

The PRODIGY Model and Guideline Comparison



Neill Jones Richard Hall and Peter Johnson

**Sowerby Centre for Health Informatics in Newcastle,
University of Newcastle, UK**



Clinical Computing in UK Primary Care

- 98 % penetration
- Most use for prescribing
- 80 % keep full clinical record
- Clinical record coded (read codes)
- Interactive use during office visits
- Encounter time very short 7-15 minutes
- Good test platform for PRODIGY3 as trial of therapeutic/management decision support

PRODIGY Design Principles: 1

- Primary care only, interactive mode of use.
- Chronic disease management. => acute too
- Must integrate with multiple clinical systems.
- Match 'look and feel' of those systems.
- Match model to cognitive process of care.
- Consistency with users' conceptual model.
- Avoid 'decision support mode.'
- Must be fast.

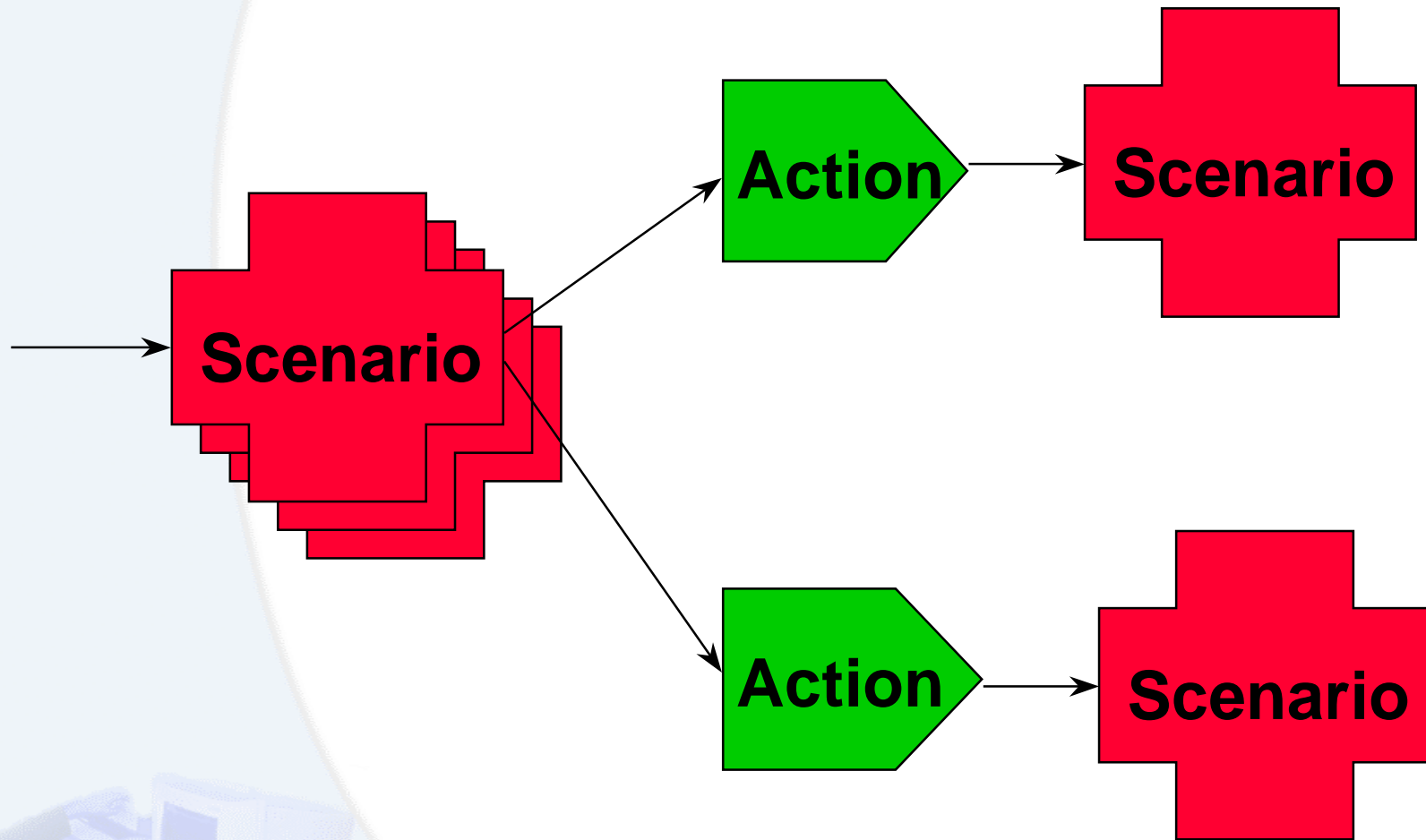
PRODIGY Design Principles: 2

- Clinician able to override recommendations
- System must be able to explain reasoning
- 'Make simple things simple, and complex things as simple as possible' (Alan Kay)
- Degrade gracefully with poor records
- Ability to give support with minimal interaction
- Crafting of guidelines mainly by clinical team (not computer experts)
- Model design skewed to ease of crafting

