2019 Patient-Centered Clinical Decision Support Learning Network Annual Meeting

October 21, 2019
Capital Hilton
Washington, DC
Lunch

- Served in lobby area outside room
- Networking opportunity
- Visit the Codeathon happening in New York room
- Reconvene at 1:00PM ET
Participant Panel on Technical Issues in CDS

Brian Douthit, MSN, RN-BC
Gabriella Flynn, MEd
Brian S. Alper, MD, MSPH, FAAFP
A Systematic Approach for Integrating the Palliative Care Planner App into the Electronic Health Record

Brian J. Douthit, MSN, RN-BC
Robert Wood Johnson Foundation Future of Nursing Scholar
Palliative Care Planner (PCplanner) Overview
Evolution of Research

**ICUconnect**
- Proactive, need-focused, primary palliative care
- Identifies high needs
- Needs measured to define: True positives included, False positives excluded
- Engages family caregivers
- Multi-media
- Delivers collaborative care
- True positives seen by ICU teams

**PCplanner**
- Proactive, need-focused, consistent, collaborative
- Identifies high needs
- Automated EHR screen: high sensitivity, high specificity
- Needs measured to define: True positives included, False positives excluded
- Engages family caregivers
- Multi-media
- Delivers collaborative care
- True positives seen by ICU teams & Palliative Care
## PCplanner Functionality

### Nathan Riggs representing Megan Hunt

**Post Care Survey**

**How to sort?** Click on T1 (Family Interview 1), T2 (Family Interview 2), or CH (change T1 - T2)

**What do need scores mean?** 10=highest level of need and 1=lowest level of need

<table>
<thead>
<tr>
<th>Family Needs</th>
<th>T1</th>
<th>T2</th>
<th>CH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decision making help</td>
<td>10</td>
<td>6</td>
<td>-4</td>
</tr>
<tr>
<td>Respect my culture</td>
<td>9</td>
<td>4</td>
<td>-5</td>
</tr>
<tr>
<td>Family stress</td>
<td>8</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Spiritual concerns</td>
<td>8</td>
<td>5</td>
<td>-3</td>
</tr>
<tr>
<td>Information needed</td>
<td>8</td>
<td>2</td>
<td>-6</td>
</tr>
<tr>
<td>Social support</td>
<td>7</td>
<td>8</td>
<td>+1</td>
</tr>
<tr>
<td>Listen &amp; answer my Qs</td>
<td>6</td>
<td>8</td>
<td>+2</td>
</tr>
<tr>
<td>Long-term outcome</td>
<td>5</td>
<td>6</td>
<td>+1</td>
</tr>
<tr>
<td>Family custom need:</td>
<td>5</td>
<td>3</td>
<td>-2</td>
</tr>
<tr>
<td>Discharge plans</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient symptoms</td>
<td>3</td>
<td>2</td>
<td>-1</td>
</tr>
<tr>
<td>Financial stress</td>
<td>3</td>
<td>6</td>
<td>+3</td>
</tr>
<tr>
<td>Communication issues</td>
<td>0</td>
<td>5</td>
<td>+5</td>
</tr>
<tr>
<td>Treatment vs values alignment</td>
<td>0</td>
<td>4</td>
<td>+4</td>
</tr>
<tr>
<td>Trust issues</td>
<td>0</td>
<td>6</td>
<td>+6</td>
</tr>
</tbody>
</table>

**Fact:** Shared decision making is often imperfect in the ICU.

**Tip:** Use ADAPT: Ask if they've heard what to expect. Discover what info about the future would help most. Anticipate indecision: 'Most people want to know about prognosis but also don't want to know at the same time — what about you? Provide info (W, best/worst/usual case, specific event). Track and respond to emotion. Also, map patient values on a simple goals of care figure.

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</tr>
</tbody>
</table>

**Fact:** Many families have emotional distress, including in-hospital symptoms of depression, anxiety, and PTSD. Acknowledging emotions can improve communication and relationships.

**Tip:** Try: NURSE = Name and validate the emotion (It seems like you may be upset or maybe even a little angry?), Understand (I can understand your concern). Respect their experience (I can't imagine how difficult this must be for you), Support (I am here to help you in any way), and Explore ('Could you tell me more?')
Cohort Identification and Results

PCplanner vs. control pilot results

<table>
<thead>
<tr>
<th>Measure</th>
<th>PCplanner</th>
<th>ICU Control 1—did not receive palliative care</th>
<th>ICU Control 2—received palliative care</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unmet needs reduction (NEST score), mean</td>
<td>-12</td>
<td>+3</td>
<td></td>
<td>0.002</td>
</tr>
<tr>
<td>Psychological distress reduction, %</td>
<td>-38</td>
<td>+200</td>
<td></td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Goals of care concordance, %</td>
<td></td>
<td>94</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>Patient-centeredness scale improvement, mean</td>
<td>+4.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality of communication scale improvement, mean</td>
<td>-1</td>
<td>+11</td>
<td></td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Hospital LOS, mean days</td>
<td></td>
<td>17</td>
<td>22</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>ICU days before palliative care consult, mean</td>
<td>4</td>
<td>4</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Discharge to hospice, %</td>
<td></td>
<td>5</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

Legend:
- **PCplanner intervention**
- **ICU Control 1—did not receive** palliative care
- **ICU Control 2—received** palliative care
Next Steps

**PCplanner**

- EHR
- Interop. API

**Next steps**

- Multi-center RCT feasible
- w/ EHR interoperability

**Machine learning**

- Refine case-finding w/ machine learning, A.I., predictive analytics

Clinician Family Scientist
Integrating PCplanner with the EHR
A Standard Approach

▪ Apps like PCplanner that improve outcomes need to be sharable
  – Owe our patients the best care and outcomes possible
  – Save time and resources

▪ Why don’t we do it?
  – Potential barriers related to private industry (non-funded)
  – No standardized guidance available
  – Lack of mature interoperability standards
Methods

PCPlanner App

Data Requirement Assessment and Mapping

Build Plan, BPMN Workflow, Data Requirements

Duke Interviews

Data Quality Assessment

Build Plan, BPMN Workflow, Quality Assessment

Outside Interviews

## Data Quality

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Conceptual definition</th>
<th>Operational examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completeness</td>
<td>Presence of the necessary data</td>
<td>Presence of necessary data elements, percent of missing values for a data element, percent of records with sufficient data to calculate a required variable (e.g., an outcome)</td>
</tr>
<tr>
<td>Accuracy</td>
<td>Closeness of agreement between a data value and the true value*</td>
<td>Percent of data values found to be in error based on a gold standard, percent of physically implausible values, percent of data values that do not conform to range expectations</td>
</tr>
<tr>
<td>Consistency</td>
<td>Relevant uniformity in data across clinical investigation sites, facilities, departments, units within a facility, providers, or other assessors</td>
<td>Comparable proportions of relevant diagnoses across sites, comparable proportions of documented order fulfillment (e.g., returned procedure report for ordered diagnostic tests)</td>
</tr>
</tbody>
</table>

*Consistent with the International Organization for Standardization (ISO) 8000 Part 2 definition of accuracy,7 replaced “property value” in the ISO 8000 definition with “data value” for consistency with the language used in clinical research.

Prepared by: Meredith N. Zozus, PhD; W. Ed Hammond, PhD; Beverly B. Green, MD, MPH; Michael G. Kahn, MD, PhD; Rachel L. Richesson, PhD, MPH; Shelley A. Rusincovitch; Gregory E. Simon, MD, MPH; Michelle M. Smerek. Reviewed by: NIH Version: 1.0, last updated July 28, 2014
Collaboratory Phenotypes, Data Standards, and Data Quality Core
Data Quality

Data Quality Dimension

- **Completeness**
  - 87% compliance

- **Accuracy**
  - Of available data, 98% reflect expected values (free text)

- **Consistency**
  - Percentages reflect similar values across clinical sites

- **Declining health trajectory**
- From SNF, LTAC
- Worsening MSOF
- Metastatic cancer
- Dementia
- CVA / ICH on vent
- Acute renal failure on life support
- Poor functional status
Acknowledgements

NIH Support for PCplanner
R01: 1R01AG058915-01A1
R21: 5R21NR016743-02

Robert Wood Johnson Foundation

Duke University
Dr. Christopher Cox
Dr. Rachel Richesson
Dr. Sharron Docherty

PCCDS Learning Network
Thank you!

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Usability Evaluation of the mLab App for Improving HIV Testing Behaviors in High-Risk Young Men

Gabriella Flynn, MEd
Background
• In 2015, youth comprised 22% of all new cases of HIV. Of these youth, 81% of infections occurred among YMSM

• Only 49% of YMSM aged 18-24 years compared to 66% of adults know of their HIV infection

• YTGW have also been disproportionately affected by HIV with the highest percentage of HIV+ test results of any gender category and the consistently low HIV testing rates

• Mobile health (mHealth) technology is a powerful platform for the delivery of HIV prevention interventions, including HIV testing
The mLab app combines:
- HIV prevention information
- Push notifications/reminders to complete HIV testing
- Automated image processing feature

The app also contains:
- Automated data collection and results reporting feature
- Relaying test results back to the research team
- Triggered messaging sequences that encourage future repeat testing or linkage to confirmatory testing
Purpose:
To iteratively refine the mLab app for young men using feedback from end-users and experts in user interface design
Methods

- Youth advisory board (YAB) feedback (N=8)

- Think-aloud protocol with 20 end-users at 2 study sites (Chicago, New York)

- A heuristic evaluation and think-aloud protocol with human computer interaction experts (N=5)

- Health Information Technology Usability Evaluation Scale (Health-ITUES) & Heuristic Mean Severity Scores
Results: YAB Content Updates

- Consolidation and design of the learn section

Topics to include:
- Infographics from CDC
- Information regarding PrEP, PEP, Prevention, HIV
Pinned facts:

- YAB suggested to be able to pin and save facts they come across in the app to review later
Results: YAB Graphic Design Enhancements

2017 login screen

2018 login screen

2019 login screen
Results: End Users & Expert Evaluators

Functional Feature Updates

- Collapsible “hamburger” menu that is mobile friendly

- Overlay walk-through to assist users with onboarding that appears the first three times a user logs in and can be accessed through a small button at the bottom of any screen
Testing timer now located on the server, allowing users to navigate through the mLab app while waiting for their results.
Results: End Users & Expert Evaluators
Functional Feature Updates

- Updated test preview screen language
Results: End Users & Expert Evaluators
Content Updates

- Embedded video content describing how to take the self-test, provided by OraQuick through YouTube
## Results: Demographics

