



# **EHR use by Florida Physicians**

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# FSU College of Medicine Center on Patient Safety

- ✧ One of 4 research centers in the Division of Health Affairs led by Dr. Robert Brooks
- ✧ Policy relevant, applied research projects
- ✧ Multidisciplinary expertise
  - ✧ Clinical, Informatics, Rural Health, Public Health, Pharmacy, Statistics, Law, Health Services Research

## Use of Information Technology in Physician Practices

1. Do you have access to a computer at your current office practice?

- YES       NO -- PLEASE SKIP TO QUESTION #2

If YES, please answer the following.

a. Do you have internet access at your current office practice?

- YES What type of internet access do you have? (Please ✓ all that apply)  
 Dial-up     High Speed (i.e. cable or DSL)     Wireless  
 NO

b. Do you routinely use the available computer? (at least once on ½ of all business days)

- Yes     No

c. Do other, non-physician, staff at your office use the available computer?

- Yes     No

d. Does the computer get used in the scope of your practice?

- YES For what type of functions? (Please ✓ all that apply)
- |  |  |
|--|--|
| <input type="checkbox"/> Scheduling of patients appointments         | <input type="checkbox"/> Patient registration    |
| <input type="checkbox"/> Billing/ charge capture                     | <input type="checkbox"/> Dictation               |
| <input type="checkbox"/> Drug references/Medication interactions     | <input type="checkbox"/> Lab results             |
| <input type="checkbox"/> Access to reference materials               | <input type="checkbox"/> Bills/claims submission |
| <input type="checkbox"/> Electronic prescribing of drugs             | <input type="checkbox"/> Weight based dosing     |
| <input type="checkbox"/> Electronic order entry (e.g., labs, x-rays) | <input type="checkbox"/> Patient records         |
| <input type="checkbox"/> Other: (Please Specify) _____               |  |

- NO

2. Do you currently own a personal digital assistant (PDA) (i.e., Palm Pilot or Pocket PC)?

- YES       NO

3. Do you routinely use a PDA in your office practice? (at least once on ½ of all business days)

- YES       NO

If Yes, for which of the following functions do you use your PDA? (Please ✓ all that apply)

- |  |  |
|--|--|
| <input type="checkbox"/> Drug references                             | <input type="checkbox"/> Charge capture          |
| <input type="checkbox"/> Medication interactions                     | <input type="checkbox"/> Patient records         |
| <input type="checkbox"/> Access to reference materials               | <input type="checkbox"/> Lab results             |
| <input type="checkbox"/> Electronic Prescribing of medications       | <input type="checkbox"/> Bills/claims submission |
| <input type="checkbox"/> Electronic order entry (e.g., labs, x-rays) | <input type="checkbox"/> Weight based dosing     |
| <input type="checkbox"/> Calendar and other organizer functions      | <input type="checkbox"/> Dictation               |
| <input type="checkbox"/> Other: (Please Specify) _____               |  |

# Physician Survey

✘ Computer Avail.

