Work System Redesign and Implementation of Evidence Based Hypertension Protocol in Specialty Clinics Using Electronic Health Record Prompts

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Disclosures

• Independent Grants for Learning and Change (Pfizer Grant ID# 13986965) “Systems-Based CVD Prevention Protocols for Rheumatology Teams” Bartels-PI

• NIH-NIAMS K23 AR062381-01 “Impact of Rheumatologist Communication Upon Managing Cardiovascular Risk in RA” Bartels-PI
Prioritizing Opportunities to Prevent Early Deaths

Background

• Hypertension (HTN) most prevalent CVD risk factor in adults
  • Blood pressures (BP) measured, addressed in 30%, rec follow-up 10% of visits
  • Despite quality measures calling for timely follow-up within 4 weeks

• Staff protocols improved BP control in primary care (PC) clinics
  • Staff protocols not tailored to specialty clinics
  • Despite specialty visits outnumbering primary care visits (2013)

• Multifaceted implementation strategies can improve protocol adherence
  • Electronic reminders are not sufficient

Objective

To engage clinic staff in work system redesign to tailor and implement an **EHR-prompted hypertension protocol** in specialty clinics.

Implementation question:  

Effectiveness questions:

- Engagement
- Education
- Reminders
- Feedback

Protocol: Staff order timely PC follow-up on confirmed high BP

Patients follow-up with PC within 4 weeks

Population level high BP decreases
Methods: Study design

- **Pre-post quasi-experimental** design in 3 academic rheumatology clinics
- All eligible adult rheumatology visits with high (≥140/90)
- **Intervention:** Order timely PC follow-up on confirmed high BP

<table>
<thead>
<tr>
<th></th>
<th>Usual care</th>
<th>Protocol care</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Jan 2012 – Sept 2014 (2.5 yrs)</td>
<td>Dec 2014 – May 2016 (1.5 yrs)</td>
</tr>
<tr>
<td>Nurse or MA</td>
<td>Measures BP</td>
<td>Measures BP</td>
</tr>
<tr>
<td>Specialty provider</td>
<td>1 in 10 visits rec f/u on high BP</td>
<td></td>
</tr>
<tr>
<td>System</td>
<td></td>
<td>Promotes re-measurement &amp; follow up order if high BP</td>
</tr>
<tr>
<td>Patient</td>
<td>Assumes normal BP if not discussed</td>
<td>Aware of need for timely follow up</td>
</tr>
</tbody>
</table>

Methods: Implementation strategies

1. **Engage staff in co-creation** before, during, & after intervention period
   - Clinic meetings + Focus groups

2. **Educate staff** before intervention period
   - BP technique + HTN + CVD risk
   - Protocol + New EHR workflow

3. **Remind staff with EHR tools**
   - Cue to re-measure BPs \( \leftarrow \text{if } \geq 140/90 \)
   - Cue brief education on need for follow-up \( \leftarrow \text{if BP} \geq 140/90 \text{ confirmed} \)
   - Order set to order scheduling PC follow-up \( \leftarrow \text{if patient accepts offer} \)

4. **Audit and feedback** on protocol adherence, monthly
   - In-person between months 1-6
   - By email between months 7-25
Methods: Mixed methods approach

Qualitative
- Focus groups
- Audit-feedback notes

Quantitative
- EHR data
- Written staff questionnaire

Structure
- Tech/Tools
  - Reminder to remeasure elevated BP
  - Reminder to recommend follow-up
  - Order set to order follow-up
- Organization
  - Standard BP protocol supported by staff and leadership
  - Capacity building for QI
- People
  - Engagement through focus group
  - Improved self-efficacy through training and audit-feedback
- Tasks
  - Remeasure high BP (≥140/90)
  - Recommend follow-up if 2nd BP high
  - Schedule follow-up appointment
- Physical environment
  - Red card to coordinate BP recheck
  - BP brochure to talk with patients
  - Order on After Visit Summary

Process
- % remeasured
- % follow-up offered

Outcome
Timely follow-up (≤4 weeks)

Adaptation
Focus Groups
Audit-Feedback
Methods: Qualitative

Data collection

- **Focus Groups**
  - Diagnostic (Month 0): 3 groups – nurses, MAs, schedulers
  - Formative (Month 3): 2 blended groups – nurse/MA
  - Summative (Month 6): 2 blended groups – nurse/MA

