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# Integrating Practice Based Research With Quality Improvement to Eliminate Undiagnosed Hypertension in a PBRN: A Case Study

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**Bernard Ewigman, MD MSPH FAAFP  
Ambulatory Primary Care Innovations Group (APCIG)  
NorthShore University HealthSystem  
Evanston, IL**



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# Conflict of Interest Statement

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I have no conflicts of interest to declare.

Bernard Ewigman, MD MSPH FAAFP

Professor & Chair

Department of Family Medicine

The University of Chicago

Owen L Coon Endowed Chair

NorthShore University HealthSystem

[bewigman@northshore.org](mailto:bewigman@northshore.org)

[bewigman@uchicago.edu](mailto:bewigman@uchicago.edu)



# The Case Study



Rakotz MK, Ewigman BG, et al. A Technology-based Quality Innovation to Identify Undiagnosed Hypertension among Active Primary Care Patients. *Annals of Family Medicine*. July-August, 2014



Information Technology-Facilitated Outreach to At-Risk Primary Care Patients Combined with In-Office Automated Measurement Substantially Reduces Undiagnosed Hypertension.

AHRQ Health Care Innovations Exchange. [www.innovations.ahrq.gov](http://www.innovations.ahrq.gov)

*To be posted immediately following publication*



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# Objectives Today

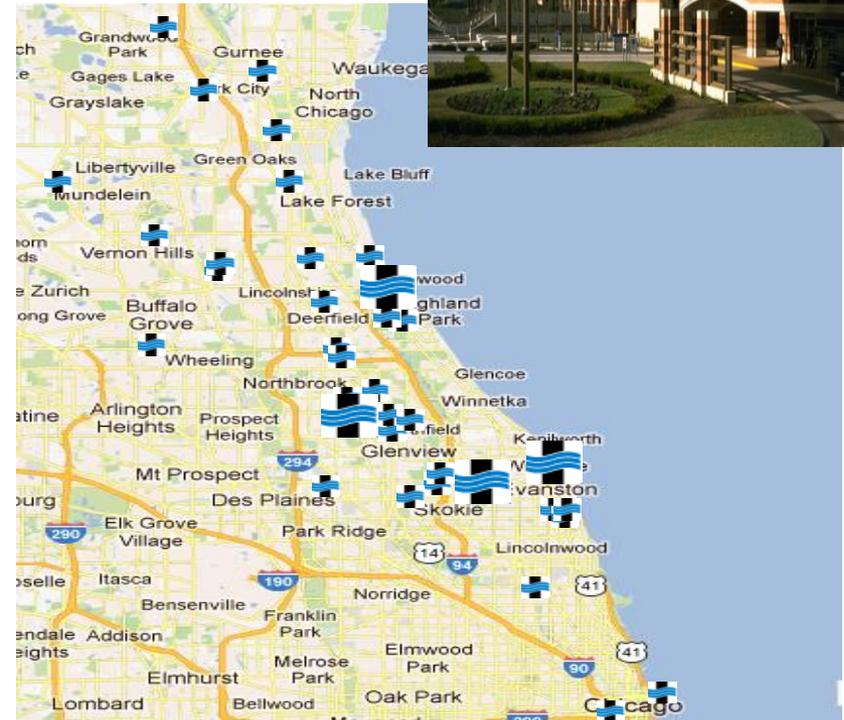
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1. To ***describe a case*** of a successful research/quality improvement (QI) process designed to eliminate undiagnosed hypertension (HTN) in a PBRN.
2. To illustrate the ***similarities and differences between research and quality improvement*** using this PBRN case example.
3. To ***illustrate the facilitators and barriers*** associated with integrating research & QI using this PBRN case example.