✘ Uses

✘ Internet Access

✘ PDA use

✘ By function

✘ Email w/patients

✘ EHR use

✘ By function

✘ EHR Barriers



# Target Population

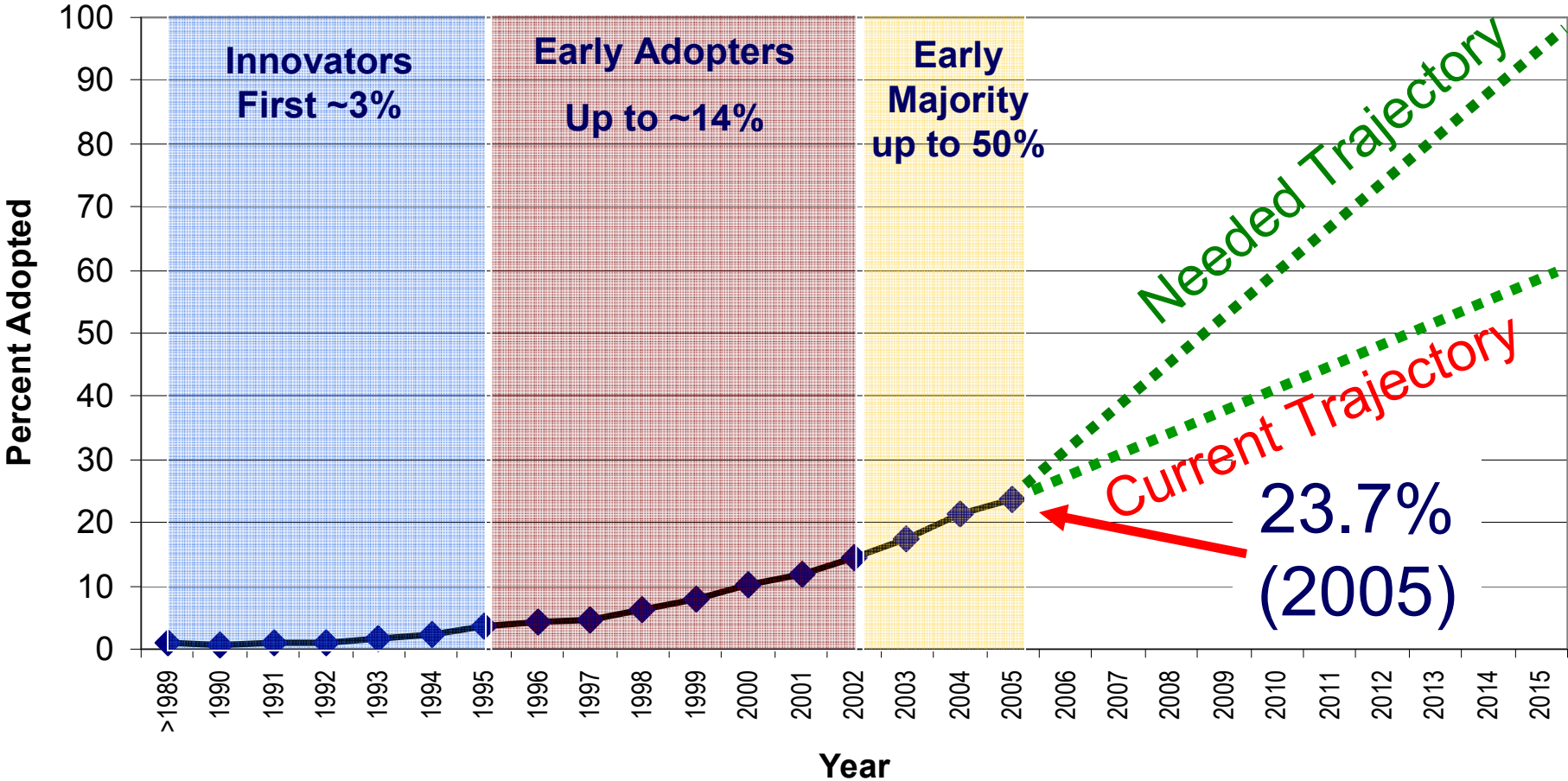
- ✘ Allopathic & osteopathic physicians
  - ✘ Clear and active license
  - ✘ Florida practice address
- ✘ Non-hospital setting
- ✘ All Primary care (FM, IM, Peds, OB)
- ✘ 25% Random stratified sample of other specialists
- ✘ N=14,921

# Results

	<b>Routine EHR use</b>	
<b>Total</b>	<b>23.7%</b>	
	<u>Percent</u>	<u>OR</u>
<b>Practice size</b>		
Solo practice	13.8	
2-9 physicians	20.4	1.40*
10-49 physicians	45.2	4.44**
50 or greater physicians	72.8	19.6**
<b>Medical training</b>		
Primary care <sup>1</sup>	22.4	
All other specialists	25.2	1.27*
<b>Practice Type</b>		
Single specialty	17.8	
Multi specialty	40.5	1.47*
<b>Age</b>		
Less than 40 years	27.6	
41-50 years	25.9	0.74
51-60 years	21.2	0.51**
61 years or greater	16.5	0.38**
<b>Race</b>		
Caucasian non-Hispanic	25.3	
African American or Black	23.3	1.3
Hispanic	18.7	0.74
Asian	20.6	0.73
Other or known race	20.6	0.91
<b>Gender</b>		
Male	23.5	
Female	22.1	0.82


# EHR Adoption Curve

## EHR Adoption among Florida Physicians



# Financial Barriers to EHR

**Do Not  
use EHR**



	Not considering	Interested adopters	Imminent adopters	Current EHR users
Upfront Costs				
Ongoing Maintenance				
Inadequate R.O.I.				