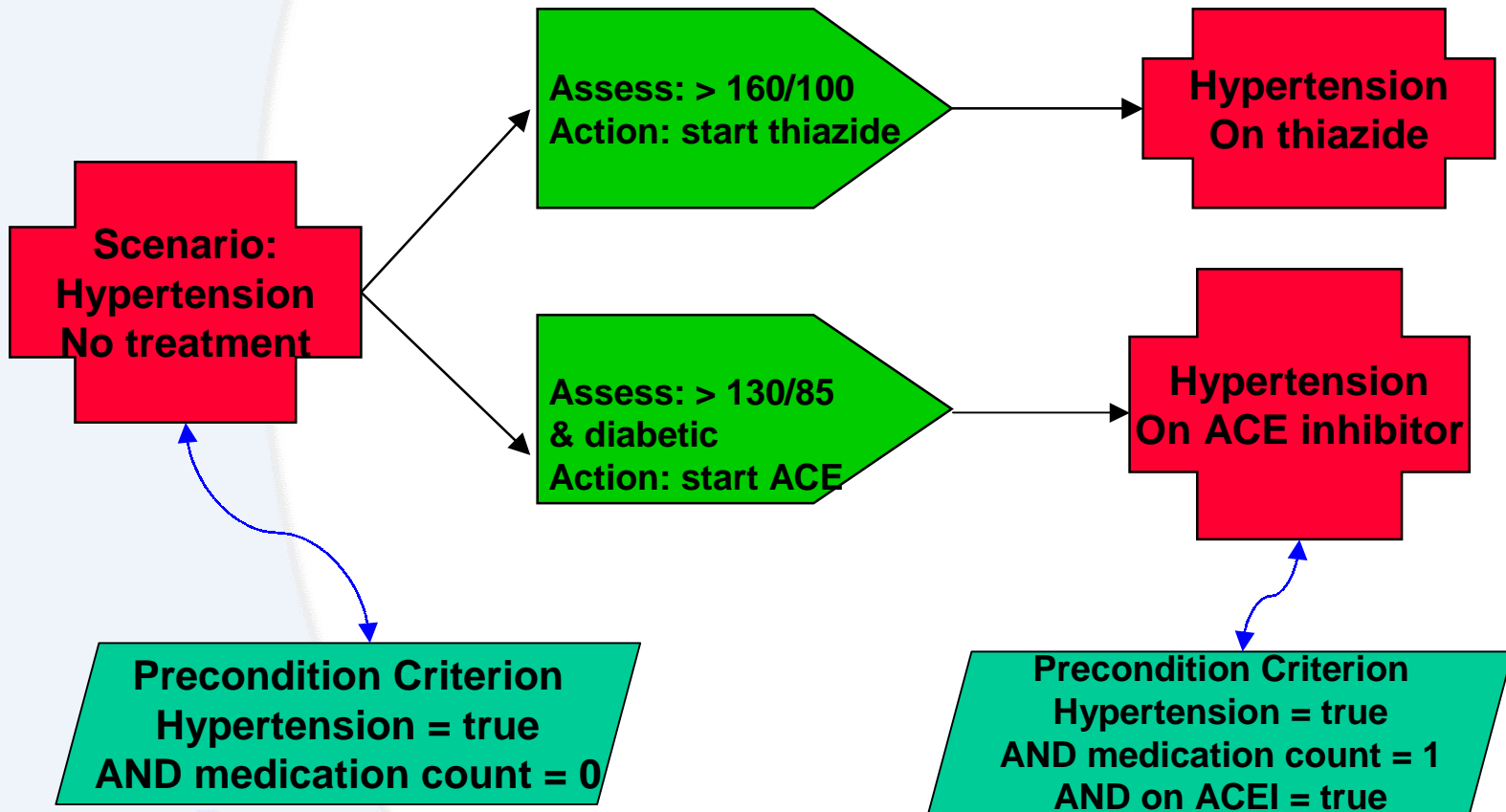
Parts of PRODIGY Guideline Model

- Guidelines as two distinct components
- Disease state map – decision making
 - Chronic disease represented as a number of 'patient states' – a SCENARIO
 - At each state, a clinician has a number of choices of ACTIONS
 - Actions have outcomes, patient in same or different state at next consultation
- Consultation template – care process
 - Actions, Information management relevant whenever patient seen; one for each scenario