- **Audit-feedback Notes**
  - 4 months in-person
  - 18 months email

Analysis

- **Content analysis**: Theoretical + open coding
Methods: Quantitative

Data collection
- **Electronic Health Record data**
  - Process initiation: Re-measurement rates
  - Process completion: Follow-up order rates
  - **Primary outcome**: Timely follow-up (<4wks) rates for patients with in-network PC
- **Staff Questionnaire**
  - Paper-based at month 6
  - 15 items on self-efficacy and project evaluation

Analysis
- **Multivariable logistic regression**
  - comparing pre-post odds (OR, 95%CI) of timely PC follow-up
  - controlling for socio-demographics, comorbidities, and utilization
- **Descriptive statistics**
  - process measures
  - questionnaire responses
**Results: Implementation**

- **Engagement**
- **Education**
- **Reminders**
- **Feedback**

**Staff order timely PC follow-up on confirmed high BP**

**Patients follow-up with PC within 4 weeks**

**Population level high BP decreases**

**Feasibility** of work system redesign

**Self-efficacy** improved

- **Remeasurement:**
  - 0.6% $\rightarrow$ 64%

- **Offered follow-up:**
  - 0% $\rightarrow$ 75%

- **Timely follow-up:**
  - 28% $\rightarrow$ 45%

- **OR 2.2 (1.8, 2.8)**
  - $p < .0001$

- **High BPs:**
  - 14% $\rightarrow$ 7%
Results: Implementation – staff self-efficacy

Before: “There is no system. I don’t ever know what happens.”
Rheum MA

AFTER: “You just have so many high ones… it would just be, “Oh it’s always like that.” Once you get used to doing it [protocol], it’s actually easier.”
Rheum MA

Resulting Staff Engagement
How confident are you in your ability to do something for high BPs in your clinic?

BEFORE: “There is no system. I don’t ever know what happens.”
Rheum MA

AFTER: “You just have so many high ones… it would just be, “Oh it’s always like that.” Once you get used to doing it [protocol], it’s actually easier.”
Rheum MA
Results: Protocol adherence

- Engagement
- Education
- Reminders
- Feedback

Staff order timely PC follow-up on confirmed high BP

Feasibility of work system redesign

Self-efficacy improved

Remeasurement: 0.6% → 64%

Offered follow-up: 0% → 75%

Patients follow-up with PC within 4 weeks

Timely follow-up: 28% → 45%

OR 2.2 (1.8, 2.8) p<.0001

Population level high BP decreases

High BPs: 14% → 7%
Results: Process trends

Protocol **initiation rates** sustained even without face-to-face audit-feedback
**Results: Process trends**

Protocol completion rates mild decline without in-person audit-feedback

- BP remeasurement
- Follow-up offered
- Audit-feedback face-to-face
- Audit-feedback by email
- Audit-feedback face-to-face for another protocol
Results: Primary outcome

- Engagement
- Education
- Reminders
- Feedback

Staff order timely PC follow-up on confirmed high BP

Feasibility of work system redesign
Self-efficacy improved

Remeasurement: 0.6% → 64%
Offered follow-up: 0% → 75%
Timely follow-up: 28% → 45%
OR 2.2 (1.8, 2.8) p<.0001

High BPs: 14% → 7%
Population level high BP decreases
## Results: Primary outcome - Timely Follow up

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Unadjusted OR (95% CI)</th>
<th>Adjusted OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baseline</strong></td>
<td>28%</td>
<td>Referent</td>
<td>Referent</td>
</tr>
<tr>
<td>N=4683</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Months 1-6</strong></td>
<td>42%</td>
<td>1.83 (1.24, 2.69) p&lt;.0001</td>
<td>2.01 (1.38, 2.93) p&lt;.0001</td>
</tr>
<tr>
<td>N=689</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Months 1-18</strong></td>
<td>45%</td>
<td>2.13 (1.71, 2.64) p&lt;.0001</td>
<td>2.16 (1.76, 2.77) p&lt;.0001</td>
</tr>
<tr>
<td>N=1710</td>
<td></td>
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</tr>
</tbody>
</table>
Results: Primary outcome trend