<table>
<thead>
<tr>
<th>Participant Characteristics (N=20)</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender identity</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>20 (100)</td>
</tr>
<tr>
<td><strong>Sexual orientation</strong></td>
<td></td>
</tr>
<tr>
<td>Only gay/homosexual</td>
<td>11 (55)</td>
</tr>
<tr>
<td>Mostly gay/homosexual</td>
<td>4 (20)</td>
</tr>
<tr>
<td>Bisexual</td>
<td>5 (25)</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>11 (55)</td>
</tr>
<tr>
<td>Black or African-American</td>
<td>4 (20)</td>
</tr>
<tr>
<td>Asian or Asian American</td>
<td>3 (15)</td>
</tr>
<tr>
<td>Multiracial</td>
<td>2 (20)</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>2 (10)</td>
</tr>
<tr>
<td>Non-Hispanic</td>
<td>18 (90)</td>
</tr>
<tr>
<td><strong>Current student status</strong></td>
<td></td>
</tr>
<tr>
<td>Currently a Student</td>
<td>8 (40)</td>
</tr>
<tr>
<td><strong>Highest level of education completed</strong></td>
<td></td>
</tr>
<tr>
<td>Undergraduate degree</td>
<td>7 (35)</td>
</tr>
<tr>
<td>Some college</td>
<td>9 (45)</td>
</tr>
<tr>
<td>High school diploma/GED</td>
<td>1 (5)</td>
</tr>
<tr>
<td>Some high school</td>
<td>1 (5)</td>
</tr>
<tr>
<td>Trade school certificate</td>
<td>1 (5)</td>
</tr>
<tr>
<td>Graduate degree</td>
<td>1 (5)</td>
</tr>
</tbody>
</table>
## Results: Health-ITUES Scores (n=20)

<table>
<thead>
<tr>
<th>Scale</th>
<th>Mean (SD)</th>
<th>Median (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact</td>
<td>4.2 (1.2)</td>
<td>5 (1.3-5)</td>
</tr>
<tr>
<td>Perceived usefulness</td>
<td>4.1 (1.2)</td>
<td>5 (1.3-5)</td>
</tr>
<tr>
<td>Perceived ease of use</td>
<td>4.4 (0.9)</td>
<td>5 (3-5)</td>
</tr>
<tr>
<td>User control</td>
<td>3.6 (1.2)</td>
<td>4 (1.7-5)</td>
</tr>
<tr>
<td>Overall Health-ITUES score</td>
<td>4.1 (1.1)</td>
<td>4 (2.6-4.9)</td>
</tr>
</tbody>
</table>

*Score description:*

1-5 Likert scale, higher scores indicate more ease of use
### Results: Heuristic Mean Severity Scores (n=5)

<table>
<thead>
<tr>
<th>Heuristic Principle</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visibility of System Status</td>
<td>2.2 (1.1)</td>
</tr>
<tr>
<td>Match between System and Real World</td>
<td>1.4 (1.1)</td>
</tr>
<tr>
<td>User Control and Freedom</td>
<td>2.6 (1.1)</td>
</tr>
<tr>
<td>Consistency and Standards</td>
<td>1.2 (1.0)</td>
</tr>
<tr>
<td>Help Users Recognize, Diagnose, and Recover from Errors* (4 out of 5 evaluators answered)</td>
<td>0.75 (0.9)</td>
</tr>
<tr>
<td>Error Prevention</td>
<td>1.4 (1.1)</td>
</tr>
<tr>
<td>Recognition Rather than Recall</td>
<td>1 (1.0)</td>
</tr>
<tr>
<td>Flexibility and Efficiency of Use</td>
<td>1.2 (1.3)</td>
</tr>
<tr>
<td>Aesthetic and Minimalist Design</td>
<td>0.2 (0.4)</td>
</tr>
<tr>
<td>Help and Documentation</td>
<td>1.4 (0.9)</td>
</tr>
</tbody>
</table>

*Scoring descriptions:*

*Scale is from 0-4, with 4 being usability catastrophe*
“Find Services” page  
- Integrates with the HIV Testing Sites and Care Services Locator provided by hiv.gov

Testing History page  
- Can review tests they have taken to review date and results on this page
Results: End User Quotes

Checking for nearby services:
– “I think the finding service thing is really useful though because I can’t tell you how many times I’ve been (looking), maybe not just for HIV stuff, but just for like healthcare information and stuff. It’s good to have an easy portal. I didn’t even know the government had this kind of thing.”

Receiving the results on the mLab App:
– “It’d be a really useful tool. If I was ever to do another HIV home test, I would use the [mLab] app, especially to take a photo of the result and to get the second conformation.”
### Next Steps: Overview of Design, Participants, and Timeline

<table>
<thead>
<tr>
<th>Design/Methods</th>
<th>Participants</th>
<th>Study Timeline</th>
</tr>
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<tbody>
<tr>
<td>Randomized controlled design</td>
<td>High-risk YMSM and YTGW (N=500; intervention=250 control n=250)</td>
<td>Begin: November 2019 End: October 2021</td>
</tr>
<tr>
<td>Analysis of Para Data</td>
<td>Data Collected through Participant use of the mLab App (N=250)</td>
<td>October of 2022</td>
</tr>
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*Principal investigators

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References


- Schnall R, Cho H, and Liu J, Health Information Technology Usability Evaluation Scale (Health-ITUES) for Usability Assessment of Mobile Health Technology, JMIR mHealth uHealth. 2018;6 (1). doi: 10.2196/mhealth.8851; PMCID: PMC5775483; PMID: 29305343


NIH
National Institute of Mental Health
R01 MH118151-01
Thank you

Questions?
Disruptive Innovations to Overcome Healthcare Challenges

Brian S. Alper, MD, MSPH, FAAFP

Founder of DynaMed
VP of Innovations and EBM Development EBSCO Information Services
Disclosures

- Dr. Alper is full-time employee of EBSCO Information Services
- Innovations shown are products of EBSCO Innovation Services or its partners
Challenge: We Do Not Make Informed Decisions
CHALLENGE: We Do Not Make Informed Decisions

SOLUTION: Evidence-based medicine: Know the evidence through systematic review
CHALLENGE: We Do Not Make Informed Decisions

BUT:
Systematic reviews cannot scale to meet all our information needs and stay current

SOLUTION:
Evidence-based medicine: Know the evidence through systematic review

BETTER SOLUTION:
Systematic Literature Surveillance (DynaMed 7-Step methodology)
# Systematic Literature Surveillance

## 7-Steps to be Evidence Based

<table>
<thead>
<tr>
<th>Step</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Identifying the evidence</td>
</tr>
<tr>
<td>2</td>
<td>Selecting the best available evidence</td>
</tr>
<tr>
<td>3</td>
<td>Critical Appraisal</td>
</tr>
<tr>
<td>4</td>
<td>Objectively Reporting the Evidence</td>
</tr>
<tr>
<td>5</td>
<td>Synthesizing Multiple Evidence Reports</td>
</tr>
<tr>
<td>6</td>
<td>Basing Conclusions on the Evidence</td>
</tr>
<tr>
<td>7</td>
<td>Maintaining Currency</td>
</tr>
</tbody>
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## Systematic Review

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<td>Systematic Search</td>
</tr>
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<td>Does it answer the question?</td>
</tr>
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<tr>
<td>Basing Conclusions on the Evidence</td>
</tr>
<tr>
<td>Repeating search after ____?</td>
</tr>
</tbody>
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## Systematic Literature Surveillance

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</tr>
<tr>
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</tr>
<tr>
<td>Synthesizing Multiple Evidence Reports</td>
</tr>
<tr>
<td>Basing Conclusions on the Evidence</td>
</tr>
<tr>
<td>Updating Daily</td>
</tr>
</tbody>
</table>

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Does it answer a relevant question?
Challenge:
We Do Not Know the Right Thing to Do
CHALLENGE: We Do Not Know the Right Thing To Do

BUT:
Guidelines can be inconsistent, outdated and wrong

SOLUTION: Guidelines

BETTER SOLUTION: Synthesize across guidelines and evidence
Overview and Recommendations

Background

- Hypertension is a sustained elevation of systemic arterial blood pressure.
- Hypertension is most commonly defined as systolic blood pressure (SBP) ≥ 140 mm Hg or diastolic blood pressure (DBP) ≥ 90 mm Hg, but definitions vary by professional organization (see Definitions section for specific cutoffs).
- Onset is generally at age 20-50 years, but prevalence increases with age.
- Risk factors for hypertension include weight gain and obesity, alcohol use (particularly for men), and exposure to insulin.
- Most patients with hypertension have primary or essential hypertension, but in 10%-15% of patients it may be due to secondary causes.
- Selected lifestyle interventions, including modifications in diet, regular exercise, and restriction of alcohol intake, can lower blood pressure and prevent or reduce the likelihood of developing hypertension.
- Untreated hypertension is associated with an increased risk of cardiovascular events and mortality.

Evaluation

Initial Diagnosis

- Measure blood pressure with the appropriate cuff size in a calm, seated position and with the patient’s arm supported at the level of the heart (Strong recommendation).
- A hypertension diagnosis is based on ≥ 2 blood pressure measurements per visit, at ≥ 2 visits, with systolic blood pressure (SBP) ≥ 140 mm Hg and/or diastolic blood pressure (DBP) ≥ 90 mm Hg when using manual measurement methods (Strong recommendation).
Target Blood Pressure and Medications for Patients without Comorbidities

- For most patients without comorbidities
  - consider a **target blood pressure** < 140/90 mm Hg for most patients (**Weak recommendation**)
  - when starting **antihypertensive medications**:
    - use a thiazide-type diuretic or an angiotensin-converting enzyme (ACE) inhibitor for most patients (**Strong recommendation**).
    - Thiazide-type diuretics are a recommended option in most guidelines, and are shown to reduce mortality.
    - ACE inhibitors are a recommended option in most guidelines, especially for nonblack patients, and may reduce mortality.
    - consider an angiotensin receptor blocker (ARB) or a calcium channel blocker as an alternative option for the first-line therapy (**Weak recommendation**).
    - ARBs are a recommended option in most guidelines, especially for nonblack patients, but may not reduce mortality and have limited data on comparative efficacy.
    - Calcium channel blockers are a recommended option in most guidelines, but have limited data on mortality reduction.
    - beta blockers are not recommended as an initial option in some guidelines, and may be less effective for reducing cardiovascular events than other initial drug choices.

- For selected patients ≥ 50 years old with increased 10-year cardiovascular risk who desire a more intensive approach, consider a **target systolic blood pressure** < 120 mm Hg using an automated blood pressure measurement device.

