Karen Margolis, M.D., M.P.H. is a board-certified general internist. She joined HealthPartners in 2005 as a Senior Investigator, and was appointed as Executive Director of Research in 2017. Dr. Margolis is a Professor of Medicine at the University of Minnesota Medical School, with an adjunct appointment in the School of Public Health’s Division of Epidemiology and Community Health. Her research interests are in the areas of hypertension, prevention of cardiovascular disease, and women’s health. She has served in leadership positions in many large multi-center, federally funded initiatives and trials, including ALLHAT (Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial), the Women’s Health Initiative, ACCORD (Action to Control Cardiovascular Risks in Diabetes), and the ongoing ASPREE (Aspirin in Reducing Events in the Elderly) and Vitamin D and type 2 diabetes (D2d) studies. She is the Principal Investigator for Hyperlink, a series of NIH- and PCORI-funded research projects to study methods to improve the control of hypertension using home blood pressure telemonitoring and pharmacist management.
Dan Rehrauer, PharmD

Senior Manager, HealthPartners Medication Therapy Management Program, HealthPartners Institute, Minneapolis, MN; Clinical Associate Professor, University of Minnesota

Dan Rehrauer, Senior Manager, MTM Program and Community Pharmacy Partnerships, graduated with a PharmD degree from the University of Minnesota-College of Pharmacy. Afterwards, he completed a 2 year Pharmaceutical Care and Leadership Residency where in his second year he established comprehensive pharmacy services at West Side Community Health Services in St. Paul, MN. In 2010, Dan transitioned to HealthPartners, the largest consumer-governed, nonprofit health care organization in the nation. His current responsibilities include management of the MTM benefit provided to HealthPartners members, oversight of the MTM program that provides care to HealthPartners and Park Nicollet Medical Group clinic patients, managing pay for performance initiatives with community pharmacy partners, and directing HealthPartners Managed Care Residency Program. In addition to his responsibilities at HealthPartners, Dan is active with the Pharmacy Quality Alliance and currently serves as a co-chair of the Quality Metrics Expert Panel.
Home Blood Pressure Telemonitoring and Pharmacist Care to Improve Hypertension Control

Karen Margolis, MD, MPH
Dan Rehrauer, PharmD
HealthPartners Institute, Minneapolis, MN
Why controlling high blood pressure is important

Elevated blood pressure (BP) is the single largest contributor to:

- All-cause mortality
- Cardiovascular mortality

- 30%
- 41%

It is a complex problem, or it would have already been solved

- There are great tools and new opportunities to tackle this as a system
- Research in our care group shows that home blood pressure telemonitoring with pharmacist care achieves the Triple Aim

50% with hypertension are well-controlled
Three research projects, $10M in federal funding

Hyperlink 1
Randomized trial
2008 - 2013

Outcomes:
BP improved over 18 months
(6 months after program end)

- Routine face-to-face care in clinic compared with home BP tele-monitoring, plus pharmacist phone management for 12 months for patients with uncontrolled hypertension
- 450 patients recruited as research participants (motivated volunteers!)

Hyperlink 2
Long-term follow-up through 2015

Outcomes:
BP change over 5 years and fewer heart disease events

Hyperlink 3
New “pragmatic” randomized trial
2017 - 2021

Outcomes:
BP change over 2 years and patient-reported outcomes

- Primary care clinics without research personnel and “typical” patients
- Substantial input from HealthPartners Medical Group and patients
HBPM with no/low co-intervention
Effect on SBP at 12 months