Simplest **PRODIGY** Model



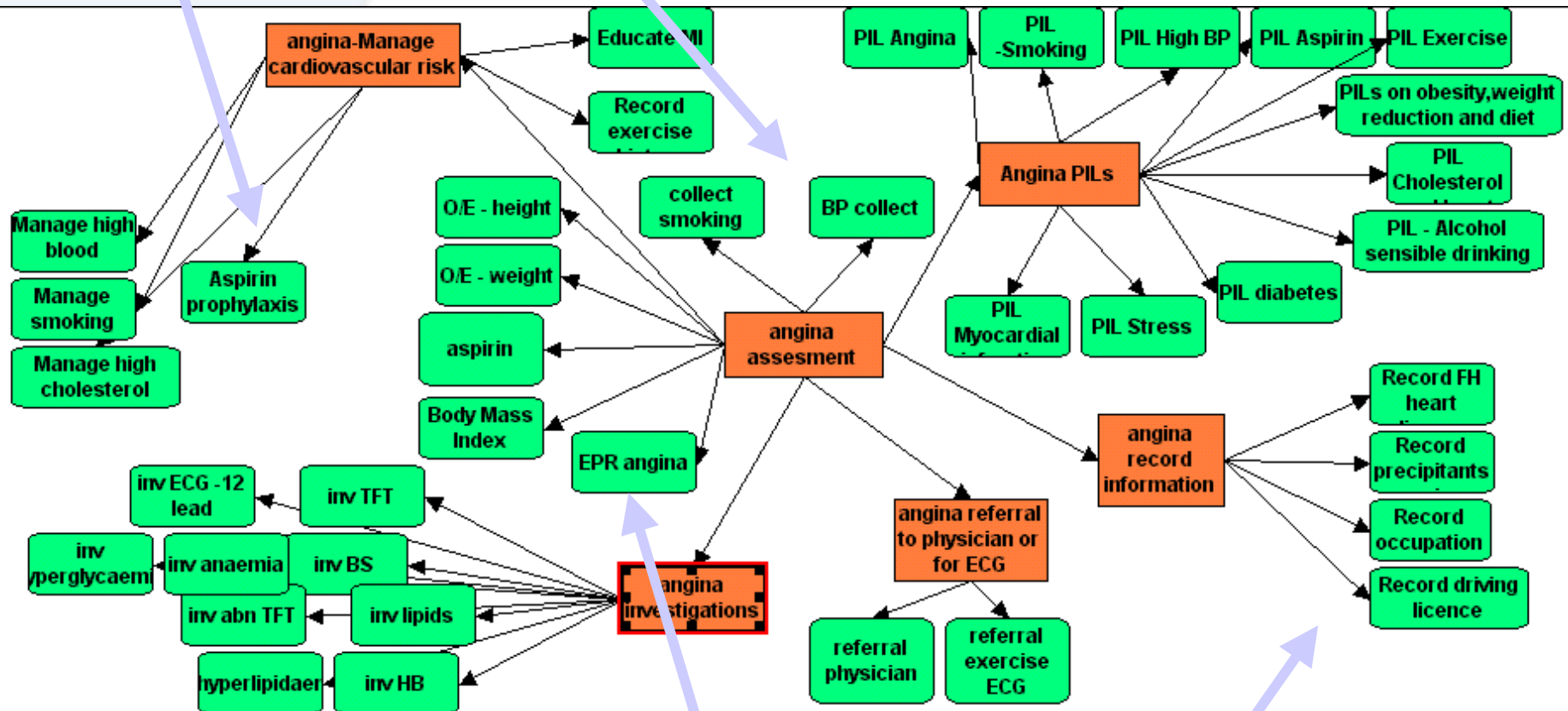
Scenario



Management acts

Assessment data entry

Patient education



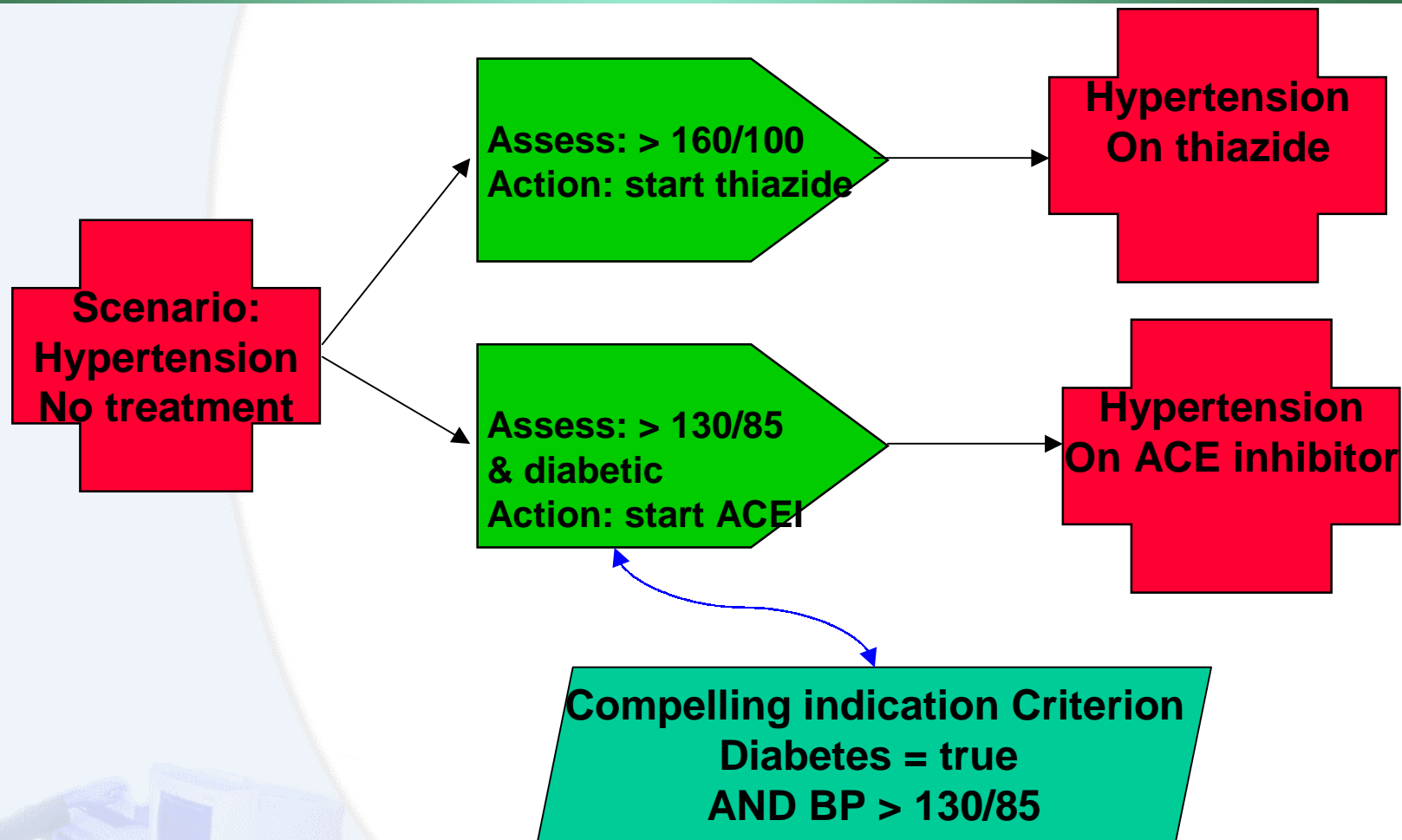