Target Blood Pressure and Medications for Patients with Comorbidities

- Consider **comorbidities** to guide the target blood pressure and initial drug selection.
  - In patients with diabetes
    - guidelines vary but targets range from < 130/80 mm Hg to < 140/90 mm Hg
    - consider an ACE inhibitor or an ARB (**Weak recommendation**), particularly in those with microalbuminuria.
  - In patients with chronic kidney disease
    - consider a **target blood pressure** < 140/90 mm Hg (**Weak recommendation**), while some guidelines suggest < 130/80 mm Hg if proteinuria or diabetes is also present.
Antihypertensive Medication Selection

- in patients without comorbidities
  - guidelines recommend initial antihypertensive drug choice (either monotherapy or combination therapy) from 5 drug classes

Table 5. Initial Antihypertensive Choices

<table>
<thead>
<tr>
<th>Drug Choice</th>
<th>ACC/AHA</th>
<th>JNC8</th>
<th>ESC/ESH</th>
<th>Hypertension Canada</th>
<th>NICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACE inhibitor</td>
<td>Recommended for nonblack patients (ACC/AHA Class I, Level A)</td>
<td>Recommended for nonblack patients (JNC8 Moderate recommendation)</td>
<td>Recommended for all (ESC/ESH Class I, Level A)</td>
<td>Recommended for nonblack patients (ESC/ESH Class I, Level A)</td>
<td>Recommended for nonblack patients (Hypertension Canada)</td>
</tr>
<tr>
<td>ARB</td>
<td>Recommended for nonblack patients (ACC/AHA Class I, Level A)</td>
<td>Recommended for nonblack patients (JNC8 Moderate recommendation)</td>
<td>Recommended for all (ESC/ESH Class I, Level A)</td>
<td>Recommended for all (Hypertension Canada)</td>
<td>Recommended for all (Hypertension Canada)</td>
</tr>
</tbody>
</table>

5 major guidelines noted:
- ACC/AHA
- JNC8
- ESC/ESH
- Hypertension Canada
- NICE

ACE inhibitors and ARBs:
- Recommended as an initial option by all 5 guidelines
- Treated equally by all 5 guidelines

Beta blockers:
- Not recommended by ACC/AHA, JNC8, NICE
- Recommended as an initial option by ESC/ESH and Hypertension Canada
Angiotensin receptor blockers (ARBs)

Efficacy (ARBs)
- no randomized controlled trials comparing first-line angiotensin receptor blockers (ARBs) to placebo or untreated control found in Cochrane review [Cochrane Database Syst Rev 2018 Apr 18;(4):CD001841]

- angiotensin-converting enzyme (ACE) inhibitors but not angiotensin receptor blockers (ARBs) associated with reduced all-cause mortality in patients with hypertension [level 2 [mid-level] evidence]
  - based on systematic review without trial quality assessment
  - systematic review of 20 randomized trials evaluating ACE or ARB inhibitor vs. placebo or other antihypertensive drug for cardiovascular mortality or morbidity in 158,988 patients
  - 91% of participants were hypertensive
  - ACE inhibitors associated with reduced all-cause mortality (hazard ratio 0.9, 95% CI 0.84-0.97) in analysis of 7 trials with 76,615 patients
  - no significant association between ARB inhibitor and all-cause mortality (HR 0.99, 95% CI 0.94-1.04) in analysis of 13 trials with 82,383 patients

- ARBs may reduce risk of stroke, heart failure, and new onset diabetes, but may not reduce overall or cardiovascular mortality; potential reduction in myocardial infarction not clearly established [level 2 [mid-level] evidence], based on trials crossing many populations (not specific to hypertension)
  - based on systematic review with inadequate assessment of trial quality
  - systematic review of 37 randomized trials comparing ARBs to control (placebo or active treatment) in 147,020 patients with follow-up of at least 1 year
  - evaluation of trial quality did not include assessment of intention-to-treat analysis, baseline differences, or dropout rates
  - patient diagnoses included hypertension, heart failure, diabetes mellitus, atrial fibrillation, coronary artery disease, myocardial infarction, and stroke
  - comparing ARBs to placebo, ARBs associated with
    - reduced risk of stroke in analysis of 11 trials
      - relative risk (RR) 0.91 (95% CI 0.85-0.98)
      - NNT 117-872 assuming stroke in 6% of controls
    - reduced risk of heart failure in analysis of 10 trials
      - relative risk (RR) 0.88 (95% CI 0.82-0.95)
Challenge: We Do Not Know When We Should Do
CHALLENGE: We Do Not Know When We Should Do

SOLUTION: Guidelines with explicit thresholds
Blood Pressure Treatment Threshold for 64-year-old with Diabetes

Recommendation 5
In the population aged 18 years or older with diabetes, initiate pharmacologic treatment to lower BP at SBP of 140 mm Hg or higher or DBP of 90 mm Hg or higher and treat to a goal SBP of lower than 140 mm Hg and goal DBP lower than 90 mm Hg.

Expert Opinion - Grade E

9.6. Diabetes Mellitus

<table>
<thead>
<tr>
<th>Recommendations for Treatment of Hypertension in Patients With DM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommendations are summarized in Online Data Supplements 46 and 47 and Systematic Review Report.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COR</th>
<th>LOE</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>SBP: B-R\textsuperscript{GR}</td>
<td>1. In adults with DM and hypertension, antihypertensive drug treatment should be initiated at a BP of 130/80 mm Hg or higher with a treatment goal of less than 130/80 mm Hg (1-8).</td>
</tr>
<tr>
<td></td>
<td>DBP: C-EO</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>A\textsuperscript{HR}</td>
<td>2. In adults with DM and hypertension, all first-line classes of antihypertensive agents (i.e., diuretics, ACE inhibitors, ARBs, and CCBs) are useful and effective (1, 9, 10).</td>
</tr>
<tr>
<td>IIb</td>
<td>B-NR</td>
<td>3. In adults with DM and hypertension, ACE inhibitors or ARBs may be considered in the presence of albuminuria (11, 12).</td>
</tr>
</tbody>
</table>

SR indicates systematic review.

Recommendations
The Figure summarizes the recommendations and clinical considerations. Recommendation 1: ACP and AAFP recommend that clinicians initiate treatment in adults aged 60 years or older with systolic blood pressure persistently at or above 150 mm Hg to achieve a target systolic blood pressure of less than 150 mm Hg to reduce the risk for stroke, cardiac events, and possibly mortality. (Grade: strong recommendation, high-quality evidence). ACP and AAFP recommend that clinicians select the treatment goals for adults aged 60 years or older based on a periodic discussion of the benefits and harms of specific blood pressure targets with the patient.

High-quality evidence showed that treating hypertension in older adults to moderate targets (<150/90 mm Hg) reduces stroke (ARR, 0.92) and cardiac events (ARR, 0.72). Moderate-quality evidence showed a possible reduction in mortality, however, the results did not quite achieve statistical significance (RR, 0.93 [CI, 0.85 to 1.00]). Most benefits apply to all adults regardless of whether they have diabetes. We rated the overall evidence as high because effects were favorable across outcomes and the reduction in mortality was nearly statistically significant. The most consistent and greatest absolute benefit was shown in trials with a higher mean SBP at baseline (>160 mm Hg). Any additional benefit from aggressive BP control is small, with a lower magnitude of benefit and inconsistent results across outcomes.
CHALLENGE: We Do Not When We Should Do

BUT: Do we care what the patient cares about?

SOLUTION: Guidelines with explicit thresholds

BETTER SOLUTION: Shared Decision Making
Doe, Jane
MRN 78941456, Female

Age: 64 years
Weight: 180 lbs

Problem List

<table>
<thead>
<tr>
<th>Description</th>
<th>Date Added</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overdue Breast Cancer Screening (last Mammogram April 4, 2013)</td>
<td>5/10/2019</td>
</tr>
<tr>
<td>Hypertension</td>
<td>6/4/2019</td>
</tr>
</tbody>
</table>

Dynamic Decision Support

HealthDecision for Hypertension
Tool illustrates impact of blood pressure reduction with medicine and non-pharmacological methods.
Launch
Hypertension Patient Information

The HealthDecision hypertension tool was used Tue Jun 04 2019 to evaluate benefits and harms of lowering blood pressure. This tool assumes you do not have cardiovascular disease or heart failure.

Data and Risk Assessment
Risks are calculated for a 64 year-old female with a blood pressure of 156/82 mmHg, currently taking blood pressure medicines. Other risk factors and data include: current smoking, elevated alcohol intake, a body mass index of 29.1 kg/m², total cholesterol 200 and HDL cholesterol 30 mg/dL.

The current blood pressure is considered "stage 2 hypertension" by the 2013 ACC/AHA guideline. Your cardiovascular event risk, including heart attack, stroke or cardiac death, in the next 10 years using the ASCVD Risk score is 21.1%.

This means that out of 100 women like you, about 21 will have an event without treatment.

Blood pressure goal:
The chosen goal was to get systolic pressure below 140 mmHg.
The treatments chosen should lower systolic pressure below 140 mmHg and so should meet the goal.

Plans for Treatment:
All treatments taken together are expected to lower systolic BP by about 17 mmHg from 156 to 139 mmHg. Reaching this level should lower the rate of cardiovascular events from 21 to 13 out of 100 people like you.

The treatment steps include: (expected SBP drop for step)
* Increase doses and/or add prescription medications. (17 mmHg)

For 100 women age 64 who meet goal using medications over 10 years:
Challenge:
We Do Not Tell Patients What They Need to Make Informed Decisions
CHALLENGE: We Do Not Tell Patients What They Need to Know to Make Informed Decisions

BUT: Decision aids are often wrong or outdated

SOLUTION: Patient Decision Aids

BETTER SOLUTION: Option Grid
Enlarged Prostate
Treatment Options for Benign Prostatic Hypertrophy

This decision tool is not for men with no or mild symptoms or with symptoms due to other reasons.

Last Update Sep 14, 2018 | Last Review Aug 13, 2019

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Competing Interests
The editors and reviewers on this EBSCO Health Option Grid decision aid have declared no conflicts of interest, as of Sep 31, 2017. All individuals involved in editorial work are required to disclose financial conflicts of interest. Any potential conflicts of interest are reviewed and managed according to the EBSCO Health Option Grid Disclosure of Competing Interests Policy.

Funding
The development of this decision aid was fully supported by EBSCO Health with no external funding.