<table>
<thead>
<tr>
<th>Intervention and Study</th>
<th>Total population</th>
<th>Control</th>
<th>Intervention</th>
<th>Mean SBP diff (95% CI)</th>
<th>% Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self-monitoring with no feedback</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TASMINH1</td>
<td>401</td>
<td>212</td>
<td>189</td>
<td>-1.21 (-4.16, 1.75)</td>
<td>5.39</td>
</tr>
<tr>
<td>Godwin et al.,</td>
<td>458</td>
<td>209</td>
<td>249</td>
<td>-1.93 (-4.69, 0.83)</td>
<td>5.53</td>
</tr>
<tr>
<td>HOMERUS</td>
<td>434</td>
<td>208</td>
<td>226</td>
<td>2.51 (-0.45, 5.47)</td>
<td>5.38</td>
</tr>
<tr>
<td>AUPRES</td>
<td>407</td>
<td>210</td>
<td>197</td>
<td>0.10 (-2.20, 2.40)</td>
<td>5.83</td>
</tr>
<tr>
<td>TCYB - Con vs. Int 1</td>
<td>234</td>
<td>122</td>
<td>112</td>
<td>-5.59 (-9.46, -1.72)</td>
<td>4.75</td>
</tr>
<tr>
<td>Subtotal</td>
<td>1934</td>
<td>961</td>
<td>973</td>
<td>-1.02 (-3.27, 1.23)</td>
<td>26.88</td>
</tr>
<tr>
<td>(I-squared = 66.6%, p = 0.018)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Self-monitoring with web/phone feedback</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TelexBPMet</td>
<td>179</td>
<td>57</td>
<td>122</td>
<td>-1.88 (-5.86, 2.08)</td>
<td>4.67</td>
</tr>
<tr>
<td>Kerry et al.,</td>
<td>334</td>
<td>167</td>
<td>167</td>
<td>0.04 (-3.86, 3.93)</td>
<td>4.73</td>
</tr>
<tr>
<td>eBP - Con vs. Int 1</td>
<td>493</td>
<td>247</td>
<td>246</td>
<td>-2.88 (-5.51, -0.24)</td>
<td>5.61</td>
</tr>
<tr>
<td>Wakefield - Con vs. Int 1</td>
<td>183</td>
<td>102</td>
<td>81</td>
<td>-2.16 (-6.70, 2.39)</td>
<td>4.28</td>
</tr>
<tr>
<td>Subtotal</td>
<td>1189</td>
<td>573</td>
<td>616</td>
<td>-1.98 (-3.74, -0.21)</td>
<td>19.29</td>
</tr>
<tr>
<td>(I-squared = 0.0%, p = 0.887)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tucker KL. PLOS Med 2017;14:e1002389
HBPM with mod/high co-intervention
Effect on SBP at 12 months
Rationale for Pharmacist Care + Home BP Monitoring /Telemonitoring

• Previous studies showed nurse- or pharmacist-led care significantly improved hypertension control, particularly when able to change treatment independently

• Adding support to home BP monitoring increases BP lowering and duration of effects up to 12 mo

• Combining these interventions should create a synergistic feedback loop

Walsh JM. Med Care 2006;44(7):646-57
Pharmacists as Members of the Care Team

• MTM Pharmacists practicing comprehensive medication management\(^1\) (CMM)

Pharmacists as Members of the Care Team

• Co-located in HealthPartners primary care clinics
• Access to and documentation in the EHR
• Collaborative Practice Agreements providing prescriptive authority and the ability to order laboratory tests to monitor for efficacy and safety of medications for a variety of chronic diseases
• Focused on optimizing medication use and outcomes
Hyperlink Trial (2008-2016)

• Cluster-randomized controlled trial

• Primary care clinics (N=16) at HealthPartners Medical Group with MTM pharmacists

• Adult patients with BP>140/90 confirmed in research clinic

• Primary care clinics randomly assigned to 2 groups:
  • Usual care (UC)
  • Telemonitoring Intervention (TI) combining pharmacist-led care management and home BP telemonitoring

• Research clinic visits at 6, 12, 18, and 54 months for BP measures and surveys

Telemonitoring Intervention

• Home blood pressure telemonitor from commercial vendor
  • Transmits stored BP to pharmacist via password-protected website
  • Patient measures BP 3 days per week, a.m. and p.m. (at least 6 readings/week)

• Pharmacist care management
  • 1st visit face-to-face, then by phone every 2-4 weeks x 6 months
  • Adjusts antihypertensive therapy using algorithm from collaborative practice agreement with PCP
  • Emphasizes lifestyle strategies and medication adherence