Protocol outcome maintained at >24 months

28% baseline
Results: Population-level outcome

- Engagement
- Education
- Reminders
- Feedback

Staff order timely PC follow-up on confirmed high BP

Patients follow-up with PC within 4 weeks

Population level high BP decreases

Feasibility of work system redesign

Self-efficacy improved

Remeasurement: 0.6% → 64%

Offered follow-up: 0% → 75%

Timely follow-up: 28% → 45%

OR 2.2 (1.8, 2.8) p < .0001

High BPs: 14% → 7%
Results: Population-Level Decreasing rates of high BP
Conclusions

• Importance of augmenting Clinical Decision Support (CDS) with organizational interventions

• Key role of work system redesign and staff engagement

• Using EHR tools for CDS, reporting, and audit for feedback

• Limitations: single-center, non-randomized, no individual-level BP outcome data

• Future: multi-site, other risk factors (smoking, fitness)
Acknowledgements

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Nursing Staff and Patients

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- K23 NIH-NIAMS AR062381-01 “Impact of Rheumatologist Communication Upon Managing Cardiovascular Risk in RA” (PI-Bartels)
BP Connect protocol

If elevated blood pressure,

Confirm elevated blood pressure,

offer order for follow-up primary care appointment

assist our patients in scheduling the appointment
Clinical decision support: Remeasurement prompt

- Rule: BP ≥140/90
- Rule: Encounter type and department check
- Rule: First BP taken at visit

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Systolic</td>
<td>160</td>
<td>162</td>
<td>145</td>
</tr>
<tr>
<td>Diastolic</td>
<td>112</td>
<td>122</td>
<td>97</td>
</tr>
</tbody>
</table>

**Action steps:**
1. Wait at least 3 minutes and take 2nd BP.
2. Log 2nd BP using “New set of vitals” tab or button.

If you have clinical questions, you can contact Dr. Smith. Optional: You may also [click here](#) to provide questions or feedback.
Clinical decision support: Follow-up prompt

- Rule: Subsequent BP taken at visit

### High Blood Pressure

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Systolic</td>
<td>160</td>
<td>162</td>
<td>145</td>
</tr>
<tr>
<td>Diastolic</td>
<td>112</td>
<td>122</td>
<td>97</td>
</tr>
</tbody>
</table>

**Action steps:**
1. Click Accept to open order set.
2. Follow order set instructions to document follow-up actions to address blood pressure.
3. Click Sign at bottom to close order set when completed.

If you have clinical questions, you can contact Dr. Smith.
Optional: You may also [click here](#) to provide questions or feedback.

[Open order set: Elevated Blood Pressure](#)
Clinical decision support: Order set

- Follow up within 4 weeks
  - If 140-159 / 90-99
- Follow up within 1-2 weeks
  - If 160-179 / 100-109
- Immediate provider notification
  - If ≥ 180 / 110

Patient Instructions
Talking points:
- Have you ever been told you had high blood pressure?
- We are concerned because this can lead to heart disease and stroke.
- We would like to help by providing you information and follow-up.
- Would you prefer information on blood pressure in general or diet management or BOTH?

Patient Instructions:
- Learning about high blood pressure
- DASH diet: After your visit

Follow-up Talking point:
- May our scheduler help discuss follow-up with your primary care clinic after your visit?

Follow-up Scheduling:
- Follow up with primary care provider or primary care nurse in <4 weeks for high blood pressure
- Follow up with primary care provider or primary care nurse in 1-2 weeks for high blood pressure

Documentation
Select a note to document care provided.

Progress Note:
- Instructions: Accepted, BP Follow-up: Accepted
- Instructions: DECLINED, BP Follow-up: DECLINED
- Instructions: Accepted, BP Follow-up: DECLINED
- Instructions: DECLINED, BP Follow-up: Accepted
Patient Instructions

Talking points:
• Have you ever been told you had high blood pressure?
• We are concerned because this can lead to heart disease and stroke.
• We would like to help by providing you information and follow-up.
• Would you prefer information on blood pressure in general or diet management or BOTH?

Patient Instructions:
- Learning about high blood pressure
- DASH diet: After your visit
High Blood Pressure

What is blood pressure (BP)?
The amount of force in blood vessels as blood flows through your body.

Systolic BP: Pressure when heart beats
Diastolic BP: Pressure when heart rests

It’s measured

\[
\begin{array}{c|c}
\text{Systolic} & 122 \\
\hline
\text{Diastolic} & 78 \\
\end{array}
\]

If not controlled, high BP can cause...