STEP 1: Enter patient information

Risk Factors

AGE
- 49 years or younger
- 50-59 years
- 60-69 years
- 70 years or older

PEAK URINARY FLOW RATE
- Not low (≥ 12 mL/sec)
- Low (< 12 mL/sec or less)

Predicted risk: 3 out of 100 men (3%) will suddenly be unable to pee and need emergency care in the next 4 years.
**Enlarged Prostate**

**Treatment Options for Benign Prostatic Hypertrophy**

This decision tool is not for men with no or mild symptoms or with symptoms due to other reasons.

---

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**Enlarged Prostate: Treatment Options for Benign Prostatic Hypertrophy**

An enlarged prostate can limit your ability to pee. You may have a backup of pee making you need to go suddenly or go many times at night. This decision aid is not for men with no or mild symptoms or with symptoms due to other reasons.

### Patient Questions

<table>
<thead>
<tr>
<th>Patient Questions</th>
<th>Lifecycle Changes</th>
<th>Alpha blockers</th>
<th>Transurethral resection of the prostate (or TURP, remove part of prostate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>What does the treatment involve?</td>
<td>Options include drinking less alcohol and caffeine, limiting drinks right before bed, and waiting a little longer when feeling the need to pee.</td>
<td>Alpha blockers are medicines that relax bladder muscles and help you pee more easily. Discuss costs.</td>
<td>You will have surgery to remove part of your prostate. You will need a tube (catheter) to drain pee for up to 2 days. You may stay in the hospital for up to 3 days. Discuss costs.</td>
</tr>
<tr>
<td>Will it help my symptoms?</td>
<td>Up to 64 out of 100 men (64%) improve. Symptoms may improve in days or weeks.</td>
<td>About 59 to 76 out of 100 men (59% to 76%) improve. Symptoms may improve in weeks.</td>
<td>Out of 100 men, up to 98 (98%) improve at first and about 77 (77%) are still improved at 3 years. Symptoms may improve in days or weeks.</td>
</tr>
<tr>
<td>Will I pee less often at night?</td>
<td>About 67 out of 100 men (67%) may pee one less time at night.</td>
<td>About 47 to 61 out of 100 men (47% to 61%) may pee one less time at night.</td>
<td>At least 50 out of 100 men (more than 50%) may pee one less time at night.</td>
</tr>
<tr>
<td>What are the risks of an enlarged prostate?</td>
<td>In the next 4 years, about 10 out of 100 men (10%) will suddenly be unable to pee and need emergency care.</td>
<td>In the next 4 years, 7 out of 100 men (7%) will suddenly be unable to pee and need emergency care.</td>
<td>In the next 4 years, 1 out of 100 men (1%) will suddenly be unable to pee and need emergency care.</td>
</tr>
</tbody>
</table>
| What are the side effects?               | Does not apply.     | Out of 100 men, about:  
- 9 (9%) get dizzy  
- 7 (7%) have stuffy or runny nose  
- 6 (6%) feel tired all the time  
- 3 (3%) do not have erections  
- 2 (2%) have ejaculation problems | After surgery, most men have blood and pain when peeing. After 4 weeks, out of 100 men:  
- up to 30 (30%) leak pee which may be temporary  
- 12 (12%) hurt when peeing  
- up to 6 (6%) have blood in pee |
| What are the risks of treatment?         | Does not apply.     | Up to 1 out of 100 men (1%) may faint because of low blood pressure. | Out of 100 men, up to:  
- 8 (8%) have bladder or kidney infection  
- 6 (6%) have problems peeing  
- 4 (4%) need more surgery |

**NOTE:** The following options were available but not selected when this decision aid was generated: Watch and wait, 5-alpha reductase inhibitors (5-ARIs), Laser surgery, Transurethral microwave therapy (or TUMT, heat to remove part of prostate)
### Enlarged Prostate: Treatment Options for Benign Prostatic Hypertrophy

#### This decision aid is for men with an enlarged prostate.

An enlarged prostate can limit your ability to urinate, making you need to go suddenly or go many times.

####Patient Questions

<table>
<thead>
<tr>
<th>Questions</th>
<th>Options included</th>
<th>Tips</th>
<th>Side Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>What does the treatment involve?</td>
<td>Drinking less alcohol and caffeine, limiting fluids right before bed, and waking more often.</td>
<td>Alpha blockers are medicines that relax bladder muscles and help you pee more easily.</td>
<td>Side effects:</td>
</tr>
<tr>
<td>Will help my symptoms?</td>
<td>Up to 64% out of 100 men (54%) improve. Symptoms may improve in days or weeks.</td>
<td>About 59% of 100 men (57%) improve. Symptoms may improve in weeks.</td>
<td>Out of 100 men, up to 98 (98%) improve at 3 years. Symptoms may improve in days or weeks.</td>
</tr>
<tr>
<td>Will I do less often at night?</td>
<td>About 87 out of 100 men (97%) may need one less time at night.</td>
<td>About 47 to 61 out of 100 men (47% to 61%) may need one less time at night.</td>
<td>At least 59 out of 100 men (more than 59%) may need one less time at night.</td>
</tr>
<tr>
<td>What are the risks of an enlarged prostate?</td>
<td>In the next 5 years, about 10 out of 100 men (5%) will suddenly be unable to pee and need emergency care.</td>
<td>In the next 4 years, 7 out of 100 men (7%) will suddenly be unable to pee and need emergency care.</td>
<td>In the next 4 years, 1 out of 100 men (1%) will suddenly be unable to pee and need emergency care.</td>
</tr>
<tr>
<td>What are the side effects?</td>
<td>Out of 100 men, about:</td>
<td>Out of 100 men, up to 1 out of 100 men (1%) may have blood in the urine.</td>
<td>Out of 100 men, up to 2 out of 100 men (2%) have an infection.</td>
</tr>
<tr>
<td>What are the risks of treatment?</td>
<td>Does not apply</td>
<td>Does not apply</td>
<td>Does not apply</td>
</tr>
</tbody>
</table>

#### Additional Information

- **EMR Note:**
  - This note text can help you record the use of this customized decision aid. Adjust wording as needed.

- **Transurethral resection of the prostate (TURP, remove part of prostate):**

- **Submit questions or comments about this decision aid:**

**NOTE:** The following options were available but not selected when this decision aid was generated:

- Watch and wait
- 5-alpha reductase inhibitors (5-ARIs)
- Laser surgery
- Transurethral microwave therapy (TUMT, heat to remove part of prostate)
Enlarged Prostate
Treatment Options for Benign Prostatic Hypertrophy

This decision aid is not for men with no or mild symptoms or with symptoms due to other reasons.

An enlarged prostate can limit your ability to pee. You may have a backup of pee making you need to go suddenly or go many times at night.

This decision aid was customized for:
- **RISK FACTORS**: 50-59 years; NIT low (> 12 ml/kg)

Generate a new version of this US English decision aid

**PATIENT QUESTIONS**

- What does the treatment involve?
- Will it help my symptoms?
- Will I pee less often at night?

Watch and wait
About 22 to 36 out of 100 men (22% to 36%) may pee one less time at night.

Lifestyle changes
About 67 out of 100 men (67%) may pee one less time at night.

- What are the risks of an enlarged prostate?
- What are the side effects?
- What are the risks of treatment?

NOTE: The following options were available but not selected when this decision aid was generated.
Challenge:
Best Evidence and Guidance is Not Instantly Known When Planning Care
CHALLENGE: Best Evidence and Guidance is Not Instantly Known When Planning Care

BUT: Pathways do not cover many comorbidities or holistic care

SOLUTION: Clinical Pathways for Clinical Decision Support

BETTER SOLUTION: Care Plan Generator
<table>
<thead>
<tr>
<th>Select Conditions</th>
<th>Set Goals</th>
<th>Set Preferences</th>
<th>Set Icons</th>
<th>Schedule</th>
<th>Review CarePlan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronic Kidney Disease Stage 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Osteoarthritis of the Knee</td>
<td></td>
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</tr>
<tr>
<td>Depression</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Possible Opioid Use Disorder</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loneliness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seborrheic keratosis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skin tags</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preventive care</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Add Condition</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Remove Condition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rename Condition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Stage 3 CKD**

- Chronic kidney disease: What you need to know
- Avoid a high protein diet
  - View other Diet Actions

**Osteoarthritis**

- Osteoarthritis: What you need to know
- Exercise for Osteoarthritis
  - Weight Loss for Osteoarthritis
  - Swim 30 minutes 3 times a week
  - View other Activity Actions

**Prescriptions**

- Stop atenolol
- Start ACE inhibitor lisinopril 20mg 1x per day
- Start statin atorvastatin 20mg 1x per day
- Start oxycodone
- Start topical NSAID diclofenac gel
- Start duloxetine 30mg 1x per day for 1 week then 60mg 1x per day

**Messages / Referrals**

- Reminder via patient portal to record blood pressure daily
- Physical therapy referral

**Select Tests**

- Set goal
- Set preferences
- Set icons
- Schedule
- Review Care Plan
<table>
<thead>
<tr>
<th>Hypertension</th>
<th>Stage 3 CKD</th>
<th>Osteoarthritis</th>
</tr>
</thead>
<tbody>
<tr>
<td>- High blood pressure: What you need to know</td>
<td>- Chronic kidney disease: What you need to know</td>
<td>- Osteoarthritis: What you need to know</td>
</tr>
<tr>
<td>- High blood pressure module (video)</td>
<td></td>
<td>- Knee injection (video)</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td><strong>Lifestyle Actions</strong></td>
<td><strong>Prescriptions</strong></td>
</tr>
<tr>
<td>- DASH diet</td>
<td>- Avoid a high protein diet</td>
<td>- Exercise for Osteoarthritis</td>
</tr>
<tr>
<td></td>
<td>- Mediterranean diet</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Eat 6 servings of fruit &amp; vegetables a day</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- View other Diet Actions</td>
<td></td>
</tr>
<tr>
<td><strong>Prescriptions</strong></td>
<td></td>
<td><strong>Messages / Referrals</strong></td>
</tr>
<tr>
<td>- Stop atenolol</td>
<td>- Start ACE inhibitor</td>
<td>- Reminder via patient portal to record blood pressure daily</td>
</tr>
<tr>
<td>- Start ACE inhibitor</td>
<td>- lisinopril 20mg 1x per day</td>
<td></td>
</tr>
<tr>
<td>- lisinopril 20mg 1x per day</td>
<td>- Start statin</td>
<td></td>
</tr>
<tr>
<td>- atorvastatin 20mg 1x per day</td>
<td>- loratadine</td>
<td></td>
</tr>
<tr>
<td>- Physical therapy referral</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- oxycodone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start topical NSAID diclofenac gel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start duloxetine 30mg 1x per day for 1 week then 60mg 1x per day</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Select Tests**
**Mediterranean Diet**