# Setting: NorthShore University HealthSystem

- 4 Hospitals
  - Northern Chicago-land
- Academic Affiliation
  - The University of Chicago
- NorthShore Medical Group
  - 880 employed physicians
  - Fully integrated on Epic >11 years
- Leapfrog, HIMSS 7, Top 15 Hospital
- \$100M+ Research Institute
  - PBRN (APCIG)
    - 23 primary care practices
    - 117 IM and FM doctors





# Objective 1

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- To describe a case of a successful research/quality improvement (QI) process designed to eliminate undiagnosed hypertension (HTN) in a PBRN



# Objective 1: Research/QI Aims

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- Aim 1: **Assess perceived gap** in diagnosis of hypertension observed by a full time practicing family physician member of our PBRN who enrolled in our PBRN based Quality & Safety Fellowship
- Aim 2: **Develop and test computer based algorithms** to identify active primary care patients at risk of undiagnosed hypertension
- Aim 3: **Develop, evaluate & sustain a quality improvement initiative** designed to eliminate undiagnosed hypertension among active primary care patients



# 48 MONTH TIMELINE

## PROJECT TIMELINE

<b>MONTH</b>	1 -6	7- 12	13 -36	36- 48
<b>ACTIVITY</b>				
Gap Assessment	█			
Test Algorithms		█		
Design QI		█		
Implement QI			█	
Sustain QI			█	█

# Aim 1: Assessing the Gap: The Existing Research Literature

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- Hypertension is the leading modifiable risk factor for:
  - ▶ Myocardial infarction, heart failure, stroke, kidney failure
  - ▶ Treatment improves outcomes, quality of life, lowers social costs
- 1 in 7 US (14%) adults have undiagnosed hypertension
- Published experience with eliminating undiagnosed hypertension in primary care?
  - ▶ None found





## Aim 1: Assessment of the Gap: Do We Have Active Primary Care Patients with Undiagnosed Hypertension?

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- ▶ 117 primary physicians (FM, IM) in 23 practices
- ▶ Analysis of EHR (Epic) and data warehouse records
- ▶ ~140,000 active primary care patients
  - 34% had a diagnosis of HTN\*
  - 66% had no diagnosis of HTN
    - BUT, 1,586 patients had one or more substantially elevated BP value consistent with HTN

\* Hypertension (ICD-9 404.0 – 405.9) &  
Pre-HTN, white coat HTN (ICD – 796.2)



## Aim 2: Develop and Test Computer Based Algorithms

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- Do these 1,586 patients with substantially elevated BPs actually have undiagnosed HTN?
- Evaluate multiple algorithms using a reference standard
- Reference standard = bp TRU BPM-200 (AOBP)





# Reference Standard for Diagnosing HTN

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- Physicians, staff trained in use of BpTRU BPM-200 machines
- Primary physicians reviewed each of their patients on the list
- With approval from the PCP, invitations for “AOBP Visit”
  - ▶ Personal letter from doctor; phone calls x 3 from MAs
  - ▶ Invited for office visit to determine if hypertensive
  - ▶ Patient alone, properly positioned, right size cuff
  - ▶ Six measurements; first one is ignored
  - ▶ The AOBP value = average of five measurements
  - ▶ Primary physician evaluation and diagnosis



# Three Sample Algorithms

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## Algorithms

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1. All patients whose ***three most recent encounters*** yielded a mean SBP  $\geq 140$  mm Hg or a mean DBP  $\geq 90$  mm.
  2. All patients who ***had any three encounters*** with a SBP  $\geq 140$  or DBP  $\geq 90$  mm Hg
  3. Patients who had ***a single encounter*** with a SBP  $\geq 180$  or a DBP  $\geq 100$  mm Hg
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**SBP = systolic blood pressure**