• Intervention for 12 months, post-intervention observation
  • Months 0-6: Intensive phase
  • Months 7-12: Maintenance phase, phone visits every 2 months x3
  • Months 13-54: return to usual primary care without telemonitoring
Participant Baseline Characteristics

- Mean age 61 y.
- Mean BP 148/85 mm Hg
- Mean number of antihypertensive drugs 1.5
- 45% female
- 82% non-Hispanic white
- 32% with cardiovascular disease or diabetes
Hyperlink 1 Results
Better BP control for those with tele-monitoring over 18 months

% Blood pressure control from baseline

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>6 Months</th>
<th>12 months</th>
<th>18 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telemonitoring + pharmacist care</td>
<td>0%</td>
<td>45.2%</td>
<td>52.8%</td>
<td>57.1%</td>
</tr>
<tr>
<td>Usual care</td>
<td>0%</td>
<td>71.8%</td>
<td>71.2%</td>
<td>71.8%</td>
</tr>
</tbody>
</table>

Hyperlink1 Results: Home BP during 12-month program

Blood pressure improved rapidly, then stayed under control

Systolic blood pressure, months from baseline
Pharmacist Medication Adjustment

Anti-Hypertensive Therapy Adjustment by Pharmacists, by visit

Number of Anti-Hypertensive Medications, end of each visit

Mandatory Intervention Visits, Month

- HT medication added or dose increase
- Antihypertensive Med Count at End of Visit
### Home BP Flowsheet

#### Home BP Summary

<table>
<thead>
<tr>
<th>Home Goal</th>
<th>Date Range</th>
<th># of Readings</th>
<th>Systolic</th>
<th>Diastolic</th>
<th>% at Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>135/85</td>
<td>Sun Dec 03 2017 - Wed Jan 03 2018</td>
<td>28</td>
<td>High:138</td>
<td>High:82</td>
<td>92% (combined readings)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Average:122</td>
<td>Average:73</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Low:109</td>
<td>Low:67</td>
<td></td>
</tr>
</tbody>
</table>

#### Summary

**Date Range:** Sun Dec 03 2017 - Wed Jan 03 2018

**Home Goal:** 130/80

**Systolic BP**

- Home Goal 135mmHg

**Diastolic BP**

- Home Goal 85mmHg
MTM actions:

**Intake:**
- BP 200+/110+, on carvedilol 37.5 mg and **lisinopril** 30, added amlodipine 5 mg/d

**Week 4:** BP better but still high, increased amlodipine to 10 mg

**Week 8:** Slight bradycardia, decreased carvedilol to 12.5 mg bid

**Week 10:** BP gets worse, increased carvedilol back to 25 mg bid

**Week 12:** BP gets better, no med changes

**Week 14:** BP worse for unclear reasons, increased **lisinopril** from 30 to 40 mg/d

**Week 16:** BP unchanged, added spironolactone 12.5 mg/d

**Week 18:** BP unchanged, increase spironolactone to 25 mg/d

**Week 20:** BP unchanged, added HCTZ 12.5 mg/d

**Week 24:** BP better, but Na down to 132, stopped HCTZ

**Week 26:** Na back to normal, started furosemide 20 mg/d

**Week 28:** BP better

**Week 30:** BP better, average of previous 4 weeks 124/66, 76% controlled
This report provides a details of visits separated by health condition by Medication Therapy Management pharmacists utilizing CPT codes 99605, 99606, or 99607.

Patient Contacts Between: 1/1/2019 and 12/31/2019
Service Area(s): HEALTHPARTNERS
Department(s) Summarized: ALL DEPARTMENTS

