Clinical Decision Support (CDS) Roadmap for NHSScotland

SCIMP Conference
23rd September 2015
Overview

1. Outline of CDS Roadmap:
   - The need for change
   - Definition and scope
   - Vision and architecture
   - Proposed milestones and deliverables
   - Benefits

2. CDS in action – demo of national CDS solution in New Zealand

3. Discussion
The Need for Change
Knowledge-Practice Gap

Knowledge exists but we often fail to apply it correctly.


17 years to translate research evidence into routine practice (Balas and Boren, 2010)
Variation, Harm and Waste in NHSScotland

• Vale of Leven
• Ayrshire and Arran
• Lanarkshire

• No coherent strategic approach to ensure that relevant healthcare knowledge is always available and used for health care decisions.

• We need to strengthen our systems for ensuring that decisions about patient care are reliably informed by the best available knowledge.
Impact of CDS – the Evidence

Clinicians with CDS available to them are:

• 1.6 times more likely to prescribe the correct medicines or other therapies;
• 1.7 times more likely to order the required diagnostic tests
• 1.6 times more likely to monitor drug effects in line with evidence
• 1.4 times more likely to take appropriate preventative measures.

CDS impact on patient outcomes:

• Trend towards reducing, patient mortality.
• Trend toward, higher quality-of-life scores.
• Reduces or prevents adverse events.
• Can improve efficiency and can reduce costs.
• Can improve patient satisfaction.

— 8 systematic reviews – Implementation Science, AHRQ, Annals of Internal Medicine.
Policy commitment

• Clinical Decision Support an objective within new eHealth Strategy.

“By 2016 we will have a plan to provide clinicians with quick and easy access to decision support tools that highlight variation from best practice, generate appropriate prompts and alerts, and enable generalists and less experienced clinicians to connect to specialist clinical knowledge and experience at point of care.”
Defining Clinical Decision Support

A computer-based system providing “passive and active referential information as well as reminders, alerts, and guidelines.” (Bates et al)
Components of Decision Support

- **Definitions**
  - Decision Support Rules
  - Engine

- **Knowledge Base**:
  - Guidelines, evidence, drug info, secondary use info
  - Knowledge from experience and practice

- **Patient-Specific Data**:
  - From clinician or clinical system

**Call to Action**

**Delivers**

**Defines**

**Invokes**
No “one size fits all” CDS system

Information       Knowledge       Decisions       Application

Rules
Algorithms
Decision trees

Formularies
E-Books
Guidelines
Evidence summaries
Datasets – e.g.
public health.

Calculators for screening, dosage, etc
Diagnostic tools
Treatment options
Lab reference guides – interpretation.
Monitoring tools.

“Pull”
“Passive” reference resources

“Push”
Intelligent systems that anticipate clinician need
4 Types of CDS

1. Standalone:
   - Web
   - Mobile

2. Linked with clinical systems
   - Clinician searches or follows links to evidence/guidance.

3. Context-sensitive support
   - Business rules “push” patient-specific prompts and alerts to clinician.

4. Clinician to clinician knowledge-sharing via technology
Standalone Clinical Decision Support - Examples

Website-Based:
• Dynamed Plus
• Clinical Pathway Publisher tool

Mobile:
• BNF and SIGN apps
• Sepsis App (MHRA-approval)
Example – Dynamed Plus

- atrial
- atrial fibrillation
- atrial flutter
- rhythm control in atrial fibrillation

Spotlight

Introducing Dynamed Plus

DynaMed is MOST CURRENT...

