94, 1.13]
Ishizaki et al 2011	67	106	71	106	2.2%	0.94 [0.77, 1.15]
Loeb et al 2010	157	250	197	250	4.8%	0.80 [0.71, 0.89]
Lughezzani et al 2010	542	863	567	863	7.7%	0.96 [0.89, 1.03]
May et al 2007	394	627	409	627	6.7%	0.96 [0.89, 1.05]
Tamblyn et al 2011	46	73	47	73	1.5%	0.98 [0.77, 1.25]
Zhao et al 2008	1114	1774	1215	1774	9.6%	0.92 [0.87, 0.96]
Subtotal (95% CI)		**4250**		**4250**	**38.7%**	**0.94 [0.89, 0.99]**
Total events	2670		2846			
Heterogeneity: Tau² = 0.00; Chi² = 13.29, df = 6 (P = 0.04); I² = 55%						
Test for overall effect: Z = 2.36 (P = 0.02)						
1.1.3 High risk group (6-10 points)						
Cooberberg et al 2006	33	136	34	136	0.6%	0.97 [0.64, 1.47]
Ishizaki et al 2011	5	20	2	20	0.0%	2.50 [0.55, 11.41]
Loeb et al 2010	9	36	16	36	0.2%	0.56 [0.29, 1.10]
Lughezzani et al 2010	49	205	82	205	1.1%	0.60 [0.44, 0.80]
May et al 2007	58	242	81	242	1.2%	0.72 [0.54, 0.95]
Tamblyn et al 2011	4	15	4	15	0.1%	1.00 [0.31, 3.28]
Zhao et al 2008	55	230	79	230	1.1%	0.70 [0.52, 0.93]
Subtotal (95% CI)		**884**		**884**	**4.3%**	**0.72 [0.60, 0.85]**
Total events	213		298			
Heterogeneity: Tau² = 0.01; Chi² = 6.92, df = 6 (P = 0.33); I² = 13%						
Test for overall effect: Z = 3.89 (P = 0.0001)						
Total (95% CI)		**12693**		**12693**	**100.0%**	**0.93 [0.90, 0.96]**
Total events	9154		9941			
Heterogeneity: Tau² = 0.00; Chi² = 62.25, df = 20 (P < 0.00001); I² = 68%						
Test for overall effect: Z = 4.43 (P < 0.00001)						



CPRs & cancer

- Need to cumulative totality of evidence
- Establish performance (discrimination & calibration) prior to implementation
- Low prior (prevalence) settings, CPRs operate best at “ruling out” cancer

(2) Solutions to implementation

- **Cochrane register of CPRs in primary care**

- Implementation of CPRs with computer-based clinical decision support systems

Cochrane Primary Health Care Field

Welcome
More about us
Contact us
Resources for review authors
Resources for healthcare users
Workshops and events
PEARLS
WONCA Europe 2008, Istanbul Turkey
WONCA Europe 2009, Basel Switzerland
Newsletter PHCF (archive)

Welcome

Aims and activities

The overall aim and mission statement of the Primary Health Care Field is as follows:

"To promote the quality, quantity, dissemination, accessibility, applicability and impact of Cochrane systematic reviews relevant to people who work in primary care".

The specific objectives are:

1. To ensure proper representation in the interests of primary care clinicians and consumers in Cochrane reviews and Cochrane Review Groups, and in other Cochrane entities.
2. To develop a network of potential users of Cochrane reviews: consumers, professionals, and organizations.
3. To disseminate Cochrane reviews to primary care clinicians via a Cochrane Primary Health Care website as a means of implementing evidence from Cochrane reviews.
4. To communicate interests and expertise from Field members to Cochrane Review Groups.
5. To identify and develop a register of clinical prediction rules (CPRs) relevant to Primary Health Care, in keeping with the Cochrane Screening and Diagnostic Methods Group. (Contact will occur after the transfer of administration - this will initially be conducted by the Dublin arm.)
6. To identify potential authors and peer referees with a primary health care perspective who can contribute to existing Cochrane Review Groups.
7. To develop and promote a specialized database of Cochrane reviews relevant to primary health care.
8. To promote liaison between the Cochrane Collaboration and key primary health care organizations at

30 journals included on the register

Academic Emergency Medicine	Family Medicine
American Family Physician	Family Practice
American Journal of Medicine	Journal of American Medical Association
Annals of Emergency Medicine	Journal of the American Board of Family Medicine
Annals of Family Medicine	Journal of Clinical Epidemiology
Annals of Internal Medicine	Journal of Family Practice
Annals of Medicine	Journal of Internal Medicine
Annual Review of Medicine	Lancet
Archives of Internal Medicine	Medical Care
BMC Family Practice	Medical Decision Making
British Medical Journal	Medicine
British Journal of General Practice	New England Journal of Medicine
Canadian Family Physician	Public Library of Science Medicine
Canadian Medical Association Journal	Primary Care
Cochrane Database Systematic Reviews	Scandinavian Journal of Primary Health Care