Work up

Contextual EMR summary

'Good practice' data entry



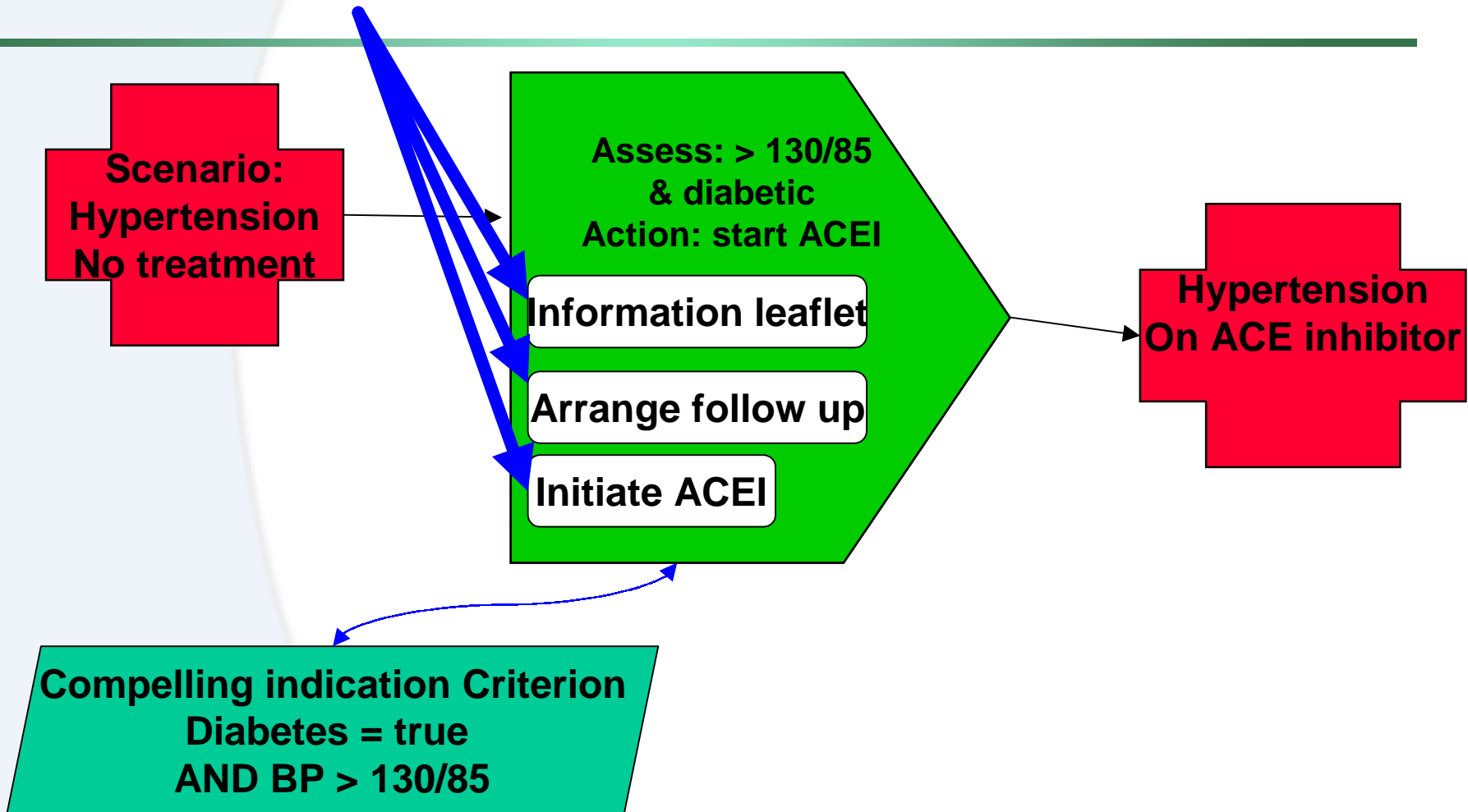
Choice of Action Steps for Each Scenario