**Related Summaries**
- Dietary considerations for cardiovascular disease prevention
- Diets for cardiovascular events and risk factor reduction
- Diets for weight loss
- Dietary considerations for patients with type 2 diabetes

**Overview**
- Mediterranean diet includes
  - minimally processed fruits, vegetables, breads, cereals, beans, nuts, and seeds
  - olive oil as main source of dietary lipids
  - limited intake of red meat and sweets
- recommendations from professional organizations
  - advise patients to consume natural foods high in monounsaturated fat (for example, olive oil in Mediterranean dietary pattern) due to strong association with improved health outcomes (AACE/ACE/TOS Grade A, BEL 1)
  - recommend Mediterranean meal plan (or therapeutic lifestyle changes meal plan providing 30%-35% of calories from total fat with emphasis on monounsaturated and polyunsaturated fatty acids) for patients who have abnormal non-low-density lipoprotein (LDL) cholesterol lipid values (AACE/ACE/TOS Grade A, BEL 1)
<table>
<thead>
<tr>
<th>Hypertension</th>
<th>Stage 3 CKD</th>
<th>Osteoarthritis</th>
</tr>
</thead>
<tbody>
<tr>
<td>High blood pressure: What you need to know</td>
<td>Chronic kidney disease: What you need to know</td>
<td>Osteoarthritis: What you need to know</td>
</tr>
<tr>
<td>High blood pressure module (video)</td>
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<td>Knee injection (video)</td>
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<tr>
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</tr>
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<td>Mediterranean diet</td>
<td></td>
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<td><strong>Prescriptions</strong></td>
</tr>
<tr>
<td>Walk 30 minutes 5 times a week</td>
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<td>Stop oxycodone</td>
</tr>
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<td>Swim 30 minutes 3 times a week</td>
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<td>Start topical NSAID diclofenac gel</td>
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### Hypertension
- High blood pressure: What you need to know
- High blood pressure module (video)

### Stage 3 CKD
- Chronic kidney disease: What you need to know

### Osteoarthritis
- Osteoarthritis: What you need to know
- Knee injection (video)

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- DASH diet
- Mediterranean diet
- Eat 6 servings of fruit & vegetables
- View other Diet Actions

#### Lifestyle Actions
- Walk 30 minutes 5 times a week
- Swim 30 minutes 3 times a week
- View other Activity Actions

#### Prescriptions
- Stop atenolol
- Start ACE inhibitor lisinopril 20mg 1x per day
- Start statin atorvastatin 20mg 1x per day
- Start oxycodone
- Start topical NSAID diclofenac gel
- Start duloxetine 30mg 1x per day for 1 week then 60mg 1x per day

#### Messages / Referrals
- Reminder via patient portal to record blood pressure daily

---

DynaMed Recommendation: When starting antihypertensive medication, use a renin-angiotensin system (RAS) blocker, either an angiotensin-converting enzyme (ACE) inhibitor or angiotensin receptor blocker (ARB) as initial therapy in patients with CKD and accompanying proteinuria of ≥ 30-300 mg/24 hours (Strong recommendation).

Heart Health Now Hypertension Treatment Algorithm (from AHRO):
<table>
<thead>
<tr>
<th><strong>Select Conditions</strong></th>
<th><strong>Set Goals</strong></th>
<th><strong>Set Preferences</strong></th>
<th><strong>Set Icons</strong></th>
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<tr>
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<td>ACE [Link]</td>
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<tr>
<td>Start statin atorvastatin 20mg 1x per day</td>
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<td></td>
</tr>
<tr>
<td>Serum creatine and potassium in 2 weeks</td>
<td>Serum creatine and potassium in 2 weeks</td>
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<td></td>
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</tr>
</tbody>
</table>
Challenge: We Do Not Know the “Human” in our Patients
CHALLENGE: We Do Not Know the “Human” in Our Patients

SOLUTION: Connect personally before starting the “work”

BUT: Busy physicians skip this effort with extreme time pressures

BETTER SOLUTION: Capture “human” story from patient and present it to support personal connection
Jackie Sample
Call me: Jackie
Age: 31
Boston, MA

I love to be outdoors doing something active. I've been working as an art teacher for three years. Before that, I was a graphic designer.

Main Health Issue
Diabetes - Type 2

This makes me happy
My family
Being near the ocean
Starting a painting, whether I finish it or not

Health priorities / goals
Manage diabetes with diet/exercise - no meds
Be able to do the activities I want to do - no limits

My agenda
Can I really handle diabetes without medicine?
My leg is starting to hurt - could that be diabetes?
We're thinking of having a baby - does pregnancy make diabetes worse?

Biggest barriers to staying healthy
Finding time to exercise
It's hard to eat right when out with friends
Public transportation is not convenient

Biggest pressure / worry
My mom is sick - I want to be there for her, but it's hard to handle everything.

How health affects life
I'm trying to deal with diabetes, but I've never had to think about my body in this way before. It's hard, but I'm starting to feel more confident in doing what's best for me.

Health Rating
Poor

Reason
I feel fine, but have a real illness.

Treatment Preference
Natural

Health Decision-Making
Self

Challenges
Money
Transport
Access
Shelter
Food
Safety

Advance Directive
I do not have one -- Ready to talk about it

Health Decision Support
Marc Sample [spouse / partner]

Last Updated
08/15/2017
**Chief Complaint:** Headache

**Patient Wisdom (updated 06/27/2019)**

**About Me:**
I was an elementary school teacher for 30 years, and stayed in town after I retired.

**Main Health Issue:**
Headaches

**Other Health Issues:**
Knee Replacement Surgery (Knee Arthroplasty)

---

**Vital Signs**
- **Height:** 5’2”
- **Weight:** 134 lbs
- **Temp:** 98.6°F
- **BP:** 144/92
- **HR:** 86
- **RR:** 22

**Physiology**

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health priorities / goals</td>
<td>Staying as independent as possible, trying to be healthy.</td>
</tr>
<tr>
<td>My agenda</td>
<td>My headaches</td>
</tr>
<tr>
<td>Feelings about Treatment</td>
<td>It’s hard to be alone.</td>
</tr>
<tr>
<td>Decision Making</td>
<td>Medical</td>
</tr>
<tr>
<td>Advance Directive</td>
<td>I do not have any - Ready to talk</td>
</tr>
</tbody>
</table>

**Problems (2)**

1. Essential (primary) hypertension
   - **Date:** 11/21/16
   - **Decision Making:** Health Decision
2. Spinal stenosis, lumbar region without neuro ... 11/21/15
   - **Decision Making:** Option Grid

---

**Medications (9)**

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
<th>Instructions</th>
<th>Medication Review</th>
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<tbody>
<tr>
<td>10/12/18</td>
<td>Cozaar</td>
<td>100mg po hs</td>
<td>Drug Interactions</td>
</tr>
<tr>
<td>10/12/18</td>
<td>Diltiazem</td>
<td>25mg po qd</td>
<td>Drug Interactions</td>
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<tr>
<td>12/12/18</td>
<td>Zocor</td>
<td>20mg po hs</td>
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<tr>
<td>9/24/18</td>
<td>Percocet</td>
<td>5mg tid</td>
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<tr>
<td>5/21/18</td>
<td>Lisinopril</td>
<td>10mg po qd</td>
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<tr>
<td>4/30/18</td>
<td>Prolopec</td>
<td>20mg po prn</td>
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<tr>
<td>4/2/13</td>
<td>Allegra</td>
<td>180mg po qd</td>
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<tr>
<td>11/8/12</td>
<td>Micronase</td>
<td>5mg po qd</td>
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</tr>
<tr>
<td>4/21/11</td>
<td>Cymbalta</td>
<td>30mg po qd</td>
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</tbody>
</table>

**Dynamic Support Decision**

**Abnormal Lab Tests (3)**
- High Triglycerides – see Dynamed: Hypertriglyceridemia or Management of dyslipidemia
- High LDL – see Dynamed: Low HDL, cholesteral level or Management of dyslipidemia
- Low HDL – see Dynamed: Low HDL, cholesterol level or Management of dyslipidemia

**Shared Decision Making Tools (2)**
- Hypertension – see Health Decision: Hypertension: ASCVD risk reduction with BP lowering
- Spinal stenosis – see Option Grid: Stenosis of lower back, Treatment Options for Spinal Narrowing

**Comprehensive Medication Review (14)**
- 3 Medications without Indications
- 2 Medication Dose Concerns
- 2 Drug Interaction Warnings
- 2 Other Medication Reminders
- 5 Drug-induced Adverse Effects at risk

---

**Consults (7)**

<table>
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<th>Date</th>
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<th>Provider</th>
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<td>1/19/19</td>
<td>Emergency Medicine</td>
<td>Jack Sparrow</td>
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<tr>
<td>12/6/18</td>
<td>Cardiology</td>
<td>Leo Marvin</td>
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<td>12/1/18</td>
<td>Dermatology</td>
<td>Zoe Washburne</td>
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<td>9/24/18</td>
<td>Neurosurgery</td>
<td>Shelly Wiggins</td>
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<tr>
<td>4/1/18</td>
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<td>Agatha Christie</td>
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<tr>
<td>11/21/17</td>
<td>Gastroenterology</td>
<td>Lee Hurts</td>
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<tr>
<td>8/18/17</td>
<td>Dermatology</td>
<td>Kara Thrace</td>
<td></td>
</tr>
</tbody>
</table>
Finding Knowledge

Building a Functioning CDS Ecosystem
AHRQ evidence-based Care Transformation Support (ACTS) Initiative: Context for a Better PCCDS Ecosystem

Jerome A. Osheroff, MD, FACP, FACMI
Objectives

▪ Share information about AHRQ-driven initiative (ACTS) to improve development, dissemination and use of evidence-informed resources to improve care delivery/outcomes

▪ Seed discussion on next steps to improve PCCDS ecosystem
Mae, a patient with multiple chronic conditions can expect:

- An extended care team to have all the **information and tools when/where and how needed**
- To leverage a ‘**care plan generator**’ assembles evidence-based **recommendations** for Mae’s problems individually and collectively – and **helps her and her team implement them**
- To **customize these recommendations** for her goals, preferences and circumstances using **shared decision-making tools**
- To have this integrated **care plan shared across the care team decreases care gaps**, and **population health tools** also monitor for and help **prevent such gaps**
- To electronically **communicate and use telehealth tools to support collaboration** and coordination among Mae’s care team, including with her daughter
PCCDS Analytic Framework For Action to Improve Care Delivery and Outcomes
Similar/Broader ACTS Perspective: National Learning Health System
ACTS Approach to Getting There