Search filter for CPRs in primary care

- Manually searched 30 journals relevant to primary care for the year 2008 ('reference standard')
- 7 individual electronic searches of the 30 journals (each filter treated as 'diagnostic tests')
- Test accuracy analysis: Sensitivity and specificity
- Aim: to maximise sensitivity

Database	Filter name	Filter search string
PubMed	**Haynes Broad Filter (HBF)**	(predict*[tiab] OR predictive value of tests[mh] OR scor*[tiab] OR observ*[tiab] OR observer variation[mh])
PubMed	**Haynes Narrow Filter (HNF)**	(validation[tiab] OR validate[tiab])
EBSCO host	**McGrath/Murphy Broad Filter (MMBF)**	((predict* N3 rule* OR predict* N3 model OR predict* N3 models) OR (decision* N3 rule*) OR (TX validat*))
EBSCO host	**McGrath/Murphy Narrow Filter (MMNF)**	((predict* N3 rule* OR predict* N3 model OR predict* N3 models) OR (decision* N3 rule*))
PubMed	**Teljeur/Murphy Inclusion Filter 26 item (TMIF-26)**	"clinical prediction" OR "clinical model*" OR "clinical score*" OR "decision rule*" OR "diagnostic accuracy" OR "diagnostic rule*" OR "diagnostic score*" OR "diagnostic value" OR "predictive outcome*" OR "predictive rule*" OR "predictive score*" OR "predictive value" OR "predictive risk*" OR "prediction outcome*" OR "prediction rule*" OR "prediction score*" OR "prediction value*" OR "prediction risk*" OR "risk assessment" OR "risk score*" OR "validation decision*" OR "validation rule*" OR "validation score*" OR (derivation AND validation) OR (sensitivity AND specificity) OR (symptoms AND signs)
PubMed	**Teljeur/Murphy Inclusion Filter 22 item (TMIF-22)**	(clinical[tiab] AND predict*[tiab]) OR (clinical[tiab] AND model*[tiab]) OR (clinical[tiab] AND score*[tiab]) OR (decision [tiab] AND rule*[tiab]) OR (derive*[tiab] AND validat*[tiab]) OR (diagnos*[tiab] AND accura*[tiab]) OR (diagnos*[tiab] AND rule*[tiab]) OR (diagnos*[tiab] AND score*[tiab]) OR (diagnos*[tiab] AND value[tiab]) OR (predict*[tiab] AND outcome*[tiab]) OR (predict*[tiab] AND rule*[tiab] OR (predict*[tiab] AND score*[tiab]) OR (predict*[tiab] AND validat*[tiab]) OR (predict*[tiab] AND value*[tiab]) OR (risk*[tiab] AND assessment*[tiab]) OR (risk[tiab] AND score*[tiab]) OR (sensitivity[tiab] AND specificity[tiab]) OR (symptoms[tiab] AND signs[tiab]) OR (validat*[tiab] AND decision*[tiab]) OR (validat*[tiab] AND rule*[tiab]) OR (validat*[tiab] AND score*[tiab]) OR (predict*[tiab] AND risk*[tiab])
PubMed	**Teljeur/Murphy Exclusion Filter (TMEF)**	(allele OR amino OR animal OR apoptosis OR chromosome OR congenital OR dental OR dna OR endogenous OR endothelial OR epithelial OR mammalian OR mice OR molecule OR molecular OR mouse OR mutate OR mutation OR necrosis OR pathogenesis OR phosphorylation OR polymorphism OR receptor OR signal OR species OR tissue OR tumor OR tumour OR tyrosine OR vitro)

Results

Manual ‘reference standard’ search retrieved 6344 articles, 41 of which were CPRs

Filter name	N articles retrieved	N CPRs retrieved	Sensitivity (%)	Specificity (%)
Haynes Broad Filter	1251	31	76	81
Haynes Narrow Filter	89	12	29	99
McGrath/Murphy Broad Filter	264	23	56	96
McGrath/Murphy Narrow Filter	63	16	39	99
Teljeur Murphy Inclusion Filter-26 item	2432	39	95	62
Teljeur/Murphy Inclusion Filter-22 item	693	34	83	90
Teljeur/Murphy Exclusion Filter	3589	24	59	43

ELSEVIER

Journal of Clinical Epidemiology 64 (2011) 848–860

Journal of Clinical Epidemiology

Optimized retrieval of primary care clinical prediction rules from MEDLINE to establish a web-based register

Claire Keogh[a,*], Emma Wallace[a], Kirsty K. O'Brien[a], Paul J. Murphy[b], Conor Teljeur[c], Brid McGrath[b], Susan M. Smith[c], Niall Doherty[a], Borislav D. Dimitrov[a], Tom Fahey[a]

[a]*Department of General Practice, Health Research Board Centre for Primary Care Research, RCSI Medical School, Royal College of Surgeons in Ireland, Dublin 2, Ireland*

[b]*Mercer Library, Royal College of Surgeons in Ireland, Dublin 2, Ireland*

[c]*Department of Public Health and Primary Care, Trinity College, Dublin 2, Ireland*