Values are percent indicating “major barrier”

# Financial Barriers to EHR

	Not considering	Interested adopters	Imminent adopters	Current EHR users
Upfront Costs	70.3	68.6	44.7	25.8
Ongoing Maintenance	57.3	42.1	24.9	15.6
Inadequate R.O.I.	57.1	40.3	19.9	12.9

Values are percent indicating “major barrier”

# Productivity Barriers to EHR

	Not considering	Interested adopters	Imminent adopters	Current EHR users
<b>Data Entry Cumbersome</b>	57.8	44.8	35.6	25.0
<b>No time to implement</b>	53.8	42.2	28.7	14.7
<b>System will slow me down</b>	42.7	26.8	22.6	19.0
<b>Temp. loss of productivity</b>	39.6	27.7	22.2	10.4
<b>Disrupts workflow</b>	40.3	22.6	15.3	8.5
<b>Difficult to use</b>	25.2	12.2	9.8	7.4

Values are percent indicating “major barrier”

# Technical Barriers to EHR

	Not considering	Interested adopters	Imminent adopters	Current EHR users
<b>No data standards</b>	46.9	47.6	33.6	23.9
<b>Computer crashes/ power fails</b>	49.7	37.4	23.2	20.4
<b>Products don't meet my needs</b>	31.5	24.1	20.9	15.3
<b>Me/staff don't have tech. knowledge</b>	18.3	8.6	4.8	4.5

Values are percent indicating "major barrier"

# Patient Barriers to EHR

	Not considering	Interested adopters	Imminent adopters	Current EHR users
<b>Privacy/ confidentiality concerns</b>	28.1	17.5	8.6	6.0
<b>Patient resistance/ not wanting their doctors to use EHR</b>	10.4	3.2	3.0	1.8

Values are percent indicating “major barrier”

# Imminent Adopters Only

<b>Top Barriers to EHR</b>	<b>Major Barrier</b>
<b>Upfront cost of hardware/ software</b>	<b>44.7</b>
<b>Entering data can be cumbersome</b>	<b>35.6</b>
<b>Lack of uniform data standards</b>	<b>33.6</b>
<b>Lack of time to acquire, implement system</b>	<b>28.7</b>

Among 995 current EHR users, 2 vendors each had a 9% market share; 12 vendors each had between 6.2 – 3.0% market share; and 111 vendors had a market share of 2% or less



# EHR Functions

<b>EHR Functions</b>	<b>Overall Percent n=995</b>
Clinical notes	93.9
Patient demographics	90.1
Medication list	88.7
Diagnosis	87.9
Allergies	87.5
Problem list	81.6
Procedures	77.9
Patient scheduling	72.5
Electronically available lab data/ results	67.6
Electronic prescribing of medications	60.8
Electronically available x-ray results	59.2
Electronic order entry (i.e., labs or x-rays)	55.3
Patient education materials	47.2
Offsite access/log-in capability	46.9
Access to reference material	38.1
Electronic connection to pharmacy info	37.7
Coding advice to physicians	37.5
Preventive service reminders	34.3
Growth charting	30.8
Weight based dosing calculations	25.6
Clinical decision support	25.3
Advance directives	23.1
Auto-updated insurance coverage info	17.5
Other EHR functions	4.6



		Adjusted Odds Ratios <sup>1</sup> for differences in functions used		
		Years since EHR installation		
<b>EHR Functions</b>	<b>Overall Percent</b> n=995	<b>0-2 Years</b> (Early Majority) n=214	<b>3-5 Years</b> (Early Adopters) n=266	<b>6+ Years</b> (Innovators) n=382
Clinical notes	93.9			
Patient demographics	90.1	1.00		2.29
Medication list	88.7			
Diagnosis	87.9			
Allergies	87.5			
Problem list	81.6			
Procedures	77.9	1.00		1.98
Patient scheduling	72.5	1.00	1.90	1.66
Electronically available lab data/ results	67.6	1.00	1.60	
Electronic prescribing of medications	60.8	1.00	2.40	1.93
Electronically available x-ray results	59.2			
Electronic order entry (i.e., labs or x-rays)	55.3	1.00	1.85	
Patient education materials	47.2	1.00	2.00	1.69
Offsite access/log-in capability	46.9	1.00	1.61	
Access to reference material	38.1			
Electronic connection to pharmacy info	37.7	1.00	1.76	
Coding advice to physicians	37.5	1.00	2.44	1.87
Preventive service reminders	34.3			
Growth charting	30.8	1.00	1.84	1.59
Weight based dosing calculations	25.6	1.00		1.67
Clinical decision support	25.3			
Advance directives	23.1			
Auto-updated insurance coverage info	17.5			
Other EHR functions	4.6			