EBSCOHealth Calculators

DynaMed Plus

atral fibrillation

Search For

atral fibrillation

Condition

supraventricular tachyarrhythmia caused by uncoordinated atrial activation and associated with irregular ventricular response

Overview and Recommendations

History and Physical

Guidelines and Resources

Complications and Prognosis

Patient Information

Thromboembolism Risk

Prevention and Screening

Thromboembolic prophylaxis in atrial fibrillation

Thromboembolism Risk

ICD-9/ICD-10 Codes

Mobile App Access – Get the Dynamed Mobile App!
Information | Knowledge | Decisions | Application

Rules
Algorithms
Decision trees
Linked Clinical Decision Support - Example

Search and links to “Dynamed Plus” embedded in Clinical System
Passive Links to Evidence Summaries from EHR
Context-Sensitive Clinical Decision Support

Evidence and guidelines converted into decision support rules that are invoked by specific data in patient record; issue prompts and reminders to clinician in context of EHR.

Example: Care-IS used in primary care throughout New Zealand
CVD risk calculator embedded in clinical system

Screenshots from the BP CARE-IS system embedded in clinical systems

Clinical Advice

Progressive renal decline, predicted to enter stage 4 soon: consider referral if patient may be affected during their lifetime

Referral may be less useful if patient unlikely to be affected by their renal decline

Offer influenza and pneumococcal vaccinations

Minimise nephrotoxic drugs and consider renal doses of medication

Review every six months with FBC, creatinine, electrolytes, lipids, HbA1c and urine albumin-creatinine ratio

Urinary protein-creatinine ratio is less sensitive but sometimes used to monitor significant levels of proteinuria

No recent serum potassium found: do not implement any advice about starting or increasing ACE inhibitors or ARBs until normokalaemia verified

Target BP is systolic 120 - 139 and diastolic less than 90

Blood pressure above target; consider reviewing antihypertensive therapy with priority to ACE inhibitors or ARBs

Please use the Common Form for more detailed advice on management of hypertension

Urine ACR indicated due to previous proteinuria (no recent ACR or PCR found)

Arrange imaging of renal tract due to persistent invisible haematuria unless benign transient cause of haematuria identified. Recall to monitor haematuria within a year

http://www.bpac.org.nz/BT/2013/June/urine-tests.aspx contains advice on investigating haematuria. Risk factors for urological malignancy include smoking, recurrent UTI or other urological disorders, occupational exposure to chemicals or dyes, pelvic irradiation, history of excessive analgesic use, and others

Refer to nephrology due to invisible haematuria with proteinuria in CKD stage 3

Patient specific advice based on SIGN Guidance – note that this combines guidance for diabetes, CKD, and Stroke management.
Limitations of Technology-Driven Evidence-Based Practice

- Inflexible rules and technology driven prompts may produce care that is management driven rather than patient centred.

- Statistically significant benefits indicated in the research evidence due to may be marginal in real-life practice where the environment – e.g. remote and rural context - and patients are very different from controlled research studies.

- Pathways and guidelines based on single conditions and non-complex patients can encourage over-referral and over-investigation not tailored to patient needs.

  (Greenhalgh 2014)
A fourth form of decision support

Clinician to clinician knowledge-sharing

• Messaging, phone and video communication to underpin guideline-driven technology prompts.

• Combines clinician expertise and experience with evidence from research and guidelines.
Example

Airedale Hospital – “Immedicare”.

• 200 nursing and residential homes in Cumbria linked to the Communications Hub based at Airedale NHS Foundation Trust.

• Run by specialist nurses, 24/7

• Residents and care home staff can get medical help from hospital consultants or specialist nurses via a secure video link, if and when they need it, without having to leave the home.
Architecture:
Common Knowledge Base, Multiple Channels

- External Agencies
- Clinicians
- Patients/Carers
- Improvement Managers

- Linked/integrated Systems
  - Patient Management System
  - GP Practice System
  - Clinical/Patient Portal

- Standalone (apps/websites)
  - Other Systems
  - Mobile Apps

- Cross-device access
- Accessible as independent, linked and/or integrated formats.

- National Clinical Decision Support Framework
  - Integration Services: Service Oriented Architecture (e.g. HTTP’s hyperlinks, REST, SOAP)
  - CDS Standards: (e.g. HL7 Infobuttons, HL7 CDS, Arden, GLIF)

- Publishing Tools
  - Coding and Classification
  - Editorial and Review Tools

- National Knowledge Base
  - Import/Export Tools
  - Indexing/Search Engine
  - Can combine centralised and distributed (local) resources
  - Probably external to CDS

- Business Intelligence
  - Reporting Tools
  - Export Tools

- Resources from national, local health board and external providers.