ACTS Overview

- Create broad/deep Stakeholder Community
- Define shared future vision for health IT/evidence-enabled care delivery and transformation
- Develop consensus Roadmap for stakeholder action (AHRQ/others) to broadly achieve future vision
- Present Roadmap to AHRQ/other organizations for action

Goal:

- Improve care delivery/transformation in a National LHS that routinely achieves the ‘Decision/Action Support 5 Rights’
Expanded CDS 5 Rights framework that applies to all LHS Cycle decision and action support needs/stakeholders/activities.
Obstacles to an Effective National LHS

- Inconsistent/hard to locate evidence
- Impedes development and maintenance of actionable knowledge resources
- Actionable knowledge resources are underutilized/hard to locate and need improvement
- Lack of shared vision and coordinated action to address the entire cycle
- Inadequate funding/incentives/policies to drive needed improvements
- Key standards/infrastructure not available or inconsistently used
- Incomplete and inaccurate data yield suboptimal or incomplete evidence
- Lack of robust, workflow-friendly data collection limits information available to assess outcomes
- Incomplete and inaccurate data yield suboptimal or incomplete evidence
Future Vision: A National LHS Without Obstacles & Silos

Resources Developer
Ready access to evidence and information when and how needed; increasingly delivered proactively for resource development, updating

Information/Resources are FAIR
Findable, Accessible, Interoperable, Reusable

Care Delivery/Transformation
CARE DELIVERY
Patients/care teams have current tools and resources to develop and implement evidence-informed care plans for all clinical issues, and to address other care needs

CARE TRANSFORMATION (Organization LHS)
Quality Improvement teams use tools/resources informed by best evidence; these address costs, are sensitive to organizational needs, comprehensively support care transformation

National Learning Health System
Supportive policies/incentives; effective standards, marketplaces, shared focus and efforts on goals. Information available when/where/how needed to optimize decisions/activities/results
## Care Plan Generator: Care Delivery Centerpiece (Mockup)

### Concept Demonstration of Care Plan Generator (in development by EBSCO Health Innovations)

<table>
<thead>
<tr>
<th>Select Conditions</th>
<th>Set Goals</th>
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<th>Set Icons</th>
<th>Schedule</th>
<th>Review CarePlan</th>
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#### Hypertension
- High blood pressure: What you need to know
- High blood pressure module (video)

**Education**
- DASH diet
- Mediterranean diet
- Eat 3 servings of fruit & vegetables a day

**Lifestyle Actions**
- Walk 30 minutes 5 times a week
- Swim 30 minutes 3 times a week

**Prescriptions**
-Stop atenolol
-Start ACE inhibitor lisinopril 20mg 1x per day

**Messages / Referrals**
- Reminder via patient portal to record blood pressure daily

**Select Tests**
- Basic Metabolic Panel
- Serum creatine and potassium in 2 weeks

#### Stage 3 CKD
- Chronic kidney disease: What you need to know
- Knee injection (video)

**Education**
- Avoid a high protein diet

**Lifestyle Actions**
- Walk 30 minutes 5 times a week
- Swim 30 minutes 3 times a week

**Prescriptions**
- Start ACE inhibitor lisinopril 20mg 1x per day

**Messages / Referrals**

**Select Tests**
- Basic Metabolic Panel

#### Osteoarthritis
- Osteoarthritis: What you need to know
- Knee injection (video)

**Education**
- Exercise for Osteoarthritis
- Weight Loss for Osteoarthritis

**Lifestyle Actions**
- Swim 30 minutes 3 times a week

**Prescriptions**
- Start topical NSAID diclofenac gel
- Start dolutetin 30mg 1x per day for 1 week then 60mg 1x per day

**Messages / Referrals**
- Physical therapy referral

**Select Tests**
- Basic Metabolic Panel

#### Depression, possible OUD, loneliness
- Depression: What you need to know
- Opioids: Using them safely and wisely to help with pain
- The loss of a loved one: Surviving the storm and finding a new norm

**Education**
- View other Diet Actions

**Lifestyle Actions**
- Walk 30 minutes 5 times a week
- Swim 30 minutes 3 times a week

**Prescriptions**
- Stop oxycodone
- Start duloxetine 20mg 2x per day for 1 week then 60mg 1x per day

**Messages / Referrals**
- Referral to community support group for widows/widowers
- For Depression – Messages/Referrals – Mental Health: Consult for Depression Order Set

**Select Tests**
- Referral to community support group for widows/widowers
- For Depression – Messages/Referrals – Mental Health: Consult for Depression Order Set
A Roadmap for Making the Cycle work to Achieve the Quadruple Aim

1. **Shared vision and collaborative approach** used to build the National LHS
2. **Portals and marketplaces** enable discovery, access and implementation for evidence-based LHS content
3. **Standards and interoperability infrastructure** support seamless information flow for the LHS cycle
4. **LHS tools, expertise and best practices** are part of routine training and care delivery for patients, clinicians, and systems
5. **Payments, incentives and policies** encourage LHS and drive care transformation toward quadruple aim
## Organizations Receiving Roadmap Presentation (38)

<table>
<thead>
<tr>
<th>Feds (5)</th>
<th>Care Delivery Organizations (13)</th>
<th>Health IT Vendors (9)</th>
<th>Specialty Societies (2)</th>
<th>Other (9)</th>
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<td>EBSCO</td>
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<td>4 Virginia Ambulatory Care Outcomes Research Network (ACORN) practices</td>
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</table>
Conclusion/Discussion Points

- Similar PCCDS-LN/ACTS goals, approaches
  - Synergies actively being cultivated
- Suggestions for specific things we should be thinking/doing?
- Participation in ACTS Stakeholder Community welcomed
  - For final deliverable review, engagement in next steps
For updates on future events and activities of the AHRQ ACTS Initiative, please check the ACTS website:

- https://healthit.ahrq.gov/acts

ACTS Project Team contact info:

- support@ahrq-acts.org

Jerry Osheroff contact info

- josheroft@tmitconsulting.com
Finding Knowledge

Building a Functioning CDS Ecosystem
Key contributions made by the Learning Network over the Past 3 Years

- Identified barriers, facilitators and methods to improve the dissemination of evidence through CDS
- Helped to define and advance the concept of Patient-Centered CDS
- Developed the CDS Analytic Framework to represent CDS stakeholders and the CDS Implementation Life Cycle
- Identified and published key elements of trust for CDS Artifacts
- Developed a Stakeholder-driven Action Plan for Improving Pain Management, Opioid Use, and Opioid Use Disorder Treatment Through Patient-Centered Clinical Decision Support
## Many Entities Pushing the Frontiers of CDS and CBK

<table>
<thead>
<tr>
<th>Entity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHRQ Funded CDS Connect</td>
<td>Develop an online presence that offers a repository of CDS artifacts and creates prototype tools and infrastructure for building and sharing CDS artifacts across health care settings.</td>
</tr>
<tr>
<td>Mobilizing Computable Biomedical Knowledge (MCBK)</td>
<td>A “movement” promoting CBK for learning health systems.</td>
</tr>
<tr>
<td>AHRQ evidence-based Care Transformation Support (ACTS)</td>
<td>Developing a future vision for making AHRQ-related evidence available and computable via CDS.</td>
</tr>
<tr>
<td>Logica / Health Services Platform Consortium (HSPC)</td>
<td>Specifying a Marketplace for the publication, search, and deployment of executable knowledge.</td>
</tr>
<tr>
<td>The Learning Network</td>
<td>Laying out a vision and evangelizing for a self-sustaining entity that reduces friction among stakeholders across the CDS ecosystem.</td>
</tr>
</tbody>
</table>
Two Complementary Ways to Represent Knowledge

Present: Human readable in words & pictures

Future: Computable (machine-executable) in code

Library Holdings: Books and Journals

Library Holdings: Will add Digital Knowledge Objects

Core Concept for CDS

https://mobilizecbk.med.umich.edu/
The CDS Ecosystem and the CDS Lifecycle

- Rapidly advancing standards for interoperable CDS emerging, but:
  - Stakeholders poorly coordinated
  - Disjointed knowledge management life cycles
  - High barriers to effective CDS implementation
  - Limited ability to achieve predicted ROI
  - Frustrated clinicians
  - Poor inclusion of patient values and goal
Overlapping Stakeholder Entities and Roles Constituting the CDS Ecosystem

**Stakeholder Entities**
- Clinicians
- Payers
- Patients
- Patients advocates
- Providers
- Standards Organizations
- HIT and Knowledge Vendors
- Medical Device Makers
- Federal Agencies
- Foundations and Research Institutes
- Quality Support Organizations
- Organizational Governance bodies
- Accrediting and Licensing Bodies
- HIEs and Data Organizations
- Professional Societies

**Stakeholder Roles**
- Clinician
- Payer
- Patient
- Patient Advocates
- Provider
- Standards developer
- Evidence Based Researcher
- Quality Improvement Analyst
- Policymaker
- Population Health End User
- Knowledge Author
- Knowledge Curator
- Knowledge Distributor
- Knowledge Engineering Professional
- Standard Based Application developer
# Emerging Model: Layers of Abstraction and Tiers of Implementation

<table>
<thead>
<tr>
<th>Tier of Implementation</th>
<th>Layers of Abstraction</th>
<th>Example Tier Content</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>L1: Narrative</strong></td>
<td></td>
</tr>
<tr>
<td>Tier 3: Presentation</td>
<td>Wireframe/UI prototyping</td>
<td>HTML, Smart on FHIR, iFrame, Web app, app</td>
</tr>
<tr>
<td></td>
<td>Structured Data Capture (SDC) and XForms</td>
<td>Use-cases, Personas, Forms, User-interfaces</td>
</tr>
<tr>
<td></td>
<td><strong>L2: Semi-structured</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CQL, KNARTs, eCQMs, DMN, BPMN, CMMN</td>
<td>Guideline Narratives, Measure Specifications, Workflow(s), Recommendations</td>
</tr>
<tr>
<td></td>
<td><strong>L3: Structured</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>VSAC value sets, SNOMED, RxNorm, LOINC, ANF (CDC CDS Kaizan checklists)</td>
<td>Terminologies, Data Dictionary, Model, Data access services</td>
</tr>
<tr>
<td></td>
<td>FHIR, QICore, Quick, QDM, CIMI/CEM (CDC CDS Kaizan checklists)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>L4: Executable</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HL7 2.x, SQL, CORBA, WCF, REST</td>
<td></td>
</tr>
<tr>
<td>Example Layer Content:</td>
<td>Guideline for a specific disease, measure specification</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flow diagram, Decision tree or table with recommendations (human readable)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Standards-compliant specification encoding logic with data model(s), terminology/code sets, value sets (computer interpretable)</td>
<td>Logic implemented in a production environment (native execution, or web services, or hybrid)</td>
</tr>
</tbody>
</table>