Accepted 16 November 2010

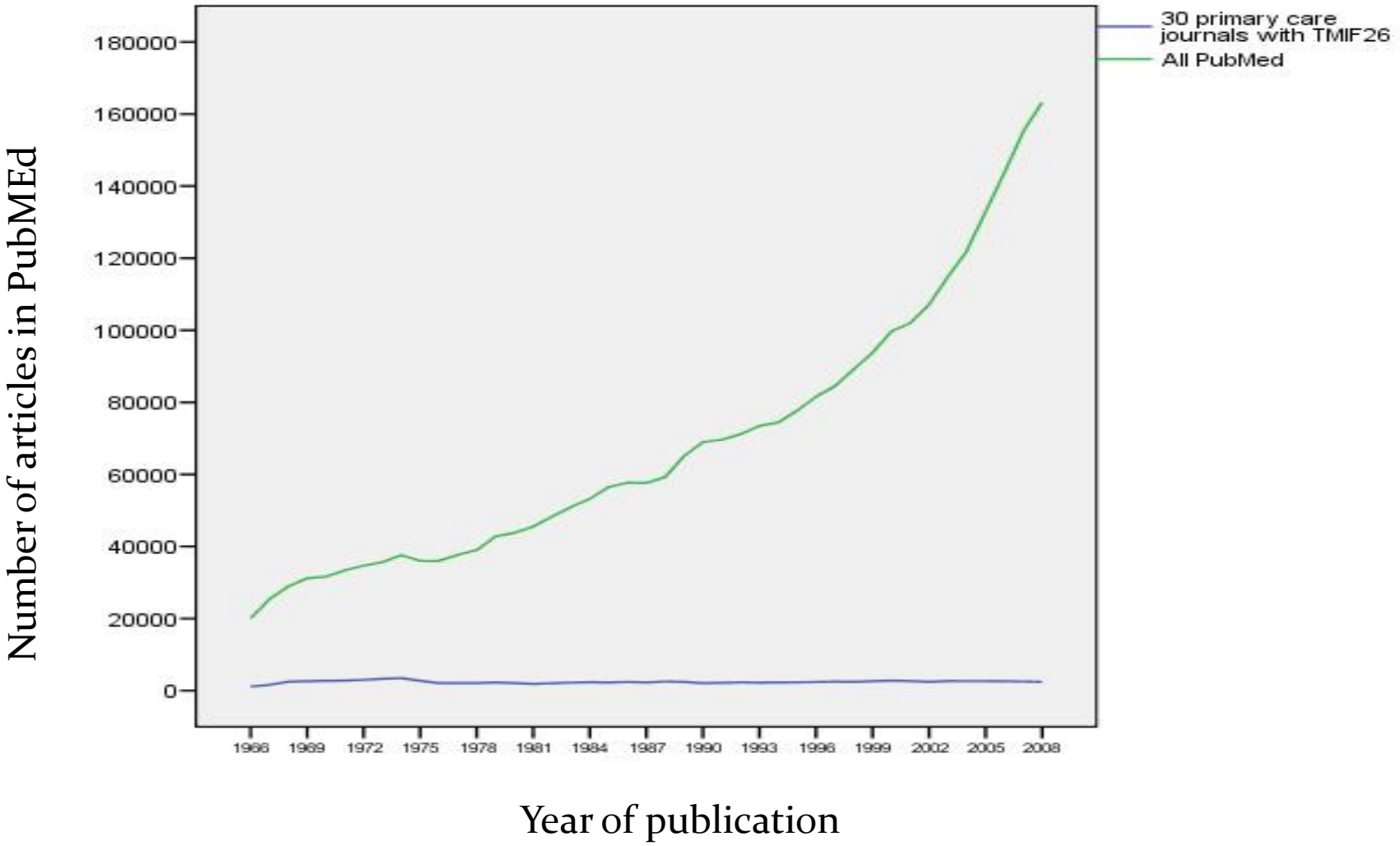
Abstract

Objectives: Identifying clinical prediction rules (CPRs) for primary care from electronic databases is difficult. This study aims to identify a search filter to optimize retrieval of these to establish a register of CPRs for the Cochrane Primary Health Care field.