- Data can be gathered for audit, reporting and feedback into CDS review/revision.
“By 2020, optimal, usable and effective clinical decision support will be widely available to clinicians when and where they need it, and whatever device they are using, as an integral part of their working practice. This will enable practitioners to translate knowledge routinely and reliably into practice to improve quality of healthcare in Scotland, helping to make NHSScotland a learning system based on continuous generation and use of knowledge.”
Milestones and Deliverables

Current Fixtures within an Evolving Roadmap
Phase 1: By March 2017

1. **Specify, procure and pilot a context-sensitive CDS platform for primary care.** Build the business case for national roll-out in phase 2.

2. **Deliver high-impact Quick Wins - including:**
   - Mobile CDS platform for antibiotic prescribing
   - Decision Support Web Gateway for Paediatric and Child Health.
   - Proof of concept of point of care mobile app for SIGN guideline and generic junior doctors’ handbook.
   - Pilot of evidence-based prompts and clinician-clinician communication to reduce over-referral and over-investigation from care home to secondary care settings

3. **Build clinician and policy level engagement and consult further on priorities for phase 2**
Challenges

• Reluctance to change
• Clinician leadership
• Competencies – data science, evidence-based practice.
• Integration with Safety and Quality agendas.
• Risk management and evidence-based practice.
Making it Real

Demo of Care-IS Decision Support Platform
National solution for primary care in New Zealand
NSS will deliver its mission through 4 strategic objectives: Customers at the heart of everything we do, Increasing our service value, Improving the way we do things; and Become a great place to work.
Areas to Cover

• CARE IS and clinical solutions
• The platform
• PRS Integrations:
  – EMIS
  – Vision
• Opportunities
  – Improve adherence to best practice clinical guidance
  – By doing so raise standards of care and outcomes
  – Reduce costs & efficiencies
  – Referral management and integration with SCI Gateway
  – Facilitate involvement of allied professional HCP’s in particular nurse and pharmacy
• Launched in New Zealand (population 4.5m) in 2005
• Integrated into the standard workflow
• Most trusted source of medical information by HCPs in primary care
• Average of 118,000 hits per working day or 29.5 million per year
• Used in 98% of practices
Mosaic Solutions

General Practice

- Risk stratification and quality reporting
- Auditable financial reporting

Clinical Practice

- Clinical guidelines
- Prescribing
- Referrals
- Investigations
- Radiology

Practice Population

- Mosaic Care Suite
- Mosaic Tool Suite

Individual Patient

- Clinical application local formulary
- Derived from local evidence-based clinical pathway
In Practice

PATIENT RECORD SYSTEM

mosaic
Analyses patient demographic and health information to provide clinical decision support, referrals and reporting.

Information reviewed by GP

Writes back to the PRS
CARE Suite: How it works
A cluster randomized controlled trial (FASTEST) Tool:

Dr Anna Ranta, MD, FRACP
MidCentral Health and University of Otago
New Zealand
ANZAN – Adelaide - May 2014
## Efficacy Endpoints

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intervention (n=172)</th>
<th>Control (n=119)</th>
<th>Unadjusted for Cluster</th>
<th>Adjusted for Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guideline adherence</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stroke at 90 days</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary endpoints</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stroke or death at 90 days</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cerebrovascular event or death</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comprehensive counselling</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ranta A¹, Dovey S², Weatherall M², O'Dea D², Gommans J², Tilyard M². Cluster randomized controlled trial of TIA electronic decision support in primary care. *Neurology*. 2015 Apr 14;84(15):1545-51
Outcomes

- Stroke at 90 days
- TIA or stroke at 90 days
- Vascular event or death at 90 days
End to End

Patient

Review
Primary and secondary prevention

Consultation
NICE/SIGN
(DUK 8 processes of care)

Self Care Plans
(Create on fly; data and objectives; patient selected; any language)

Structured Education
(Create account and write back)

Analytics
(QOF; 8 process and outcomes of care; concordance; complications)

Referrals
(Pharmacy Shared Care; Community; Complications)

please
Mosaic Patient Review

Clicking this button saves all the data back into the patient record.