Action Step Preference

- 4 criteria (rules) used per action step
 - Absolute contraindication
 - Relative contraindication
 - Compelling indication
 - Relative indication
- Gives 5 possible states
 - 5th is 'neutral'
- Explanation – why this preference rating?
- Rationale behind the action being present
- References / evidence grading

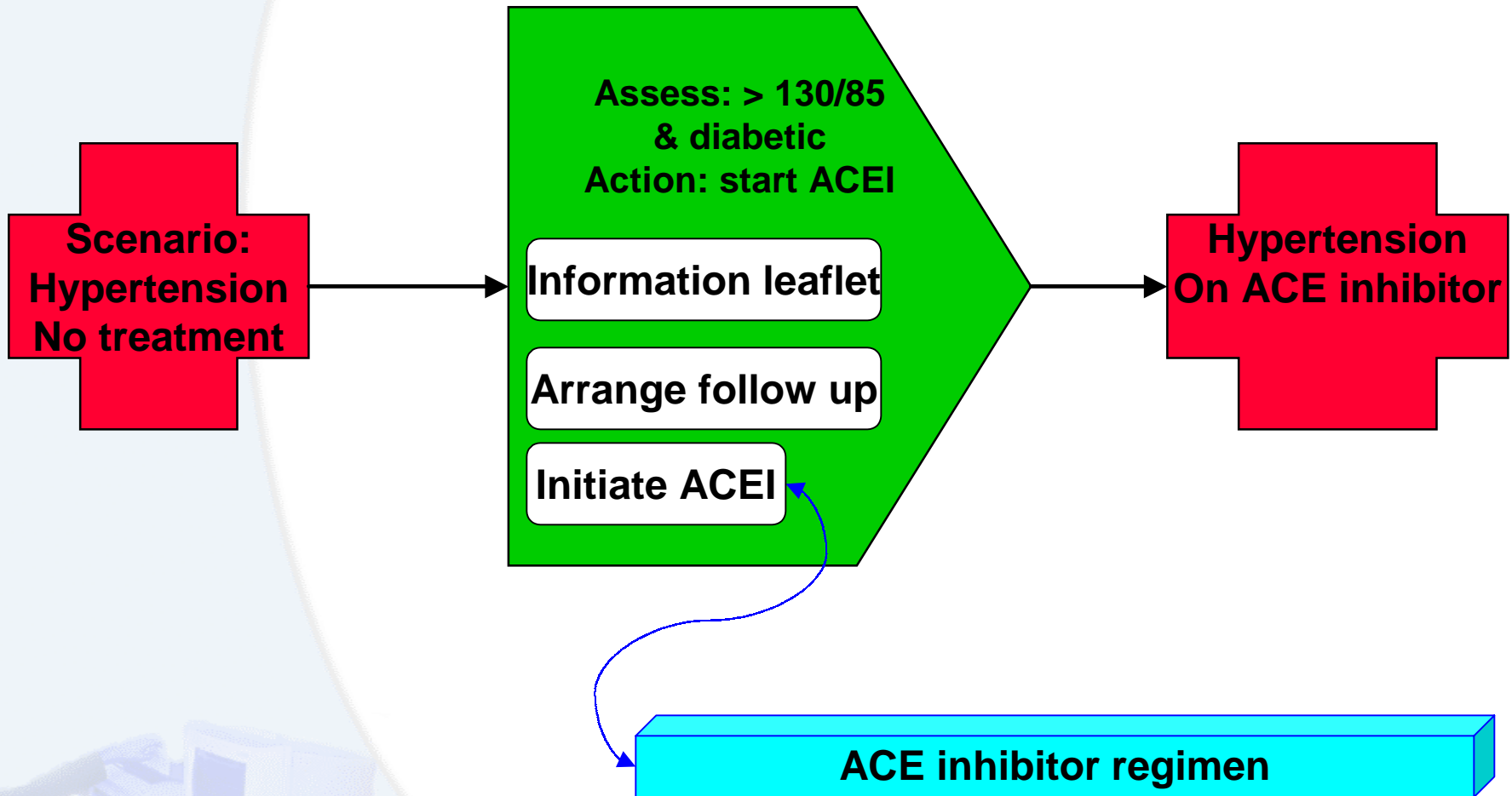
Multiple Actions in One Action Step



Action

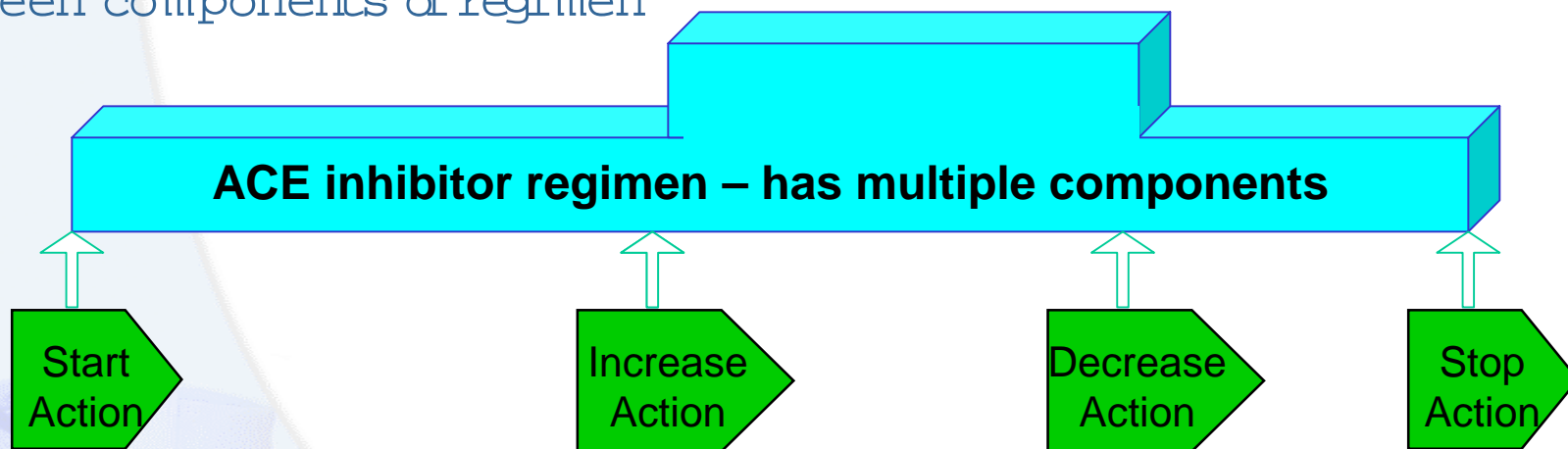
- Actions instantiate the clinical guidance
 - e.g. start/modify/stop therapy regimen patient information; referral; investigation; acute prescription
- Actions occur at a single time point
 - Duration mostly not relevant in primary care
 - Actions can act on Activities which do have duration
- Actions may be refined
- One kind of action is a 'subguideline'
 - Allows further action choice

Action on a Regimen

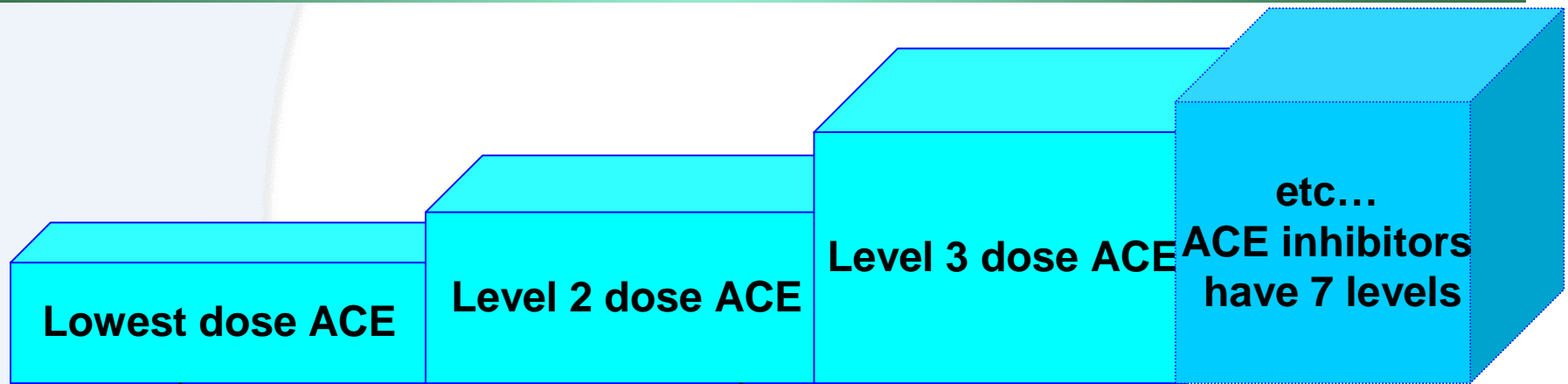


Regimen (An Activity)

- Drug treatment which persists over time
 - 'ACE inhibitor treatment' for hypertension
- May have several stepped doses
 - 'Low', 'medium', 'high'
- Many candidate drugs
- May include more than one drug at a time (e.g. Triple therapy)
- Guideline actions of start, stop, increase or decrease change between components of regimen



Regimens, Regimen Component, Prescribable Items: Action Refinement



-
- Captopril 12.5mg 0.5 tablet twice a day
 - Enalapril 2.5mg 1 tablet a day
 - Cilazapril 500mcg 1 tablet a day
 - Moexipril 7.5mg 0.5 tablet a day

-
- Captopril 12.5mg 1 tablet twice a day
 - Enalapril 5mg 1 tablet a day
 - Cilazapril 1mg 1 tablet a day
 - Ramipril 1.25mg 1 capsule a day



