

# Electronic Medical Record Use and the Quality of Care in Physician Offices

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Chun-Ju (Janey) Hsiao, Ph.D, M.H.S.  
Jill A. Marsteller, Ph.D, M.P.P.  
Alan E. Simon, MD  
National Center for Health Statistics



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# Background

- The adoption of electronic medical record (EMR) has been promoted as an important tool to improve the quality of care.
- Many of the existing ambulatory care studies were conducted in hospital outpatient department settings.
- Two recent studies using the National Ambulatory Medical Care Survey (NAMCS) did not find consistent associations between EMR use and quality.

# Research objective

- To examine the association between EMR use and quality of care in physician offices
  - More detailed characterization of EMR use
  - More recent data
  - Added one quality measure
  - Four approaches that address gaps in the present literature

# Study design

## National Ambulatory Medical Care Survey (NAMCS) 2007-2008

- NAMCS is a national probability sample survey of visits to nonfederal office-based physicians in the U.S.
- NAMCS collects both physician and patient information.
- Analytical sample included:
  - Visits to patients' primary care provider, plus
  - Visits to physicians with primary care specialties, plus
  - Visits to physicians with certain specialties that are related to the quality measures

# Electronic medical record measures

- NAMCS physician induction forms include a series of questions on the availability of EMR features in physician offices
  - Several EMR functions were added in 2007 and 2008 NAMCS
  - EMR features have been used to report the adoption of basic and fully functional systems

# Basic and fully functional systems defined by items collected in NAMCS

|   | Basic | Fully functional |
|---|-------|------------------|
| Patient demographics  | X     | X                |
| Patient problem lists   | X     | X                |
| Physician clinical notes                                      | X     | X                |
| Medical history and follow-up notes                           |       | X                |
| Guideline-based interventions and/or screening test reminders |       | X                |
| Lab results   | X     | X                |
| Out-of-range values highlighted                               |       | X                |
| Imaging results   | X     | X                |
| Electronic images returned                                    |       | X                |
| Computerized orders for prescriptions                         | X     | X                |
| Drug interaction or contraindication warning provided         |       | X                |
| Prescription sent to pharmacy electronically                  |       | X                |
| Computerized orders for tests                                 |       | X                |
| Test orders sent electronically                               |       | X                |

# Quality measures

- Aspirin use for ischemic heart disease or cerebrovascular disease (IHD/CVD) visits
- Smoking counseling
- Blood pressure check
- Controlled blood pressure for patients with hypertension
- No routine urinalysis
- Avoiding potentially inappropriate prescribing in elderly patients
- Avoiding prescribing antibiotics for upper respiratory infections

# Four approaches

- Hypothetically related EMR features
- Common configurations
- Levels of EMR use
- Top vs. bottom quality performers

# Hypothetically related EMR features

|  | Aspirin use for IHD/CVD visits | Smoking counseling | Blood pressure check | Controlled blood pressure |
|--|--------------------------------|--------------------|----------------------|---------------------------|
| Patient problem list   | X                              | X                  | X                    | X                         |
| Orders for prescriptions   |                                |                    |                      | X                         |
| Warnings for drug interactions or contraindications provided       | X                              |                    |                      |                           |
| Prescriptions sent electronically to the pharmacy                  |                                |                    |                      | X                         |
| Orders for tests   |                                |                    |                      |                           |
| Orders sent electronically   |                                |                    |                      |                           |
| Viewing lab results  |                                |                    |                      |                           |
| Out-of-range levels highlighted                                    |                                |                    |                      |                           |
| Medical history and follow-up notes                                | X                              | X                  | X                    | X                         |
| Reminders for guideline-based interventions and/or screening tests | X                              | X                  |                      | X                         |

# Hypothetically related EMR features (cont.)

|  | No routine urinalysis | Avoiding potentially inappropriate prescribing in elderly patients | Avoiding prescribing antibiotics for upper respiratory infection |
|--|-----------------------|--|--|
| Patient problem list   |                       | X  | X  |
| Orders for prescriptions   |                       | X  | X  |
| Warnings for drug interactions or contraindications provided       |                       | X  |  |
| Prescriptions sent electronically to the pharmacy                  |                       | X  | X  |
| Orders for tests   | X                     |  |  |
| Orders sent electronically   | X                     |  |  |
| Viewing lab results  | X                     |  |  |
| Out-of-range levels highlighted                                    | X                     |  |  |
| Medical history and follow-up notes                                |                       | X  | X  |
| Reminders for guideline-based interventions and/or screening tests | X                     | X  | X  |

# Common configurations

- Used 8 EMR features to examine common configurations
  - Select the top 10 common configurations
  - “No EMR” is the reference group

# Levels of EMR use

- One categorical variable to represent different levels of EMR use
  - No EMR
  - Some EMR, but not basic systems
  - Basic systems, but not fully functional systems
  - Fully functional systems

# Top vs. bottom quality performers

- Created success to opportunity ratio for each physician
  - Number of successes / Number of opportunities for the quality measures
  - Top vs. bottom performers among those with at least 30 opportunities to provide high quality

# Statistical analyses

- Multivariate logistic regression for the first three approaches controlling for:
  - Patient characteristics
  - Physician characteristics
- Cochran-Mantel-Haenszel chi-square test to compare the availability of EMR features between top and bottom performers. (n=43)
- Linear regression to examine the relationship between levels of EMR use and success to opportunity ratio. (n=1224)

# Results

## Findings associated with recommended care

|                                 | Aspirin use for IHD/CVD visits  | Smoking counseling | Blood pressure check | Controlled blood pressure   |
|---------------------------------|---|--------------------|----------------------|---|
| Hypothetically related features | <ul style="list-style-type: none"><li>•Having patient problem lists</li></ul> |                    |                      |   |
| Common configurations           |   |                    |                      | <ul style="list-style-type: none"><li>•Having patient demographic info</li><li>•Having patient demographic info, viewing lab results, viewing imaging results</li></ul> |

# Results (cont.)

## Findings associated with recommended care

|                                 | No routine urinalysis  | Avoiding potentially inappropriate prescribing in elderly patients | Avoiding prescribing antibiotics for upper respiratory infection   |
|---------------------------------|--|--|--|
| Hypothetically related features |  |  |  |
| Common configurations           | <ul style="list-style-type: none"><li>•Having patient demographic info, orders for prescriptions, orders for tests, viewing lab results, clinical notes, reminders for guideline-based interventions</li></ul> |  | <ul style="list-style-type: none"><li>•Having patient demographic info, viewing imaging results</li><li>•Having patient demographic info, orders for prescriptions, orders for tests, viewing lab results, clinical notes, reminders for guideline-based interventions</li></ul> |

# Results (cont.)

- Levels of EMR use
  - No significant findings for any quality measures
- Top vs. bottom performers
  - Success to opportunity ratio did not differ by levels of EMR use.
  - A higher percentage of bottom performers had warnings of drug interactions or contraindications.

# Limitations

- Lack of information on how EMR was used
- Quality measures from NAMCS may not be the right measures
- Small sample sizes for some quality measures

# Conclusions

- No consistent relationship between EMR use and quality.
- A small percentage of physician offices has the same EMR features.

# Implications

- Strengthen data collection
  - How EMR was used in physician offices
  - Appropriate quality measures for EMR features
- Create EMR systems that assist health professionals to provide high quality of care
- Moving towards meaningful use