This patient is currently being treated on the diabetes and depression applications. Clicking the link opens the application.

Based on the patient’s record, Mosaic is suggesting the patient is considered for the CKD and TIA applications.

Based on alerts in the patient record and NICE based classifications, coded messages and reminders are included here.

Diagnoses (classifications) and basic examination data (eg BP or Weight) can be added here.
Mosaic Consultation: Diabetes Module

Retinal screening results (images) can be uploaded and displayed. Improves patient understanding.

Patient is identified as having CKD stage 3b. Direct link to CKD application.

Click through to generate a personal care plan with patient specific objectives.

Risk of diabetic complications calculated and presented

Hover over any alert and the underlying parameters for the risk calculation are displayed.

Diabetic foot risk assessed. Click in to do assessment. Another click to initiate referral and one further click to complete and send.
Mosaic Consultation: CKD Pathway

Extracts EGFR results from PRS (calculates EGFR from creatinine)

- Determines stage
- Does regression
- Determines estimated time to stage 4

Current/Existing Data

<table>
<thead>
<tr>
<th>Laboratory Results</th>
<th>Value</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum Creatinine</td>
<td>175</td>
<td>µmol/L</td>
</tr>
<tr>
<td>eGFR</td>
<td>37</td>
<td>ml/min/1.73m²</td>
</tr>
<tr>
<td>Annual Rate of Change</td>
<td>-27</td>
<td>ml/min/1.73m²/year</td>
</tr>
<tr>
<td>Five Year Rate of Change</td>
<td>-208</td>
<td>ml/min/1.73m²/year</td>
</tr>
<tr>
<td>ACR, (mg/mmol)</td>
<td>45</td>
<td>(01/10/2014)</td>
</tr>
</tbody>
</table>
Consultation notes can be added from the PRS.

Medications taken from the PRS

Medical warning and allergies added from PRS automatically.

Diagnosis pre-populated

Referral generation fully automated

Patient specific letter generated and prepopulated. Can be edited.

Standard set of laboratory investigations added. Others can be selected.
Frail and Elderly

- Healthcare
- Social care
- Medication Use Review
- MDT review notes
- Full audit log

