WS3: Data-Responsive Care Planning

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A Care Process is systematic approach to the detection, treatment, and management of disease in a population by a given care team.

- Often implicit or not very systematic
- **Goals**: transparent, patient oriented, evidence based
  - Regularisation of *known, high quality* care
# Care Process Models

<table>
<thead>
<tr>
<th>Title</th>
<th>Reference number</th>
<th>Published</th>
<th>Last updated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head injury: assessment and early management</td>
<td>CG176</td>
<td>January 2014</td>
<td>June 2017</td>
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<tr>
<td>Spondyloarthritis in over 16s: diagnosis and management</td>
<td>NG65</td>
<td>February 2017</td>
<td>June 2017</td>
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<tr>
<td>Eating disorders: recognition and treatment</td>
<td>NG69</td>
<td>May 2017</td>
<td>May 2017</td>
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<tr>
<td>Idiopathic pulmonary fibrosis in adults: diagnosis and management</td>
<td>CG163</td>
<td>June 2013</td>
<td>May 2017</td>
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<td>Hip fracture: management</td>
<td>CG124</td>
<td>June 2011</td>
<td>May 2017</td>
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The nice thing about standards is that there are so many of them to choose from.

— Andrew S. Tanenbaum
Challenges

• CPMs constantly evolve
  – Much faster than embodied care processes
• CPMs are high level
• CPMs are incomplete
• CPMs are hard to implement or adapt
  – Esp. across **time, space, condition,** organisation
  – Esp. in concert with complex IT
    • Or devolved sensing
  – Exacerbated for Long Term Conditions
All people with diabetes aged 12 years and over should receive all of the nine NICE recommended care processes\(^1,2\) and attend a structured education programme when diagnosed.

### Nine Annual Care Processes for all people with diabetes aged 12 and over

<table>
<thead>
<tr>
<th>Responsibility of Diabetes Care providers (included in the NDA 8 Care Processes)</th>
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<tbody>
<tr>
<td>1. HbA1c (blood test for glucose control)</td>
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<td>2. Blood Pressure (measurement for cardiovascular risk)</td>
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<tr>
<td>3. Serum Cholesterol (blood test for cardiovascular risk)</td>
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<td>4. Serum Creatinine (blood test for kidney function)</td>
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<td>5. Urine Albumin/Creatinine Ratio (urine test for kidney function)</td>
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<td>6. Foot Risk Surveillance (foot examination for foot ulcer risk)</td>
</tr>
<tr>
<td>7. Body Mass Index (measurement for cardiovascular risk)</td>
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<td>8. Smoking History (question for cardiovascular risk)</td>
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<th>Responsibility of NHS Diabetes Eye Screening (screening register drawn from practices)</th>
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<tr>
<td>9. Digital Retinal Screening (photographic eye test for eye risk)</td>
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Focus on Compliance

Care Processes - Locality Variation, Type 1

Key Finding
The striking variation at locality level is evident and can also be seen between similar specialist services.

Figure 5: The range of CCG/LHB care process completion for people with Type 1 diabetes, 2015-2016

England and Wales
What’s missing?

- These aren’t full fledged processes
  - More like “checkpoints”
  - The gap between goal and enactment is large
- Hard to adapt and customize
  - Tracking preferences or deviations
  - Challenging to deal with
    - large data streams
    - evolving prediction and other data driven models
- Co-morbidities typically not well integrated
  - CPMs tend to have “light links” across conditions
Integrating Wearables

• CPMs aim for compliance by *simplification*
  – Focus on few, high value, broad based moves
  – Aim for 100% compliance on key bits

• Wearable world
  – Powerful sensors and devices near the patient
  – High level of interconnection
    • From watches to powerful servers
  – Lots of data
  – Possibility for *effective* patient control
    • Compliant with richer Care Process Models
People with diabetes rarely spend more than two to three hours per year with a healthcare professional, and for the remaining 8,757 hours they must manage their diabetes themselves. They need the knowledge and skills [and tools] to do this.

*National Diabetes Audit, 2015-2016*
Data-responsive care planning

• Goals:
  – Sophisticated electronic representation of CPMs
    • At a granular, deployable level
  – Planning as well as execution or monitoring
    • Determine patient specific pathways
    • Adapt to new circumstances or changes in patients
    • Mindful of the totality of the patient situation
  – Incorporate sensing (in the broad sense)
    • React to data from sensors (mediated by pred. models)
    • Direct sensors (hardware or people)
WS3

• WS3.1. Acquisition of detailed care plans for long term care
  – Formalism design
  – Modular, multi-level, extensible
  – Use all members of the care team, esp. patients

• WS3.2. Planning for sensing
  – Tracking multiple sources of information
  – Adapt to failures (or success) of info gathering
Key Collaborators

• Cerner Corporation
  – US centered
  – Top 2 supplier of electronic health record systems
  – Big push toward Knowledge Driven Systems

• NICE
  – Structured development of guidance
    • Including “deployable” guidance

• Elsevier
  – Exploiting their extensive knowledge assets