The PRODIGY Model and Guideline Comparison

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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 PRODIGY 3 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
- Action
- Scenario

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Scenario

Scenario: Hypertension
No treatment

Assess: > 130/85
Action: start ACE

Assess: > 160/100
Action: start thiazide

Hypertension
On ACE inhibitor

Hypertension
On thiazide

Precondition Criterion
Hypertension = true
AND medication count = 0

Precondition Criterion
Hypertension = true
AND medication count = 1
AND on ACEI = true
Management acts

- angina-Manage cardiovascular risk
- Manage high blood
- Manage smoking
- Manage high cholesterol
- Aspirin prophylaxis
- inv ECG - 12 lead
- inv anaemia
- inv hyperglycaemia
- inv TFT
- inv hyperlipidaemia
- inv BS
- inv abn TFT
- inv lipids
- inv HB

Assessment data entry

- O/E - height
- O/E - weight
- aspirin
- Body Mass Index
- EPR angina
- inv TFT
- inv

Patient education

- PIL Angina
- PIL Smoking
- PIL High BP
- PIL Aspirin
- PIL Exercise
- PIL Cholesterol
- PIL Alcohol sensible drinking

- Angina PILs
- PIL Myocardial infarction
- PIL Stress
- PIL diabetes
- PILs on obesity, weight reduction and diet

Contextual EMR summary

- angina record information
- angina referral to physician or for ECG
- referral physician
- referral exercise ECG

‘Good practice’ data entry

- Record FH heart
- Record precipitants
- Record occupation
- Record driving licence

Work up
Choice of Action Steps for Each Scenario

Scenario: Hypertension
- No treatment

Assess: > 130/85 & diabetic
Action: start ACEI

Assess: > 160/100
Action: start thiazide

Hypertension On thiazide

Hypertension On ACE inhibitor

Compelling indication Criterion
Diabetes = true
AND BP > 130/85
Action Step Preference

- **4 criteria (rules) used per action step**
  - Absolute contraindication
  - Relative contraindication
  - Compelling indication
  - Relative indication

- **Gives 5 possible states**
  - 5\textsuperscript{th} is ‘neutral’

- **Explanation – why this preference rating?**
- **Rationale behind the action being present**
- **References / evidence grading**
Multiple Actions in One Action Step

Scenario: Hypertension
No treatment

Assess: > 130/85
& diabetic
Action: start ACEI

Compelling indication Criterion
Diabetes = true
AND BP > 130/85

Information leaflet
Arrange follow up
Initiate ACEI

Hypertension On ACE inhibitor

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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

Scenario: Hypertension
No treatment

Assess: > 130/85 & diabetic
Action: start ACEI

Information leaflet
Arrange follow up
Initiate ACEI

Hypertension
On ACE inhibitor

ACE inhibitor 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

ACE inhibitor regimen – has multiple components

Start Action
Increase Action
Decrease Action
Stop Action
Regimens, Regimen Component, Prescribable Items: Action Refinement

ACE inhibitors have 7 levels:

- **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**

etc…
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
Initiate therapy action step:
At low threshold because diabetic
Refinement of action:

**Initiate ACE inhibitor**

*Indication because diabetic*
Further action refinement: Start ACE at standard dose, Choose which one
Information Sources

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

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...
Guideline KB

Term mapping kb

Physical Unit mapping kb

Execution Engine component

virtual MR

Term mapper component

Unit mapper component

user interface

Host interface

Physical EPR

Guideline Ext.
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.