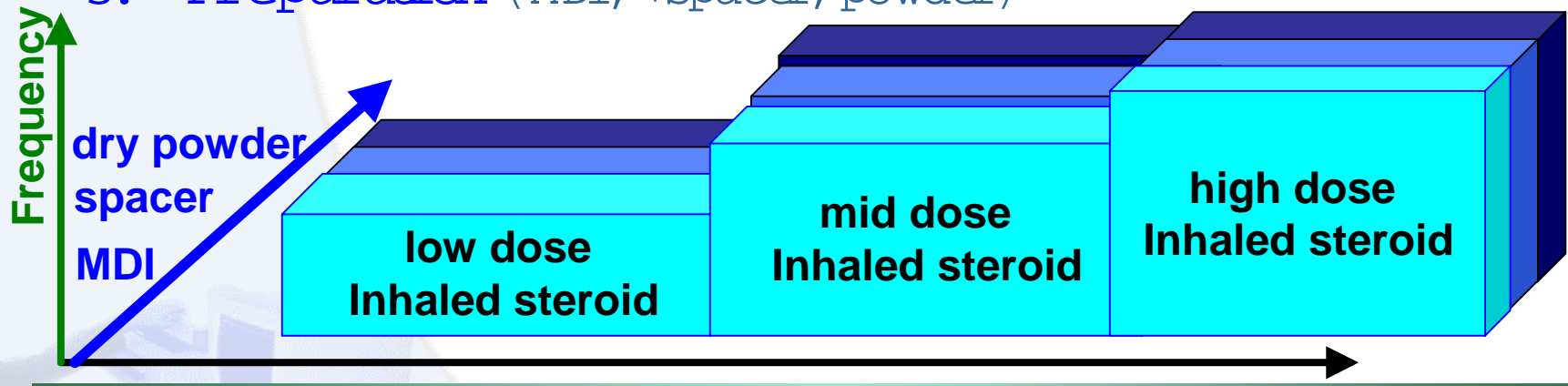
Regimen Components

A regimen has several components

May vary on three axes

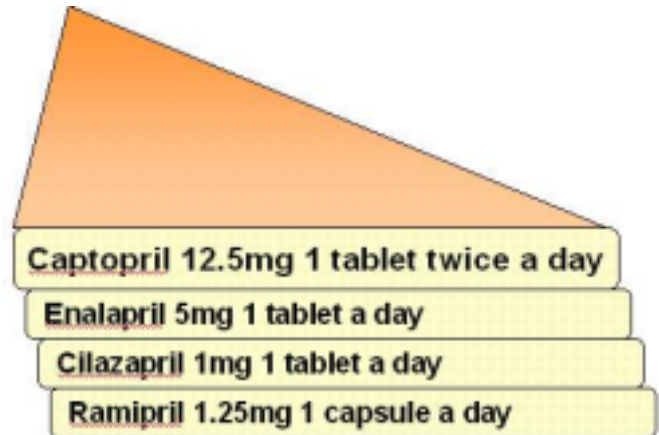
E. G. Inhaled steroids

1. Dose (low, mid, high)
2. Frequency (same dose, other frequency)
3. Preparation (MDI, +spacer, powder)



Prescribable Items

- Populate a regimen component
 - 'Low dose ACE inhibitors'
- Has Prescribable Items
 - Captopril 12.5mg tablet OD
 - Lisinopril 2.5mg one per day
- These are authorisations for prescriptions



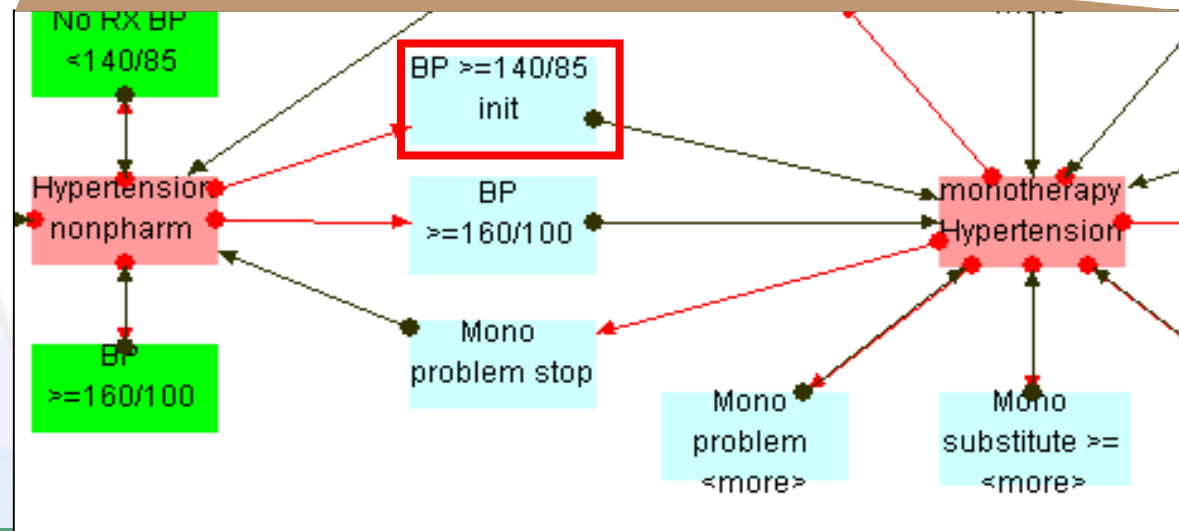
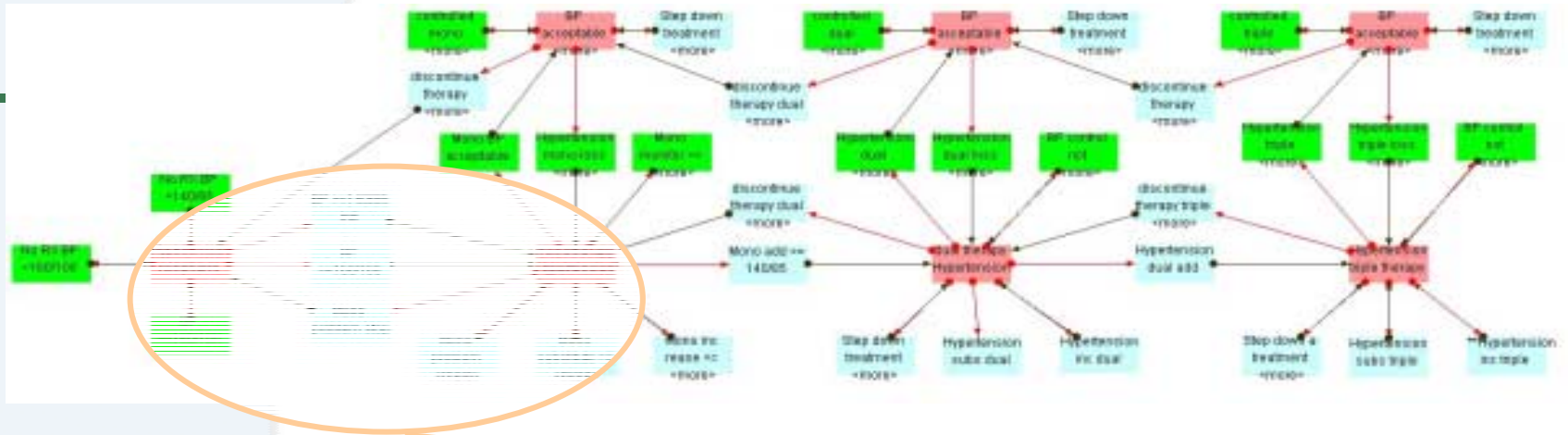
Which Prescribable Item?