**DBP = diastolic blood pressure**

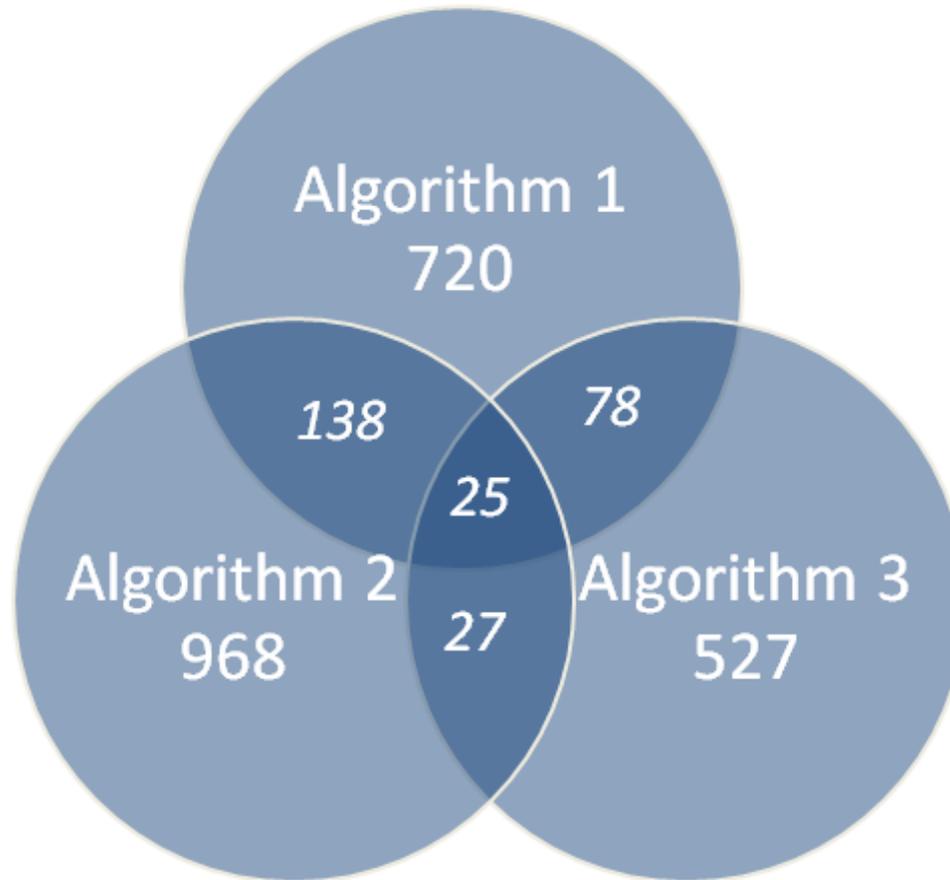
**All data were obtained from outpatient encounters with a PCP or specialist.**

**Encounters used were within 12 months prior to their most recent encounter.**



# Overlapping Venn Diagrams of 1,586 Patients At Risk of Undiagnosed Hypertension

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## Number of True Hypertensive Patients Identified, Positive Predictive Values (PPVs), by Algorithm for a Sample of 475 of the 1,586 At Risk Patients

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Algorithm	At Risk & Attended AOBP Visit	True Hypertension (N)	PPV (%)	95% CI
1	234	136	58	51-65
2	321	168	52	47-58
3	138	70	51	42-59
<b>1,2 or 3</b>	<b>475</b>	<b>249</b>	<b>52</b>	<b>48-57</b>

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# Aim 1 & Aim 2 Summaries

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## Aim 1: Assessment of Gap

- 1,586 at risk active patients in 23 practices
- ~13.5 patients per physician with undiagnosed hypertension?

## Aim 2: Develop & Test Algorithm

- Detected all patient with significantly  $\uparrow$ BP
- Positive predictive value of 52%



## Aim 3: Design Sustainable Quality Improvement (QI) Initiative

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- Quality analytics team generated a monthly list of patients at risk of undiagnosed hypertension for each PCP
- Primary physicians review each of their patients on the monthly at risk list
- With approval from the PCP, outreach for “AOBP Visit” s
- An EHR based decision support tool was is built to generate an alert when an at-risk patient comes to the office for any reason, and when any patient has an elevated manual BP reading during a visit



## Aim 3: Design Sustainable Quality Improvement (QI) Initiative

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- MAs initiate AOBP measurement based on alert while patient is in the office, prior to physician evaluation
- Quarterly aggregate quality reports by physician, by practice and overall – peer pressure
- Quarterly medical management incentive (\$) goals set annually
- “Rate of undiagnosed HTN” corporate quality goal routinely reported to Board of Trustees by System Quality Committee



## Aim 3: Impact of QI At 36 Months

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- 1586 originally “at risk”
  - ▶ 553 patients excluded by PCP or left practice
    - Death, terminal illness, severe mental illness, moved, etc
- 1033 active patients at risk:
  - 740 (72%) diagnosed
    - 361 (36%) true hypertension
    - 290 (28%) pre-hypertension, white coat hypertension
    - 89 (8%) normotensive
  - 293 (28%) remained at risk of undiagnosed HTN



## Aim 3: Impact of QI At 36 Months

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Estimate of Rate of Undiagnosed HTN  
Among Active Primary Care Patients?