Adapted from: [http://build.fhir.org/ig/HL7/cqf-recommendations/documentation-approach.html](http://build.fhir.org/ig/HL7/cqf-recommendations/documentation-approach.html)
A Knowledge Network Entity could Increase Collaboration Between Public and Private Knowledge Stakeholders

1. Knowledge Portals/APIs (with underlying Knowledge Repositories) supplying knowledge artifacts directly to EHR vendor or CDS Implementers not compliant with Knowledge Network Standards
2. Knowledge Repository supplying content to a Knowledge Commerce Entity employing Knowledge Network approved standards (K Meta-data schema, K locator services, K representation standards, encoding standards)
3. Knowledge Repository supplying K assets compliant with Knowledge Network Standards to both Knowledge Network and CDS Implementers (EHRs, or Cloud services)
A “Knowledge Network” is currently a Missing Layer in the CDS Ecosystem

| Reference Architecture (Standards for Level of abstraction and implementation tier) | Knowledge Commerce Entities  
(Operational knowledge stores and implementations, e.g. EHRs, CDS Implementers (Apervita, etc.) |
| Knowledge Network  
(Artifacts Index, Standards, Best Practices) |
| Knowledge Repository Entities  
(Repositories, Sources of knowledge) |
The ACTs Road Map has Advanced Objectives that Might be Addressed through an Knowledge Network Entity

The Learning Network could Evolve as a Public/Private collaborative Supporting ACTs Roadmap Objectives:

1. Collaboratively guide the design and piloting of Portals supporting FAIR principles for knowledge artifacts
2. Convene and , and Collaboratively lead develop public/private CDS marketplace specifications
3. Support collaborative efforts to advance needed standards
4. Support the collaborative collection of requirements, and the design of a national CDS testbed and supporting pilots
Example: Guiding CBK Portal Design and Development

- Master Knowledge Index: Guiding design of a master index, a central concept (e.g., ID for each asset) to make knowledge assets more findable
- Knowledge Taxonomy development: Develop a multidimensional taxonomy to provide additional organization
- Metadata Schema: Create a schema for the application of metadata
- Annotation System + Interface: Adapt a system for annotation of knowledge assets with more systematized management
- Multimodal Search: Provide search support in multiple ways, including
  - Portal: Create portal to make knowledge assets accessible
  - API: Create an API for machines (apps and agents) to access knowledge assets
- Extend to Computable Knowledge: Apply to more granular resources
Functions Knowledge Network Entity Might Address

Knowledge Commerce Entities (KCEs)

- L4 specifications and implementations
- CDS Product Information Label
- Digital rights management
- Support, provisioning/updates, monetization (where appropriate)
- Performance characterization against customer data
- Curation of commercial assets
- Patient safety and feedback data

Knowledge Network Entity (KNE)

Across Stakeholders:
- Apply and maintain MOUs across all stakeholders
- Convening experts and WGs
- Knowledge schema/metadata design and governance
- Knowledge resource locator and meta-index maintenance
- CDS Product Information Label DSTU development/governance
- Reference performance characterization against test data sets
- Knowledge repository standards development
- Marketplace standards
- Aggregate / anonymized CDS safety reports (See: National Testbed)

Knowledge Repositories Entities (KREs)

- Physical repositories (L1, L2, L3)
- Tagged assets
- Professional and authoritative creation and curation of assets
Participant Panel on User-Centered Design in CDS

Richard D. Boyce, Guilherme Del Fiol, Daniel Malone
Enabling Shared Decision Making to Reduce Harm from Drug Interactions

Richard D. Boyce
Potential drug-drug interactions (PDDIs)

Exposure two or more drugs that are known to interact

“potential” because exposure does not necessarily mean a clinically meaningful effect

Exposure is very common

33% of general hospital patients and 67% of ICU patients [1]

Clues about the frequency of harm

Clinically important events attributable to drug-drug interactions [1]:
- 5.3% - 14.3% of inpatients
- 231,000 US emergency department visits

Hospital admissions associated with an adverse drug event attributable to drug-drug interactions [2]:
- 22.2% (interquartile range 16.6 - 36.0%)

Reason’s team error conceptual model applied to PDDIs

Hansten PD, Horn JR. Modified from: James Reason, Human Error, 1990
Patient education is an important defense that is not currently well supported.

Thus, interoperable patient-centered shared decision making tools will enhance patient-provider decision making regarding PDDI risks and benefits.
Innovation: Patient-centered tools for shared PDDI decision making

Hansten PD, Horn JR. Modified from: James Reason, Human Error, 1990
Innovation: Patient-centered tools for shared PDDI decision making continued…

- Prescriber’s Knowledge
- Computer Screening
- Patient Risk Factors
- Patient Education

A + B

ADR
Innovation: Patient-centered tools for shared PDDI decision making continued...

Prescriber’s Knowledge

- Computer Screening
- Patient Risk Factors
- Patient Education

Patient-centered PDDI shared decision making tool - DDInteract

Avoidance of ADR
Specific aims

1. Design and evaluate a user-centered PDDI CDS dashboard called DDInteract
2. Enable the creation of contextual PDDI CDS knowledge artifacts using the CDS Connect
3. Conduct a pilot dissemination of DDInteract and PDDI knowledge process
Clinical focus – Management of anticoagulant PDDIs

Warfarin PDDIs:
- Warfarin and Non-steroidal anti-inflammatory drugs (NSAID)
- Warfarin and antidepressants
- Warfarin and salicylate

Direct-acting oral anticoagulants (DOACs) (i.e., apixiban, dabigitran, endoxaban, and rivaroxaban)
- DOACs and antidepressants
Example use case – warfarin and NSAIDS

- Common exposure
- Increases bleeding risk 2-fold

<table>
<thead>
<tr>
<th>Study</th>
<th>OR (95% CI)</th>
<th>% Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoor, 1993</td>
<td>2.66 (1.12, 6.29)</td>
<td>6.37</td>
</tr>
<tr>
<td>Johsen, 2001</td>
<td>3.38 (1.17, 9.80)</td>
<td>4.52</td>
</tr>
<tr>
<td>Battistella, 2005</td>
<td>1.90 (1.16, 3.11)</td>
<td>13.69</td>
</tr>
<tr>
<td>Hauta-Aho, 2009</td>
<td>2.79 (0.88, 8.88)</td>
<td>3.91</td>
</tr>
<tr>
<td>Cheethan, 2009</td>
<td>3.58 (2.32, 5.54)</td>
<td>15.61</td>
</tr>
<tr>
<td>Schelleman, 2011</td>
<td>1.68 (1.55, 1.82)</td>
<td>29.87</td>
</tr>
<tr>
<td>Mosholder, 2013</td>
<td>1.39 (1.15, 1.68)</td>
<td>26.03</td>
</tr>
<tr>
<td>Overall (I-squared = 68.7%, p = 0.004)</td>
<td>1.98 (1.55, 2.53)</td>
<td>100.00</td>
</tr>
</tbody>
</table>
Example use case – warfarin and NSAIDS

Risk depends on contextual factors:

• Specific dose/formulation of the interacting drug
  • E.g., topical vs bioavailable

• Age
  • Risk increases with age

• Prior history of bleed
  • High risk

• Risk conferring or mitigating concomitant medications
  • ↓ PPIs or misoprostol
  • ↑ Systemic corticosteroids, aldosterone antagonist
Both prescribers and patients should understand the risks of bleeding while taking warfarin with and without NSAIDs.
Plan to design DDInteract

- User-centered participatory design
  - Usability heuristics evaluation
  - Usability testing
  - Formative evaluation
    - PDDI dashboard versus conventional EHR alerts
DDInteract - usability heuristics evaluation

- Low-fidelity prototype designs
  - Nielsen's usability principles

- Two experts will review the prototype independently
  - a third expert mediating disagreements

- Outcome: DDInteract meets usability principles
DDInteract - usability testing

- Full simulation of the final product
  - without “backend” software

- 8 physicians and 8 patients (16 participants total)
  - Independently exposed to DDInteract

- Think-aloud + system usability survey

- Outcome: Identification and correction of usability issues
DDInteract – formative evaluation

- Usable DDInteract versus conventional EHR alerts
  - Simulation of shared decision making with 20 physician/patient dyads
    - Random assignment DDInteract vs contemporary alert
    - Two PDDI case vignettes
  - Primary outcome: *Shared-decision making quality*
  - Secondary outcomes: *perceived efficiency, effort, user experience*
Link triggers DDInteract as a SMART on FHIR app

CDS Service: near real-time support as remote services

- **Context based CDS**
  - **order-select:** at the time of order selection
  - **order-sign:** at the time of order authorization

- **Basic actions**
  - registering for CDS services,
  - calling those services,
  - receiving the response: cards
  - Link to trigger DDInteract

**Warfarin-NSAID**

<table>
<thead>
<tr>
<th>Warfarin</th>
<th>Warfarin + NSAID</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 people will have bleeding</td>
<td>34 people will have bleeding</td>
</tr>
<tr>
<td>85 people will have no bleeding</td>
<td>66 people will have no bleeding</td>
</tr>
</tbody>
</table>
Limitations with the current CDS Connect Authoring tool with respect to authoring DDI CDS.

<table>
<thead>
<tr>
<th>DDI CDS Requirement</th>
<th>Existing CDS Authoring Tool Capability?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rules trigger at specific step in the medication therapy workflow</td>
<td>No</td>
</tr>
<tr>
<td>Rules trigger possible actions within the EHR that will take place if the prescribing clinician accepts them</td>
<td>No</td>
</tr>
<tr>
<td>Rules present informative rationale that specify the potential DDI mechanism, potential clinical consequence, operational classification of seriousness, and evidence</td>
<td>No</td>
</tr>
<tr>
<td>Rules require technical validation to ensure that they are correct and shareable.</td>
<td>Partially – share-ability is tested</td>
</tr>
</tbody>
</table>
Summary

- We expect that shared decision making for PDDIs will improve patient safety
  - greater patient engagement
  - contextualized to the individual patient

Avoidance of ADR

Prescriber’s Knowledge

Computer Screening
Patient Risk Factors
Patient Education

A + B

Patient-centered PDDI shared decision making tool - DDInteract
Acknowledgement

- AHRQ U18HS027099
Coach McLungs℠

An Interactive, Digital Health Coaching Experience for Pediatric Asthma

Kelly Reeves, BSN, RN, UXC
October 21, 2019
Asthma Prevalence and Gaps

10 million
children living with asthma in US

# 1 cause of missed school days
and missed work

Linkage to Primary Care Provider is challenging

Care is often fragmented and variable
Patient Engagement through Shared Decision Making
Shared Decision Making - Meeting of Two Experts

**Patient** provides information on values, preferences, lifestyle, beliefs and current knowledge about the illness and its treatment.