- Stiff, narrow vessels
- Problems over time:
  - Heart attack
  - Heart failure
  - Stroke
  - Kidney damage

Damage is often silent, without symptoms.

Conditions increasing heart disease risk:

- Lupus
- Gout
- Steroid use
- Rheumatoid arthritis
- Ankylosing spondylitis
- Psoriatic arthritis

Controlling blood pressure can help prevent heart disease!

Managing your Blood Pressure

Know Your Numbers!
Your blood pressure was:
Today is:


| Extremely High: 180 or more |
| High: 110 or more |
| High: Between 140 - 180 |
| Between 90 - 110 |
| Normal: Less than 140 |
| Less than 90 |

What can I do?

Make lifestyle changes:
- Be active! 30-45 minutes a day.
- Eat less salt and more fruits and veggies
- Limit alcohol and caffeine

Learn More: about blood pressure at:
- http://www.cdc.gov/bloodpressure/

Get your BP checked outside the clinic at drug store, work place, or with a parish nurse.

Talk to your primary care team!

Primary appointment:

<table>
<thead>
<tr>
<th>Date</th>
<th>Blood Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>_____</td>
<td>_____</td>
</tr>
<tr>
<td>_____</td>
<td>_____</td>
</tr>
</tbody>
</table>
Workflow study

Figure 1. Time study tool for specialty rooming observations
<table>
<thead>
<tr>
<th>Task categories</th>
<th>Tasks</th>
</tr>
</thead>
</table>
| 1. Rooming Initiation (ID and Walk Patient to Room) | 1.1 Invite the patient from the waiting room  
2. Confirm patient identifier(s)  
3. Walk the patient to exam room |
| 2. Vital Sign Measurements          | 2.1 Measure weight  
2.2 Measure height (stadiometer)  
2.3 Measure temperature  
2.4 Respiratory rate or pulse oximetry assessment  
2.5 Measure pulse  
2.6 Measure blood pressure |
| 3. Medications and Allergies        | 3.1 Ask patient about their allergies  
3.2 Confirm patient's current medications  
3.3 Ask and record patient's primary pharmacy  
3.4 Discuss refill needs with the patient |
| 4. Chronic Disease Management       | 4.1 Inquire regarding pain assessment  
4.2 Explain disease activity questionnaire  
4.3 Ask if patient has had/needs any vaccinations  
4.4 Obtain patient's tobacco history |
| 5. Other Questions and Conversation | 5.1 Discuss clinical questions  
5.2 Converse with patient |
### Table 2. Mean durations of rooming sequence tasks in rheumatology clinic visits

<table>
<thead>
<tr>
<th>TASKS</th>
<th>All Visits</th>
<th>Clinic A</th>
<th>Clinic B</th>
<th>Clinic C</th>
</tr>
</thead>
<tbody>
<tr>
<td>n=190</td>
<td>n=41</td>
<td>n=86</td>
<td>n=63</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL DURATIONS</strong></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>7.5 (3.1)</td>
<td>8.8 (2.5)</td>
<td>6.7 (3.3)</td>
<td>7.6 (2.8)</td>
<td></td>
</tr>
<tr>
<td>Rooming Initiation (ID and Walk Patient to Room)</td>
<td>0.8 (0.4)</td>
<td>0.7 (0.5)</td>
<td>0.7 (0.3)</td>
<td>0.8 (0.3)</td>
</tr>
<tr>
<td>Vitals (WT/HT/P/BP/R/Temp)</td>
<td>1.9 (0.6)</td>
<td>2.2 (0.5)</td>
<td>1.8 (0.6)</td>
<td>2.0 (0.5)</td>
</tr>
<tr>
<td>Allergies/Med Reconciliation/Pharmacy</td>
<td>2.1 (1.4)</td>
<td>2.5 (1.2)</td>
<td>1.9 (1.7)</td>
<td>2.1 (1.0)</td>
</tr>
<tr>
<td>Chronic Disease Management</td>
<td>0.8 (1.1)</td>
<td>0.6 (0.4)</td>
<td>1.0 (2.0)</td>
<td>0.9 (0.6)</td>
</tr>
<tr>
<td>Other Clinical Questions or Conversation</td>
<td>1.3 (1.2)</td>
<td>1.7 (1.3)</td>
<td>1.2 (1.2)</td>
<td>1.2 (0.9)</td>
</tr>
</tbody>
</table>