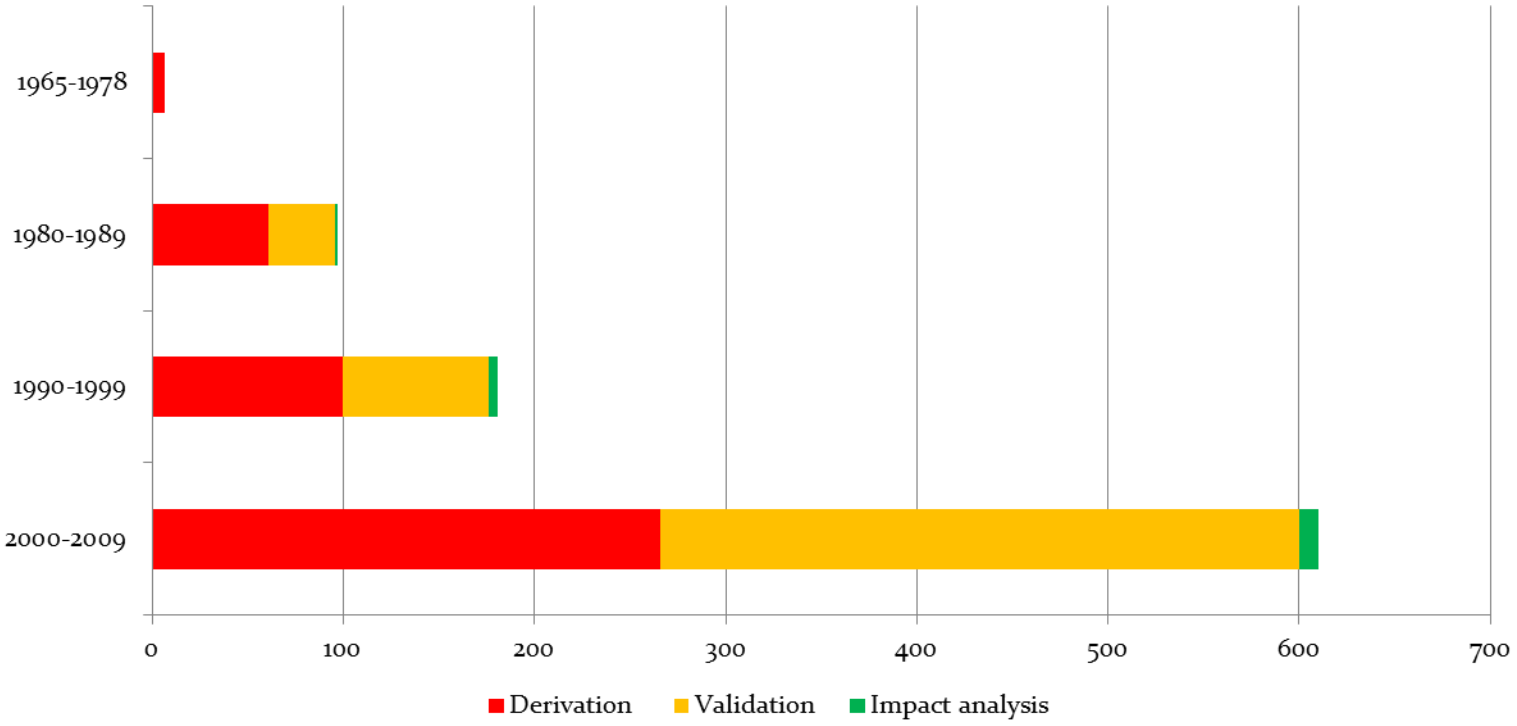
Study Design and Setting: Thirty primary care journals were manually searched for CPRs. This was compared with electronic search filters using alternative methodologies: (1) textword searching; (2) proximity searching; (3) inclusion terms using specific phrases and truncation; (4) exclusion terms; and (5) combinations of methodologies.

Results: We manually searched 6,344 articles, revealing 41 CPRs. Across the 45 search filters, sensitivities ranged from 12% to 98%, whereas specificities ranged from 43% to 100%. There was generally a trade-off between the sensitivity and specificity of each filter (i.e., the number of CPRs and total number of articles retrieved). Combining textword searching with the inclusion terms (using specific phrases) resulted in the highest sensitivity (98%) but lower specificity (59%) than other methods. The associated precision (2%) and accuracy (60%) were also low.