Month 1-6    1,033/91,844    = 1.1%

Month 36        293/91,844    = 0.3%

- A 72% relative reduction
- 740 patients not previously diagnosed



## Aim 3: Impact of QI At 36 Months

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### Diagnostic Yield

Of 740 patients receiving a diagnosis

– 88 percent had a BP-related condition, including,

» 361 (48.8 percent) with true HTN

» 290 (39.2 percent) with white coat HTN/pre-HTN

Of 13.3 patients at risk per physician:

○ 6.3 patients were diagnosed per physician

○ 4.5 patients/physician not active/not relevant diagnosis

○ 2.5 patients per physician remained at risk of undiagnosed hypertension



## Aim 3: Sustainability of QI At 42 Months As of June 30, 2014:

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- The QI approach is fully integrated into the operations of all primary care practices and continues to detect new patients at risk of undiagnosed hypertension
- Expanded to 40 primary care practices + peds & ob/gyn
- Continue to detect new patients at risk of undiagnosed hypertension as well as established patients who develop risk of undiagnosed hypertension
- Variations in diagnostic resolution rates vary with new practices, new physicians and turnover of staff; continuous monitoring, training & problem solving is required



## Objective 2

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- To illustrate the similarities and differences between research and quality improvement using this PBRN case example.

Domain	Practice Based Research	Quality Improvement
Purpose	Generate new knowledge	Improve care
Gap Assessment	Published research	Local assessment
Who Does It?	Academic researchers, practicing clinicians	System leaders, practicing clinicians
Funding	External funding	& Internal funding sources
Data Sources	Primary & secondary	Secondary mainly
Human Subjects Review	Yes, unless minimal risk	Not needed
Products	Publications, presentations	Measured outcomes & business success
Validation	Peer review	Measured performance & business success

# Integrating Practice Based Research & Quality Improvement

Generating new knowledge & implementing to improve care

Gap assessment through published research & local assessment

Academic researchers working with system leaders

External funding & internal funding sources

Use primary and secondary data sources

Human subjects review: yes, unless minimal risk

Publications, presentations, measured outcomes & business success

Validation by peer review & measured performance



## Objective 3

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- To illustrate the facilitators and barriers associated with integrating research & QI using this PBRN case example



# Facilitators-System Level

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- High functioning clinically integrated health system
- Advanced EHR implementation
  - ▶ HIMSS 7 inpatient-first system in the US
  - ▶ HIMSS 7 ambulatory-only system in the US
- Practice based research network/researchers committed to research & quality improvement
- Centrally administered primary care practice group



# Facilitators-System Level

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- Collaborative leadership from research, quality, information technology & operations
- Quality & Safety Fellowship for PBRN Members
- Enterprise level data warehouse
- Sophisticated quality analytics capacity
- Well established workflow change processes



# Facilitators-Project Level

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- Enthusiastic physician champion
- Direct physician education and problem solving
- Direct office staff education and problem solving
- Many meetings, problem solving, communications
- Financial support from PBRN & Medical Group
- Research, quality, informatics
  - ▶ mentoring, support, and infrastructure



# Barriers

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- Perceived conflict of purposes—operational improvement and financial performance vs. “research” goals
- Concern about disruption of patient flow & that patients would be upset about being contacted and told they may have hypertension
- Initial resistance from primary care physicians & from operations/management



# Barriers

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- Institutional Review Board barriers
  - ▶ Is this research?
  - ▶ Is this quality improvement?
  - ▶ Is informed consent needed?
  - ▶ Many months to resolve
    - developed policies, procedures and checklists



# Summary

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- We successfully used our EHR and data warehouse to identify active primary care patients at risk of undiagnosed hypertension
- The optimal algorithm achieved a maximum identification rate with an acceptable positive predictive value (52%)
- We implemented a continuous quality improvement initiative that has reduced undiagnosed hypertension among our active primary care patients by 72% and has been sustained for 42 months as of June 30, 2014



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The End