**TOTAL OBSERVATION TIME = 1419 minutes**

*p*<0.05.
Garnering leadership and staff support

**BP Connect:**
Addressing high blood pressure in specialty clinics

**Evidence in Hypertension Care**
1/3 of adults have hypertension
- NNT to prevent a CV event = 11
(NNT is 11 years to prevent 1 event)

- Quality Metrics
  - Control is reported BP at last contact—regardless of site
  - Other national group quality metric calls for “timely follow-up” < 4 wks

Staff HTN Protocols: “Nothing will save more lives.” CDC Dr. Feinb

**Continuous Improvement**

MA/DSN Blood Pressure Rickrack

*Offered orders for BP follow-up increased from 0% to 73%*

Odds Ratio 2.1 (1.4-3.0)— Doubled odds of timely follow-up!

**Building Specialty Clinic Engagement**

**Prioritizing Opportunities to Prevent Early Deaths**

**Background Summary**
- Patients with RA lose 5 years of life, most often CVD
- Patients with Lupus, under age 50 face 50X CVD risk
- ~75% of RA/SLE visits are in specialty clinics
- Smoking as high as 35%, HTN 50% in these groups
- Both receive less CVD preventive care

In 2013 US Specialty visits outnumbered primary care visits.

**Tools and Key Components:**
1. Staff training on BP norms, why BP matters, how to help (what to say)
2. EHR alert if BP ≥140/90 cuing re-measurement
3. EHR cuing PC follow-up order if confirmed high
4. Monthly audit & feedback + action planning

Research Question: Can a specialty staff protocol improve timely PC follow-up after a high BP compared to usual care?

**Acknowledgements**

- National Institutes of Health
- AcademicHealth

- [AcademyHealth](https://www.academyhealth.org)
- [National Institutes of Health](https://www.nih.gov)

**Rheumatology Hypertension Protocol**

- Of the 0.45% study period
  - 649 patients
  - 34 patients (5.5%)

- Of the 3.3% patients with a second confirmed high BP, 42% are able to reduce their BP with protocol guidance.

**Building Specialty Clinic Engagement**

**BP Connect Pilot**
Setting: 3 rheum clinics 11/2014-6/2015
Eligible: Adult rheumatology patients with BP ≥140/90

Before: “There is no system. I don’t ever know what happens.”
Rheum MA

After: “You just have so many high ones... it would just be, “Oh it’s always like that.” Once you get used to doing it [protocol], it’s actually easier.”
Rheum MA

**Funding:**
- [NIAMS](https://www.niams.nih.gov)
- [AHRQ](https://www.ahrq.gov)
- [Rheumatology](https://www.rheumatology.org)

**Author:**
[AcademyHealth](https://www.academyhealth.org)
[National Institutes of Health](https://www.nih.gov)
Tasks
- Remeasure high BP (≥140/90)
- Recommend follow-up if 2nd BP high
- Schedule follow-up appointment

People
- Engagement through focus group
- Improved self-efficacy through training and audit-feedback

Organization
- Standard BP protocol supported by staff and leadership
- Capacity building for QI

Tech/Tools
- Reminder to remeasure elevated BP
- Reminder to recommend follow-up
- Order set to order follow-up

Physical environment
- Red card to coordinate BP recheck
- BP brochure to talk with patients
- Order on After Visit Summary
# Results Summary

<table>
<thead>
<tr>
<th></th>
<th>Baseline (2.5 yrs)</th>
<th>Months 1-6</th>
<th>Months 1-18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reach</td>
<td>Visits with high BP</td>
<td>4,683</td>
<td>689</td>
</tr>
<tr>
<td>Effectiveness</td>
<td>Timely follow-up</td>
<td>28%</td>
<td>42%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2.01 (1.38, 2.93)</td>
</tr>
<tr>
<td>Adoption</td>
<td>High BP remeasured Follow-up offered</td>
<td>0.6%</td>
<td>58%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0%</td>
<td>84%</td>
</tr>
<tr>
<td>Implementation</td>
<td>Follow-up ordered</td>
<td>0%</td>
<td>Future analysis</td>
</tr>
<tr>
<td>Maintenance</td>
<td>See Months 1-18 column</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Limitations: single-center, non-randomized, no individual-level BP outcome data
- Systems
- EHR alerts

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3808121/