<table>
<thead>
<tr>
<th>Health Condition # Pts. / # Encounters</th>
<th>Indication</th>
<th>Efficacy</th>
<th>Safety</th>
<th>Adherence</th>
<th>Convenience</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antithrombotics 290 / 318</td>
<td>183</td>
<td>74</td>
<td>128</td>
<td>99</td>
<td>12</td>
<td>496</td>
</tr>
<tr>
<td>Asthma 228 / 280</td>
<td>30</td>
<td>39</td>
<td>19</td>
<td>191</td>
<td>8</td>
<td>287</td>
</tr>
<tr>
<td>COPD 226 / 272</td>
<td>40</td>
<td>26</td>
<td>17</td>
<td>170</td>
<td>33</td>
<td>286</td>
</tr>
<tr>
<td>Diabetes 1640 / 3395</td>
<td>620</td>
<td>1,963</td>
<td>751</td>
<td>708</td>
<td>106</td>
<td>4,148</td>
</tr>
<tr>
<td>Heart Failure - CHF 77 / 100</td>
<td>11</td>
<td>27</td>
<td>24</td>
<td>28</td>
<td>3</td>
<td>93</td>
</tr>
<tr>
<td>HIV 109 / 164</td>
<td>25</td>
<td>68</td>
<td>44</td>
<td>22</td>
<td>21</td>
<td>180</td>
</tr>
<tr>
<td>Hyperlipidemia 1091 / 1511</td>
<td>504</td>
<td>523</td>
<td>243</td>
<td>219</td>
<td>23</td>
<td>1,512</td>
</tr>
<tr>
<td>Hypertension 1919 / 3615</td>
<td>840</td>
<td>1,364</td>
<td>1,583</td>
<td>812</td>
<td>92</td>
<td>4,491</td>
</tr>
<tr>
<td>Hypothyroidism 181 / 208</td>
<td>7</td>
<td>98</td>
<td>42</td>
<td>64</td>
<td>4</td>
<td>215</td>
</tr>
<tr>
<td>Infectious Disease 107 / 116</td>
<td>99</td>
<td>0</td>
<td>4</td>
<td>10</td>
<td>0</td>
<td>113</td>
</tr>
<tr>
<td>Mental Health 590 / 744</td>
<td>112</td>
<td>134</td>
<td>304</td>
<td>157</td>
<td>15</td>
<td>782</td>
</tr>
<tr>
<td>Pain Control 578 / 841</td>
<td>119</td>
<td>133</td>
<td>507</td>
<td>98</td>
<td>12</td>
<td>869</td>
</tr>
<tr>
<td>Tobacco Use 253 / 366</td>
<td>246</td>
<td>14</td>
<td>17</td>
<td>86</td>
<td>4</td>
<td>369</td>
</tr>
<tr>
<td>Vitamins/Supplements 887 / 937</td>
<td>470</td>
<td>114</td>
<td>185</td>
<td>212</td>
<td>23</td>
<td>1,004</td>
</tr>
<tr>
<td>Other Medical Conditions 2254 / 2652</td>
<td>942</td>
<td>504</td>
<td>1,252</td>
<td>968</td>
<td>265</td>
<td>3,931</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4,250</strong></td>
<td><strong>5,101</strong></td>
<td><strong>5,160</strong></td>
<td><strong>3,644</strong></td>
<td><strong>621</strong></td>
<td><strong>18,776</strong></td>
</tr>
</tbody>
</table>
Hyperlink 2: BP differences over 5 years

BP differences at 6, 12, 18 months, but not different at 5 years
Gap between 18 months and 5 years with no information

We filled the gap between 18 months and 5 years with data from the electronic health record
Blood pressure differences through 2 years
Estimated heart disease event costs (5 years)
Net savings of $1,241 per patient in the intervention group

<table>
<thead>
<tr>
<th></th>
<th>Intervention (n=228)</th>
<th>Control (n=222)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Events</td>
<td>Estimated $</td>
</tr>
<tr>
<td>Heart Attack (MI)</td>
<td>5</td>
<td>$273,000</td>
</tr>
<tr>
<td>Stroke</td>
<td>4</td>
<td>$174,000</td>
</tr>
<tr>
<td>Heart failure</td>
<td>5</td>
<td>$249,000</td>
</tr>
<tr>
<td>Coronary bypass/stent</td>
<td>2</td>
<td>$62,000</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>$758,000</td>
</tr>
<tr>
<td>Difference</td>
<td>-$780,000</td>
<td></td>
</tr>
</tbody>
</table>