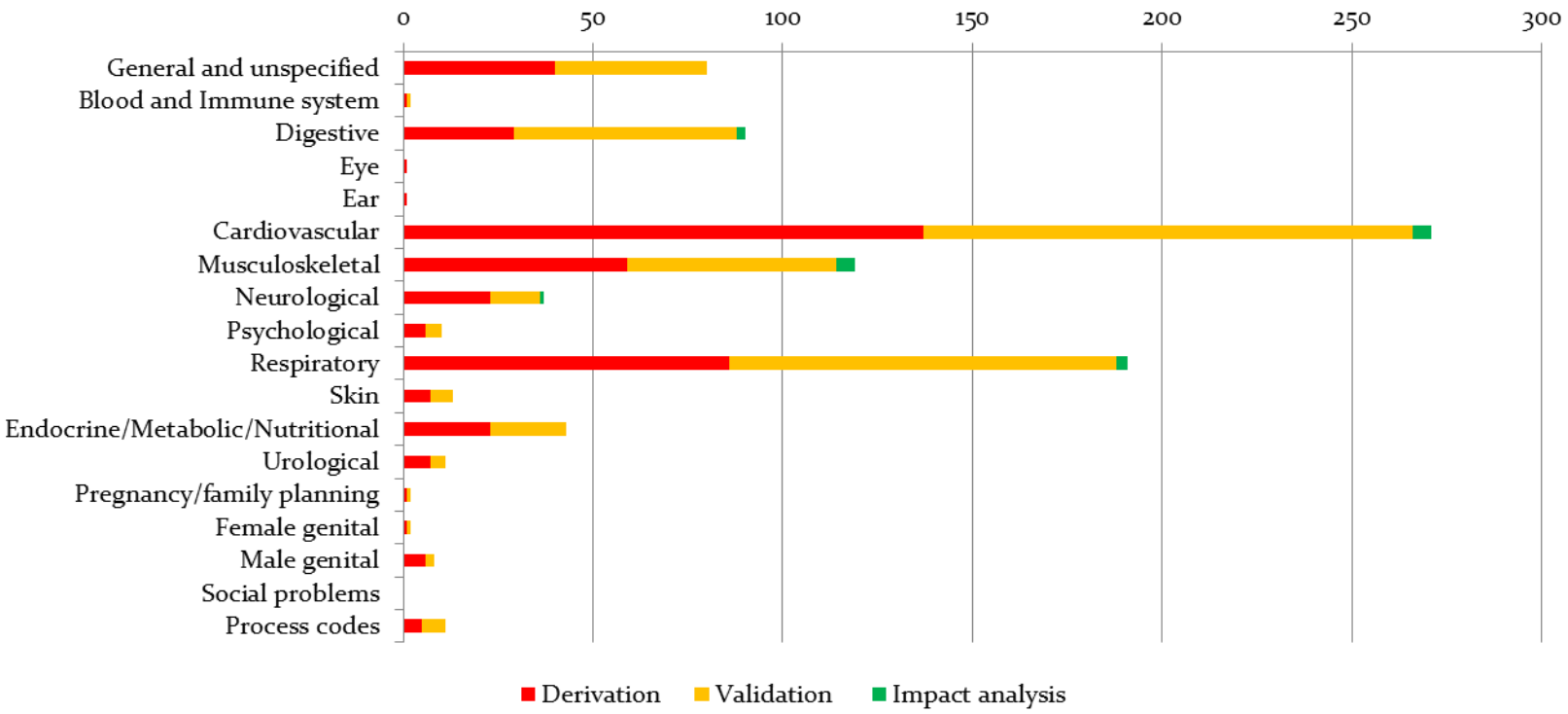
MEDLINE versus the final search filter applied to 30 primary care journals (1966 – 2008)



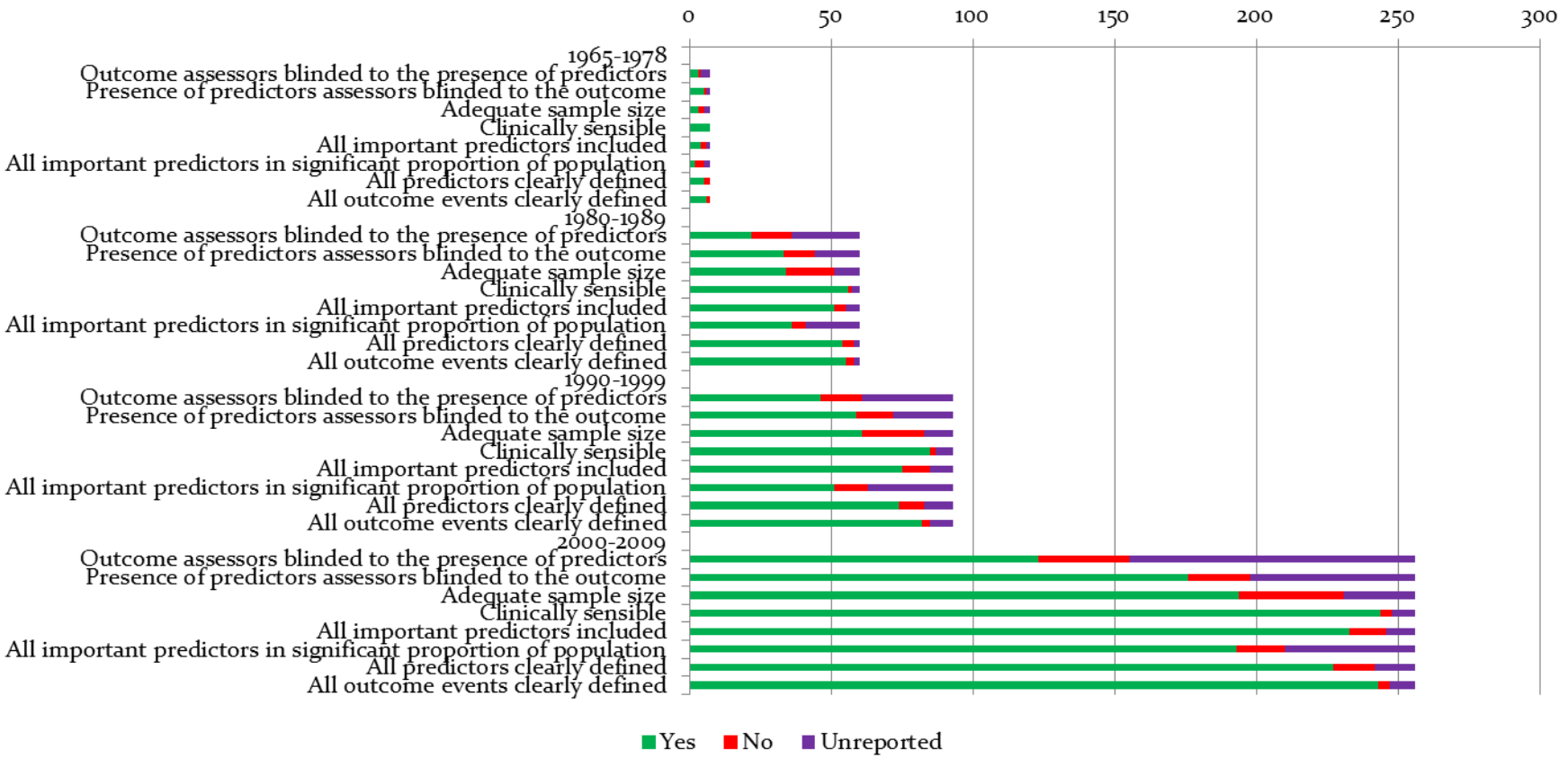
Register of CPRs (n=745 studies)