**Physician/ACP** provides all relevant disease information, benefits and risks of various treatments and potential effects on the patient’s psychological and social well being.
1. Set the Stage (Health Coach)
2. Gather Patient Information (Health Coach)
3. Provide Information (Health Coach)
4. Negotiation (Health Coach)
5. Wrap Up (Provider)
Iterative Design Process

- Providers and Clinical Staff
- Patients and Caregivers
- Researchers
  - Software Developers
  - IT experts
- Leadership
  - Quality
  - Health Literacy
Iterative Design Process

- User-centered design process
- Engage end-users and stakeholders *early* and *often*
- **Test**, test, and test again
Adaptation
Coach McLungs™ Interactive, digital health coaching experience for pediatric asthma
Coach McLungs™ is an interactive digital solution that engages patients, caregivers, and providers in a tailored conversation about asthma and promotes shared decision making in creating a plan of care.

1. Before a visit with her doctor, a pediatric patient and her caregiver engage with Coach McLungs™ and receive tailored education about asthma, triggers, and treatments.

2. Coach McLungs™ gathers information about goals, adherence and symptoms and provides personalized recommendations for both the patient and provider.

3. The patient, caregiver and provider share in the decision-making and create a personalized treatment plan at the point of care.
Introduction to Coach McLungs™
Begin by Setting a Person-Centered Goal

Big #1 Asthma Goal
What’s the one thing asthma makes super hard for you?
- Staying active (playing sports or just running around)
- Sleeping through the night
- Going to school
- My asthma’s not that bad
- Something else

Pick all that apply.
When it comes to asthma medicine, what concerns do you have?
- Will it control the asthma?
- How much will it cost?
- What are the side effects of the medicine?
- How hard is the medicine to use and how often do I use it?

Other Concerns? Done!
Kayla, how much do you already know about asthma?

- I know it all.
- I know a little bit.
- I barely know anything. Help!
Controller vs Rescue Medicine
Now, think about your asthma lately...

Does it feel like it’s under control?

Yes!

Kind of!

Nope!

In the last month...

How often have you had to use a rescue inhaler or nebulizer, day or night?

Never 1 or 2 times a week

3 to 7 times a week  Several times a day

What are those?  I don’t have one of those.
Control-O-Meter™ Results

You said: 
Under control.

Actually:
Not under control.
Asthma Triggers

Which of these triggers makes your asthma worse?

- Exercise
- Pets
- Mold
- Dust
- Smells
- Getting really happy, sad, or angry
- Getting sick (like having a cold)
- Changes in weather
- Allergies
- Smoke
- Pests
- Other
Personalized Trigger Avoidance Strategies
Actionable “Playbook” for Patient & Provider

- Parent shares their specific concerns regarding their child’s asthma and answers questions about their experience using Coach McLungs™

- Coach McLungs™ clinical decision support algorithms generate summary pages for the patient and the provider
Version 2.0 in development

- Include use for 5 and 6 year olds
- Spanish version
- Email follow up reminders
- Enhance and improve the usability issues
- Integration- SMART on FHIR
Thank you to the Development Team and Stakeholders!

- Andrew McWilliams, Lindsay Shade, Hazel Tapp, Cheryl Courtlandt, Andrew Gunter, Shane Gavin, Madelyn Welch, Melanie Hogg, Stacy Reynolds, Michael Runyon, Michael Dulin, Beth Burton, Melissa Calvert, Jing Zhao, Tom Ludden, Katherine O’Hare
- Pam Landis, Andrea Bouronich, Melanie Bamberg, Stacy Harris, Jeff Cohen
- Holly Harron, Jeff Cleveland, Lyn Nuse, Janelle White, Renu Doshi and members of the Pediatric Asthma Initiative Steering Committee
- Janice Scotton, Hope Schwanhausser, Saul Amezquita
- Jean Wright, Lindsay Deneault, Sally Baek, Elizabeth Benfield, Ann Somers Hogg
- Colleen Generoso, Cindy Bobay
- Zeev Neuwirth, Katie Kaney, Jennifer Terry, Callie Dobbins
Contact Info:

Kelly Reeves
Atrium Health Department of Family Medicine
Kelly.reeves@atriumhealth.org
Barriers to Treatment and Control

- Cost
- Prior authorizations
- Inconvenience
- Side effects

- Poor technique – can’t figure out how to use inhaler
- Patients often self-discontinue or reduce dose
- Poor understanding of controller vs reliever
- Trigger avoidance strategies
Design and Development of a Clinician, Parent, and Teacher Facing CDS Application Using a Stakeholder-Engaged Process to Support ADHD Management

Jeremy Michel
Disclosures

▪ Dr. Michel, Dr. Grundmeier, and Mr. Miller are the primary authors of the ADHD Care Assistant, which was used to implement portions of the intervention evaluated in this manuscript. No patent or licensing agreement exists for this technology and the invention has generated no revenue.

▪ Coauthors on this project (Drs. Fiks & Grundmeier) are the inventors of the Care Assistant Platform that was used in this research but receive no financial benefit from this invention.

▪ Coauthors on this project also received salary support from Pfizer’s Independent Grants for Learning and Change for work on a related project.
Background

- Attention Deficit/Hyperactivity Disorder (ADHD)
  - Common neurodevelopmental disorder in children (5-10%) 
  - Diagnosis commonly occurs between 5-12 years of age 
  - Affects ability to function at home (interpersonal impairments) 
  - Affects ability to learn in school (academic impairments) 
  - If untreated it has life-long impacts and high societal costs 
- Care for ADHD is often fragmented 
  - Parents, teachers, and clinicians all see different slices of time 
- Rating scales facilitate diagnosis and disease management 
  - Initial diagnosis and comorbidity screening 
  - Trending symptoms over time 
  - Help to remove some of the subjectivity
ADHD Rating Scales

- Numerous paper-based scales
- Electronic versions exist but rarely link to the EHR
- Of those linked to EHRs, none allowed teacher data submission
- Few provide any parent view
- None met our clinician needs
Design of an EHR-Linked Rating Scale System

- Analyzed the workflow for collecting ADHD rating scales
- Developed an electronic process for rating scales (e-mail based)
- The initial tool displayed content within the EHR to the clinician in three locations (views)
  - Clinical note - Documentation view
  - In basket - Summary view
  - Encounter - Longitudinal view
• How could we improve this system?
• We conducted a prospective technology development and implementation evaluation with an iterative design process
  – 8 parents
  – 11 pediatricians
  – 8 educators
• Meetings were used to set priorities
  – 2 family advisors
  – 3 educators
  – 3 pediatricians
  – 2 joint parent-educators
Parents and educators wanted to see the same information that clinicians saw, but organized differently:
- Clinicians sought summarized results (with access to raw data)
- Parents/Educators wanted detailed reports (with summaries)

Everyone wanted to keep a copy of their own data:
- Parents wanted to keep records to support school discussions
- Teachers reported needing to build student files to support resource use and noted school policies on data retention

Parents and teachers both wanted to see the data submitted by their counterparts.

Parents were happy to share data with teachers but wanted control to limit data sharing.
Two new functions (copying and sharing) added to the system to better support parent and teacher decision making
Multiple Views

- Self submitted
- Teacher view of parents reports
- Longitudinal data
Data Sharing Control

- Six questions were added to the survey to support limited sharing of parent reported responses (example below).

| Fidgets with hands or feet or squirms in seat | ☐ | ☐ | ☐ | ☐ | ☐ |
| Leaves seat when remaining seated is expected | ☐ | ☐ | ☐ | ☐ | ☐ |
| Runs about or climbs too much when remaining seated is expected | ☐ | ☐ | ☐ | ☐ | ☐ |
| Has difficulty playing or beginning quiet play activities | ☐ | ☐ | ☐ | ☐ | ☐ |
| Is 'on the go' or often acts as if 'driven by a motor' | ☐ | ☐ | ☐ | ☐ | ☐ |
| Talks too much | ☐ | ☐ | ☐ | ☐ | ☐ |
| Blurs out answers before questions have been completed | ☐ | ☐ | ☐ | ☐ | ☐ |
| Has difficulty waiting his or her turn | ☐ | ☐ | ☐ | ☐ | ☐ |
| Interrupts or intrudes in on others' conversations and/or activities | ☐ | ☐ | ☐ | ☐ | ☐ |

Do you want to share the information from the above "Symptoms" section with your child's teacher? ☐ Yes  ☐ No
Usage Data (Since Implementing Parent and Teacher Result Sharing)

- Parent Users
  - 1368 system users
- Teacher Users
  - 871 system users
- Parent Submitted Surveys
  - 846 initial surveys (72-73% share at each opportunity)
  - 4569 follow up surveys (53-56% share at each opportunity)
- Teacher Submitted Surveys
  - 660 initial surveys
  - 1894 follow up surveys
Project Takeaways

- Non-clinicians may want the same data as clinicians, but formatted differently to support differing needs.

- A stakeholder-engaged process can identify unmet needs of a CDS system to better support patient-facing functionality.

- The process we applied serves as a model for including patient stakeholders to optimize CDS via patient-facing views.
Thank You

• We will be publishing this CDS Module on CDS Connect.
• Primary Contact: Jeremy Michel michelj@email.chop.edu
• ADHD Care Assistant Research and Development Team
  – Robert Grundmeier, MD
  – Jeff Miller, MAS
  – Jeritt Thayer
  – Tom Power, PhD
  – Alex Fiks, MD, MSCE
  – Jim Guevara, MD
  – Nathan Blum, MD
  – Stephanie Mayne, PhD
  – Nghi Vo
Closing Remarks

Thank you for your participation and support of the Patient-Centered Clinical Decision Support Learning Network!
PCCDS-LN Contact Information

For updates on future events and activities of the PCCDS Learning Network please check out our website at www.pccds-ln.org

Project Team Contact Information:

- Barry Blumenfeld, MD, MS (bhb@rti.org)
- Joshua Richardson, PhD, MS, MLIS (jrichardson@rti.org)
- Laura Marcial, PhD (lmarcial@rti.org)
- Beth Lasater, MSPH (boverman@rti.org)