Primary outcome (MI + stroke + HF+ CV death)
OR= 0.49 (95% CI, 0.21-1.13), \(p=0.09\)

Secondary outcome (above + revascularization)
OR= 0.48 (95% CI, 0.22-1.08), \(p=0.08\)
Hyperlink 3 study design

Like Hyperlink 1, clinics were randomized to telemonitoring + pharmacist care vs. “improved” clinic-based care

Unlike Hyperlink 1, we used an Epic algorithm to enroll patients at routine primary care visits

The blood pressure level for eligibility was raised to $\geq 150/95$ because so many patients were $\geq 140/90$

We aimed to enroll many more patients

Funded by Patient Centered Outcomes Research Institute IHS-1507-31146
Contemp Clin Trials 2020;92:105939
58,675 patients with hypertension at clinic

6% had high enough BP (150/95)

3,796 patients

81% Enrolled in Hyperlink

3,072 patients

Clinic-based Care
1,648 patients

Tele-monitoring
1,424 patients

Refer to nurse
1,476 patients

Refer to pharmacist
1,057 patients
What happened after Hyperlink 3 enrollment?

Nearly everyone eventually received follow-up, but only 1/3 went to the nurse (clinic-based care) or pharmacist (tele-monitoring) within 6 weeks.

Engagement was strong after a visit with the pharmacist.

<table>
<thead>
<tr>
<th>Telehealth-enrolled patients who sign up for HomeBP</th>
<th>32% (n=461)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HomeBP patients who submit at least 1 BP</td>
<td>94%</td>
</tr>
<tr>
<td>Average time to complete intake visit with Medication Therapy Management pharmacist</td>
<td>3.4 weeks</td>
</tr>
<tr>
<td>Average duration of HomeBP</td>
<td>18 weeks</td>
</tr>
<tr>
<td>Median home BPs sent per week</td>
<td>6 per week</td>
</tr>
</tbody>
</table>
Research leads to policy change

2017 - 2019
AHA/ACC and other guidelines strengthened recommendations for home blood pressure monitoring + team-based care

2019
NCQA HEDIS measure “Controlling High Blood Pressure” updated to include tele-monitoring

2019-2020
New CPT codes introduced for remote monitoring and home BP that cover education, set-up, work with patients
Hyperlink next steps

Hyperlink 1 & 2
Complete

Hyperlink 3
New “pragmatic” randomized trial 2017 - 2021

Pilot development

Complete Hyperlink 3
• Compare self-reported side effects, satisfaction with hypertension care
• Monitor how patients are doing, and whether they can incorporate monitoring into daily life
• Compare changes in BP for up to 2 years

Actively developing a pilot
• Physicians wanted the study to continue, but they want to have control over who they refer for monitoring
• Epic integration
• Link with other key groups in the organization
• Leverage changes in policy to make it easier to put into practice
Elements of Effective Team-based Care + Telemonitoring

- Care team member(s) able to take responsibility for enrollment, teaching, ongoing monitoring, evidence-based treatment algorithm
- Systematic identification and enrollment of eligible patients
- Provision of low-cost, simple-to-use, validated BP telemonitor (probably Bluetooth-to-Smartphone)
- Home BP data uploaded to EHR (dedicated field), with data visualization tools
- Alerts to non-physician care team member
- Dashboard and data summarization
Elements of Effective Care

- Trust
- Patients gain insights from their own data
- Clear criteria for intensification
  - 75% of home readings at goal (Hyperlink)
  - Lower home goal (BARBER-2)
- Personalized, flexible treatment
- Close attention to side effects
- Good communication with care team
- Criteria for hand-off (BP control x 3 sessions)
Long-term Follow-up

- Surveillance of either telemonitoring or ERH BP data
- Criteria to define “relapse”
- Recontact patient or routine check-in
- Using the right team members at the right time (health coach, medical assistant, nurse, NP, pharmacist, dietician, social worker, physician)
Questions?

Karen.L.Margolis@healthpartners.com
952-967-7301
Daniel.J.Rehrauer@healthpartners.com
952-967-5133