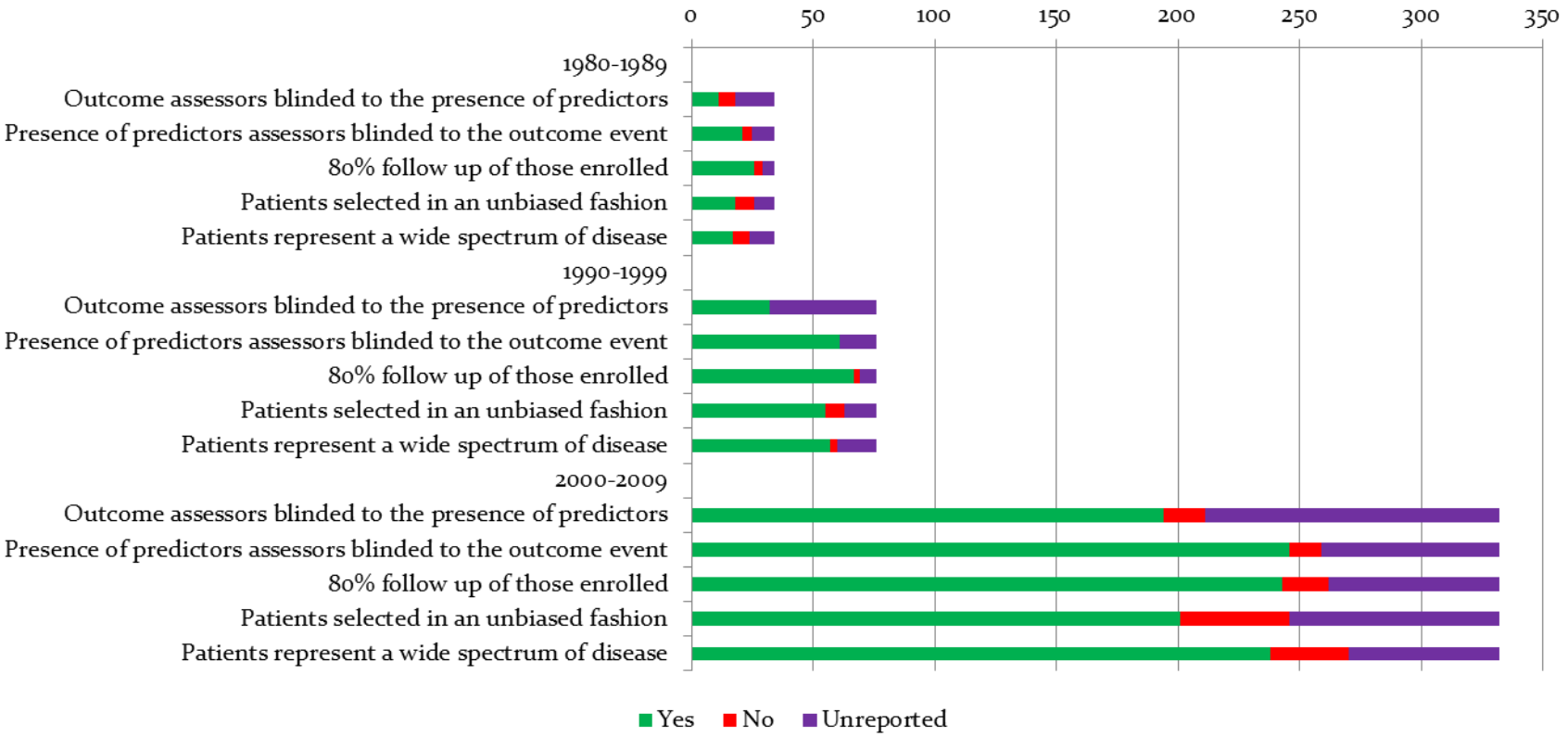
CPRs clinical domains



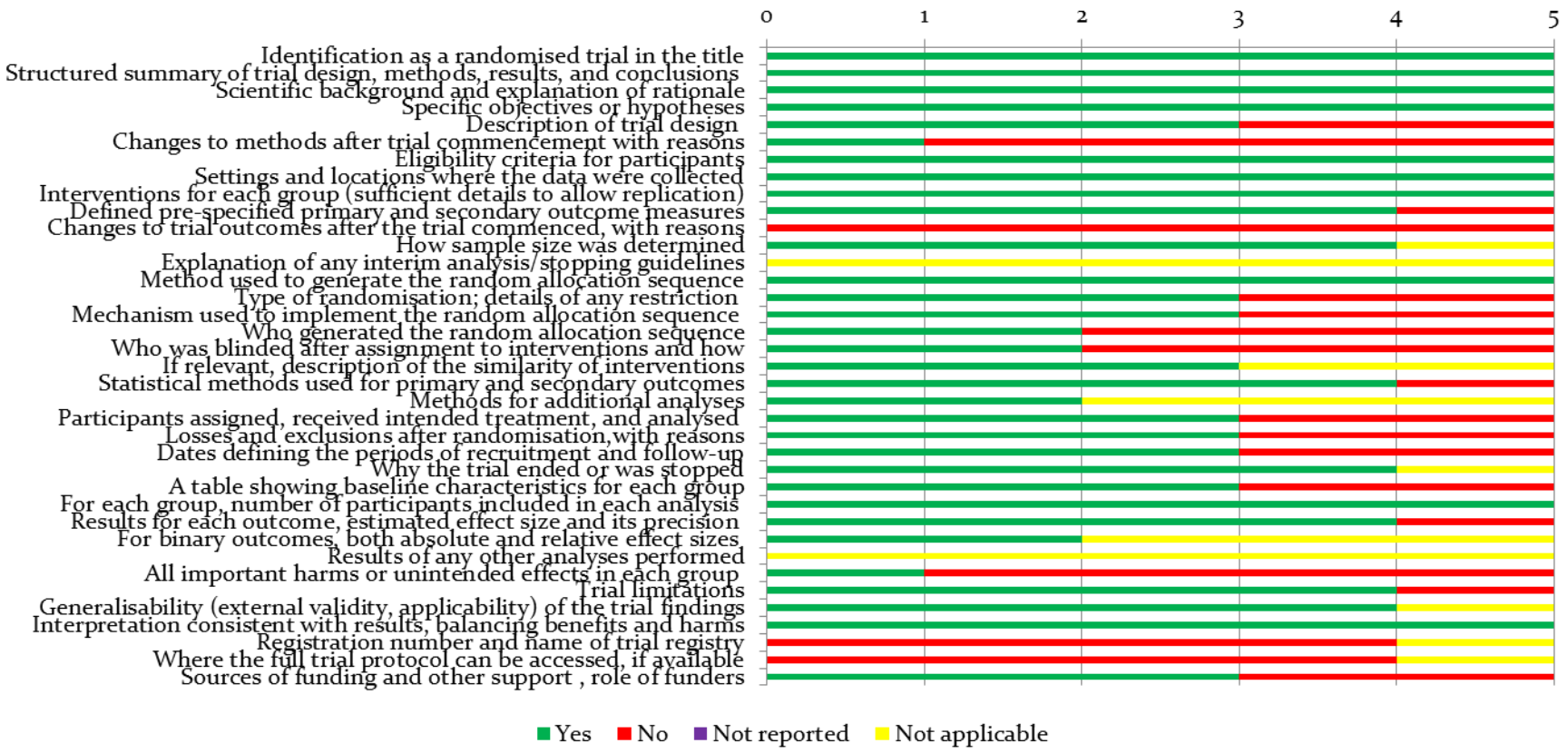
Quality assessment CPRs- derivation



Quality assessment CPRs- validation



Quality assessment CPRs- impact analysis



International Register of Clinical Prediction Rules for Primary Care

HOME | SEARCH | CDSS | QUICK SEARCH ICPC 2:

Search

- ICPC 2 Code ← 1
- Name of CPR ← 2
- Clinical Domain

Select Domain ← 3

Respiratory

- Symptoms

Select Symptoms ← 4

Pain General
Chills
Fever
Weakness
Throat Symptoms
Pain Respiratory System
Dyspnoea
Wheezing

- Type ← 5
- Setting ← 6

Search Registry

Search Results

Symptoms : Fever, Throat Symptoms **Clinical Domain** : Respiratory **Date** : 04/0