- Key outcomes
  - Reduced unplanned admissions
  - Survival at home
<table>
<thead>
<tr>
<th>Date</th>
<th>Term</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-Sep-2015</td>
<td>Albumin / creatinine ratio</td>
<td>35</td>
</tr>
<tr>
<td>14-Sep-2015</td>
<td>Blood glucose level</td>
<td>15 mmol/L</td>
</tr>
<tr>
<td>10-Sep-2015</td>
<td>HbA1c level (DCCT aligned)</td>
<td>2 %</td>
</tr>
<tr>
<td>10-Sep-2015</td>
<td>Serum HDL:non-HDL cholesterol ratio</td>
<td>20</td>
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<tr>
<td>08-Sep-2015</td>
<td>Urine protein/creatinine ratio</td>
<td>125 umol/L</td>
</tr>
<tr>
<td>07-Sep-2015</td>
<td>Blood group A Rh(D) positive</td>
<td></td>
</tr>
<tr>
<td>07-Sep-2015</td>
<td>Blood group O</td>
<td></td>
</tr>
<tr>
<td>03-Sep-2015</td>
<td>Serum creatinine</td>
<td></td>
</tr>
<tr>
<td>01-Sep-2015</td>
<td>Alcohol consumption</td>
<td>35 U/week</td>
</tr>
<tr>
<td>01-Sep-2015</td>
<td>Body mass index</td>
<td>31.02 kg/m²</td>
</tr>
<tr>
<td>01-Sep-2015</td>
<td>O/E - height</td>
<td>175 cm</td>
</tr>
<tr>
<td>01-Sep-2015</td>
<td>O/E - weight</td>
<td>95 kg</td>
</tr>
<tr>
<td>01-Sep-2015</td>
<td>O/E - blood pressure reading</td>
<td>180/95 mmHg</td>
</tr>
<tr>
<td>21-Aug-2015</td>
<td>Full blood count normal</td>
<td></td>
</tr>
<tr>
<td>01-Jul-2014</td>
<td>QAdm risk arry hsp adm nx 12mth</td>
<td>4.45</td>
</tr>
<tr>
<td>03-Apr-2014</td>
<td>HTLV-3 antibody positive</td>
<td>Positive Test</td>
</tr>
<tr>
<td>03-Apr-2014</td>
<td>Human immunodeficiency virus test equivocal</td>
<td>Indeterminate Test:</td>
</tr>
<tr>
<td>03-Apr-2014</td>
<td>HTLV-3 antibody negative</td>
<td>Negative Test</td>
</tr>
<tr>
<td>02-Apr-2014</td>
<td>TC/HDL</td>
<td>1.5 TC/HDL 1.5</td>
</tr>
<tr>
<td>02-Apr-2014</td>
<td>Serum HDL Cholesterol Level</td>
<td>2 mmol/L</td>
</tr>
<tr>
<td>02-Apr-2014</td>
<td>QRisk2 Score</td>
<td>22 %</td>
</tr>
<tr>
<td>02-Apr-2014</td>
<td>Fasting blood glucose level</td>
<td>10 mmol/L</td>
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<tr>
<td>02-Apr-2014</td>
<td>Serum Cholesterol</td>
<td>3 mmol/L</td>
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<td>02-Apr-2014</td>
<td>[DEGRADE] QRisk2 Heart Age</td>
<td>75 years</td>
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<td>02-Apr-2014</td>
<td>Value (NK-unip) AUDIT-C</td>
<td>0</td>
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<tr>
<td>02-Apr-2014</td>
<td>AUDIT-C Alcohol Score Value (NK-unip)</td>
<td></td>
</tr>
<tr>
<td>02-Apr-2014</td>
<td>AUDIT-C</td>
<td></td>
</tr>
</tbody>
</table>
Urine dip stick test

- Persistent microscopic haematuria
- Visible blood
- Blood: Non-haemolysed Trace
- Protein: ++++
- Leukocytes: Trace
- Glucose
- Nitrate
- View historical data

Smoking status/cessation

- Status: Smoker
- Cessation therapy: Given
- Drug therapy: Not given
- Education
- Referral: Not referred

Clinical chart

- eGFR

Clinical advice for G3a

Laboratory results:
- Serum creatinine (most recent): 98.00 μmol/l, 06/03/2007
- eGFR: 95.78 ml/min/1.73m², 06/03/2007
- Annual rate of change: N/A ml/min/1.73m²
- Five year rate of change: N/A ml/min/1.73m²
- ACR (most recent): 27.00 mg/mmol, 19/09/2015

Classifications:

Blood pressure:

Urine dip stick test:

Smoking status/cessation:
- Status: Ex-smoker
- Cessation therapy:
- Drug therapy: Given
  - Nicotine gum
  - Nicotine inhalator
  - Nicotine lozenge
  - Nicotine patch
  - Buproprion
  - Varenicline

Clinical charts:
- eGFR
- Blood pressure
- HbA1c: No data available
- ACR
- Non-HDL cholesterol: No data available
- eGFR/ACR: No data available

Clinical advice for G1A2
Demonstration

Please find Neil or I at the CARE IS stand
Discussion

1. From what you have heard in this session, what seems most interesting or important to you about national implementation of clinical decision support in NHSScotland?

2. Where is there evidence of waste, variation and harm that a CDS solution could help to address? What would it enable that can’t be done currently?

3. Would your organisation be interested in the piloting of context-sensitive CDS in primary care?
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