- Same 4 rules as for actions
- But also
 - Drug:drug interaction checking
 - Contraindication checking
 - Sensitivity checking
 - Special rules
 - Use same drug if already on it
 - Don't recommend drug if already discontinued

Guideline Fragment

- For patients with Diabetes Mellitus, the blood pressure should be controlled to below 140/85 mm Hg
- For patients with Diabetes Mellitus, ACE Inhibitor is compellingly indicated

Hypertension State Map



BP >=140/85 init (Subguideline_Step)

Action Prompt

Next Step

Comment

Rule In Condition

Rule Out Condition

Name

Subguideline

Trend Prompt

Default Preference

Evidence Rating

Greyed In Condition

Greyed Out Condition

**Initiate therapy
 action step:
 At low threshold
 because diabetic**

Hypertension low threshold for rx (nAryCriterion)

Name

Criteria
 diag C/S complications Hypertension
 diag diabetes
 CHD 10Y risk >= 30%
 diag LVH

User Name

Operator



Refinement of action:

initiate ACE Hypertension (Action_Step)

Action Prompt
initiate ACE inhibitor

Rule In Condition
compelling indication ACE Hypertens...

Comment
to association with renovascular disease).

Rule Out Condition
contraindication initiate ACE

Default Explanation
nt has heart failure or diabetic nephropathy.

Trend Term
Hypertension control poor

Name
initiate ACE Hypertension

Action
sub hypertension initiate ace

Trend Prompt
Uncontrolled

Default Preference
neutral

Evidence Rating
nil

Greyed In Condition

Greyed Out Condition
possible contraindication ACE Hyperte...

Next Step

Review Window Maximum

Review Window Minimum

References
Hypertension Initial medication
Hypertension Add-on treatment
Hypertension rationale: ACE inhibitors
Pill Hypertension - antihypertensive dr

compelling indication ACE Hypertension (nAryCriterion)

Name
compelling indication ACE Hypertension

Criteria
diag heart failure
diag diabetes
diag LVF

User Name
compelling indication for ACE inhibitor exists

Operator
OR

**ACE inhibitor compelling
Indication because
diabetic**

initiate ace standard dose (Action_Step)

Action Prompt

Rule In Condition

Comment

Rule Out Condition

Default Explanation

Trend Term
 Hypertension control poor

Name

Action
 initiate ACE standard dose
 app follow up

**Further action refinement:
 Start ACE at standard dose,
 Choose which one**

ace dose 2 (Regime_Component)

Trend Prompt

Dose Level **Rationale**

Frequency Level **User Name**

Name **Item Selections**
 Captopril 12.5mg tablets bd
 Enalapril 5mg tablets od
 Lisinopril 2.5mg tablets od
 Ramipril 1.25mg capsules od
 Cilazapril 1mg tablets od

Preparation

Default Preference

Greyed In Cond

Greyed Out Cor

Next Step

Information Sources

- HTML to allow better user navigation and reuse
- Context sensitive
- Entry-points

Prodigy 3 - Reference

File Help

Supporting Texts	Reference	Hypertension Initial medication
	Reference	Hypertension Add-on treatment
	Reference	Hypertension rationale: ACE inhibitors
	PIL	Pil Hypertension - antihypertensive drugs

hypotension.

- **ACE inhibitors:** first line in heart failure, left ventricular dysfunction, or type I diabetic nephropathy, consider in type II diabetic nephropathy or chronic renal disease (usually following specialist advice); avoid in pregnancy or renovascular disease and caution if peripheral vascular disease (cue to association with renovascular disease).
- **Angiotensin-II antagonists:** may have a place as an alternative to ACE-inhibitors in patients who have persistent ACE-inhibitor induced cough.