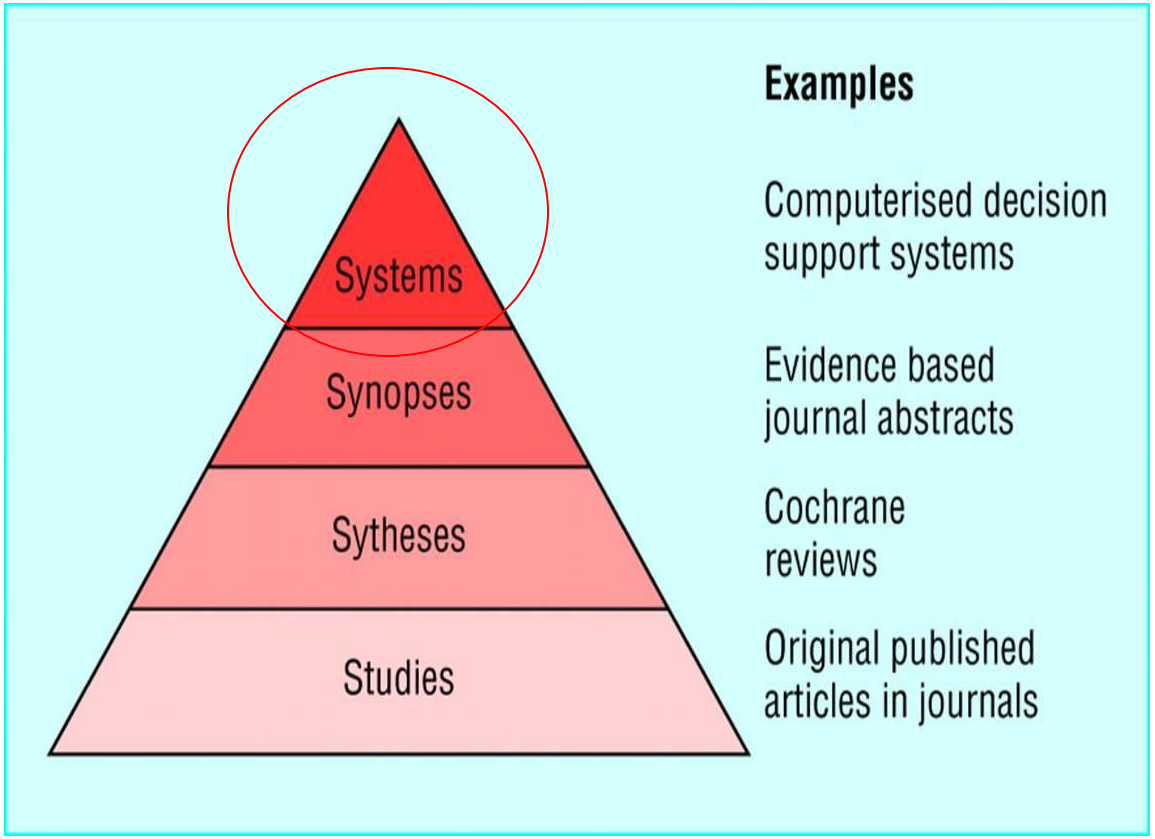
	% Match	Evidence Level	CPR Name	Paper	Type of Article	Setting	Quality Grade
☑	80	2	Centor Score	Systematic Review of the Diagnostic Accuracy of Signs and Symptoms and validation of the centor Score in Predicting Group A B-haemolytic StreptococcalPharyngitis in Adults in Primary Care	Systematic Review	Primary Care	
☑	100	4	Centor Score	The diagnosis of strep troat in adults in the emergency room	Original	Emergency Dept	
☑	100	2	Centor Score	A clinical score to reduce unnecessary antibiotic used in patients with sore throat.	Original	Primary Care	
☑	100	2	Modified Centor Score	Empirical validation of guidelines for the management of pharyngitis in children and adults	Original	Primary Care	
☑	60	4		A diagnostic rule for the aetiology of lower respiratory tract infections as guidance for antimicrobial treatment	Original	Primary Care	
☑	50		Centor Score	It's 5pm Friday; the caller thinks he has strep--do yo write a script?	Review	Primary Care	
☑	100	2	Centor Score	Transportability of a decision rule for the diagnosis of streptococcal pharyngitis	Original	Emergency Dept	

Health Research Board

Trinity College Dublin

Ongoing Work

Implementation of evidence



Clinical decision support system

- Clinical decision support system (CDSS)
  - Systems that are designed to improve clinical decision making
- Key points
  - Integrated with the electronic patient record
  - Available at the point of care
  - Computerised knowledge base
  - Provide patient-specific content

Implementation

Clinical Domain : **Pharyngitis**

CPR : **Centor Score**

- CDSS based on Bayesian reasoning
  - Reasoning engine →
    - Software Algorithm
    - Combining Clinical Prediction Rules in registry to patient data
  - Communication mechanism →
    - **Input** : Electronic Patient Record
    - **Output** : Diagnostic and therapeutic recommendations

Conclusions

- Cancer diagnosis requires more CPRs developed and validated in community settings
- Evidence should be synthesised in the same way as RCTs
- Solutions to implementation
  - Cochrane Register of CPRs in primary care
  - Computer based clinical decision support systems (CDSSs) of CPRs