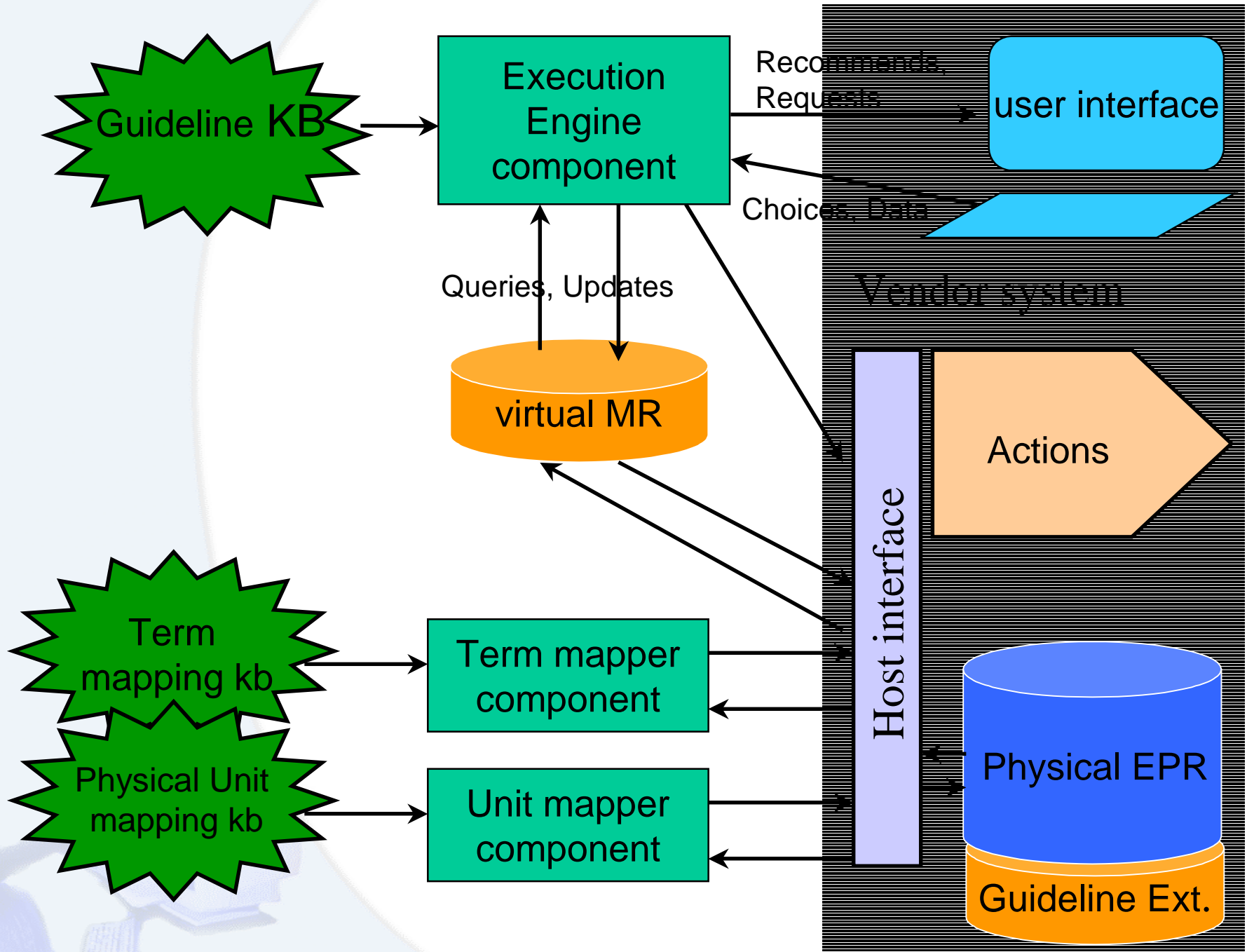
Prodigy 3 - Patient Information Leaflet

File Help

Smoking - Tips on Stopping

If you have decided that you really want to stop smoking, you have won part of the battle. The more determined you are, the more likely your chances of success. If you have tried before and failed, don't despair, people who keep trying usually succeed. Stopping smoking isn't easy. Withdrawal from nicotine can be uncomfortable producing both physical and psychological symptoms including nausea, headaches and irritability. These may last for several weeks but if they occur, do persevere as they gradually subside and most people soon feel a lot healthier for giving up. Here are some tips which may help with quitting:

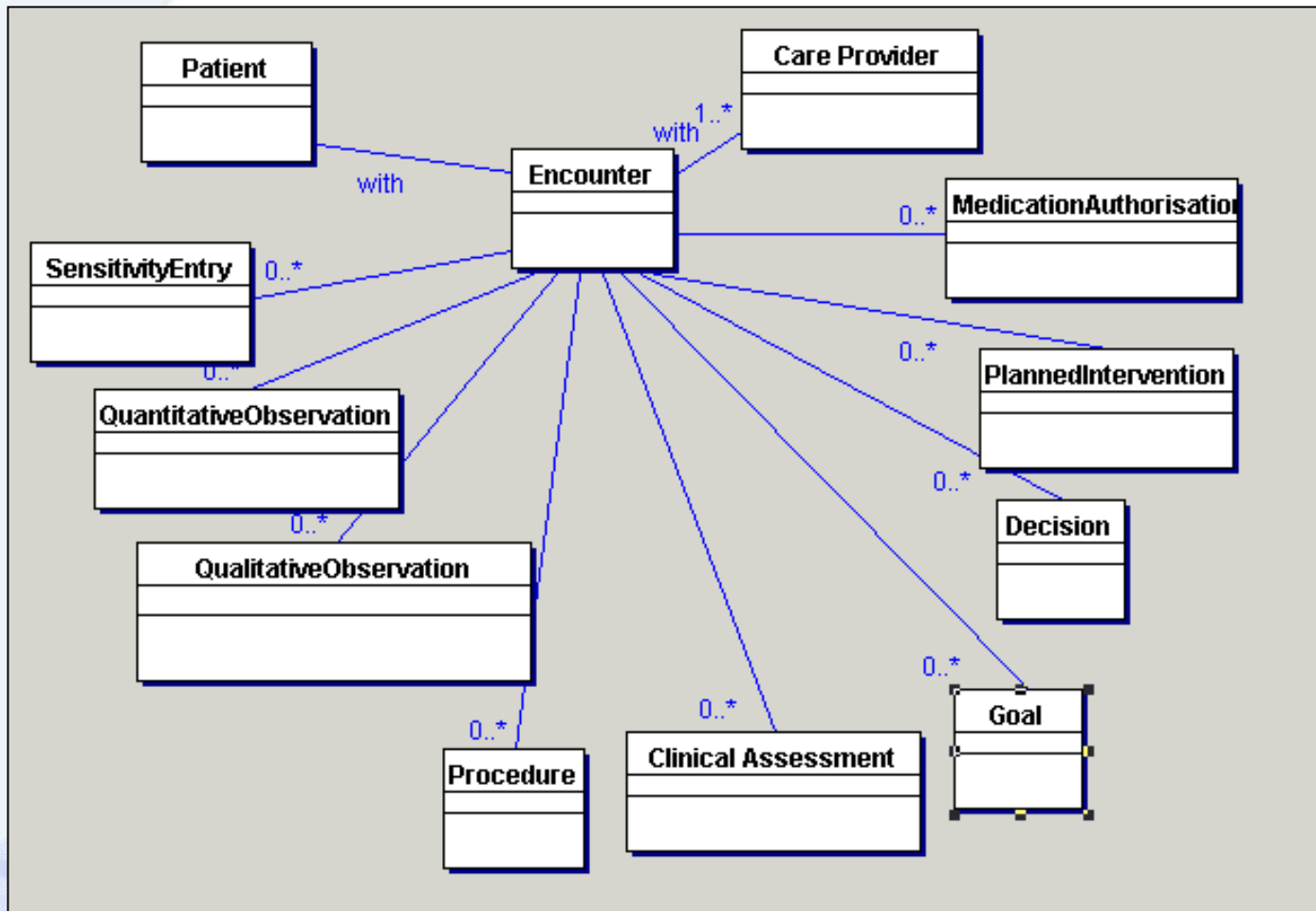
1. Write a list of all the reasons why you want to stop and keep them with



Virtual Medical Records

- Many different schemata in vendor medical records
 - Most of their distinctions not relevant to clinical DSS
 - Drop administrative, audit trail, security distinctions
 - Define a simplified schemata – a 'view' of EMR
 - Provides named classes of things in the EMR, to use in criteria definitions
-
- Provide knowledge bases containing term maps
 - Provide software components for mapping terms with well defined programming interfaces
 - System vendor uses these to provide DSS standard view of their medical record – the vMR

The Generalised Medical Record: (vMR) - 12 Entities Only



Terminology Mapping

- Generalisation / abstraction of terms.
- Coded records may be very specific, e. G. 'Prolonged ST interval on ECG.'
- DSS may need only more general 'risk of heart block' – satisfiable by presence of hundreds of coded entries.
- Mapping from specific -> general.
- Lessens risk of changed meaning.

Name

Chronic cough

Last Step



First Step

Chronic cough - symptom



Steps