# Payer Mix & EHR Adoption

	EHR Adoption	
	<u>Percent</u>	<u>Odds Ratio</u>
<b>Payer Mix</b>		
<b>Medicaid practice composition</b>		
Low volume (0%)	24.3	1.00
Typical volume (middle quartiles)	22.1	.888 (.71 – 1.11)
High volume (75% or greater)	20.2	<b>.690 (.50 – .95)</b>
<b>Medicare practice composition</b>		
Low volume (25% or less)	18.7	1.00
Typical volume (middle quartiles)	24.7	1.11 (.84 – 1.47)
High volume (60% or greater)	25.9	1.33 (.94 – 1.88)
<b>Private insurance practice composition</b>		
Low volume (20% or less)	18.1	1.00
Typical volume (middle quartiles)	25.7	<b>1.62 (1.16 – 2.27)</b>
High volume (60% or greater)	19.6	1.44 (.96 – 2.16)

# EHR

- ✘ What factors influence adoption in Florida?
  - ✘ Competition?
  - ✘ Managed Care penetration?
  - ✘ Market characteristics?
- ✘ Matched our data to other publicly available data sources



	Use of EHR	
	Percent	Odds Ratio
<b>Market Characteristics (county level)</b>		
Physicians per capita <sup>1</sup>		.968
Poverty Rate <sup>1</sup>		1.02
Managed Care Penetration Rate <sup>1</sup> (%)		.981**
Percent of population that is white		.130
Percent of population 65 years or greater		.255
Newborns as percent of population		.205
Unemployment rate		.890
Geographic location		
Urban	24.1	1.00
Rural	17.6	.746
<b>Practice Level Characteristics</b>		
<b>Practice size</b>		
Solo practice	13.8	1.00
2-9 physicians	20.4	1.14
10-49 physicians	45.2	2.78**
50 or greater physicians	72.8	7.36**
<b>Practice Type</b>		
Single specialty	17.8	1.00
Multi specialty	40.5	1.43**
<b>Primary Care<sup>2</sup></b>		
No	22.4	1.00
Yes	25.2	1.40**
<b>Physician Age<sup>1</sup></b>		
<b>Physician Gender</b>		
Male	23.5	1.00
Female	22.1	.900

# Market Drivers of EHR Adoption

✘ For every 1% increase in managed care penetration, a 1.9% decrease in the odds of physician utilization of EHR is observed

✘ Other 'external' factors did not matter (i.e., patient characteristics in the market, competition)



# Analyses by Specialty

- ✘ Family Physicians
- ✘ Obstetrician-Gynecologist
- ✘ Child Health Providers
  
- ✘ We tried to find 'meaningful' groups for comparison

Routine EHR usage	Percent		P-Value
	<u>Family Medicine</u>	<u>Other</u>	
Routine EHR usage	23.3	23.8	.779
<b>EHR Functions</b>			
• Allergies	94.9	81.7	<.001
• Medication list	94.3	83.5	<.001
• Clinical notes	92.0	90.6	.546
• Patient demographics	90.9	86.3	.099
• Diagnosis	90.9	83.2	.010
• Problem list	90.9	75.5	<.001
• Patient scheduling	79.0	69.4	.011
• Procedures	73.9	75.3	.682
• Electronic prescribing of medications	69.3	56.7	.002
• Electronically available lab data/ results	68.8	65.7	.436
• Patient education materials	61.9	41.0	<.001
• Electronic order entry	56.3	53.8	.561
• Electronically available x-ray results	55.1	59.1	.331
• Growth charting	52.8	23.9	<.001
• Preventive service reminders	48.3	30.3	<.001
• Access to reference material	47.2	35.2	.003
• Coding advice to physicians	47.2	33.7	.001
• Offsite access/log-in capability	46.0	43.1	.478
• Electronic connection to pharmacy info	38.6	36.9	.661
• Clinical decision support	29.0	23.7	.139
• Weight based dosing calculations	28.4	24.1	.225
• Advance directives	23.9	22.1	.611
• Auto-updated insurance coverage info	17.0	16.4	.824
• Other EHR functions	3.4	4.8	.433

Menachemi et al., (2006). *Informatics in Primary Care*, 14(1).

# Child Health Providers

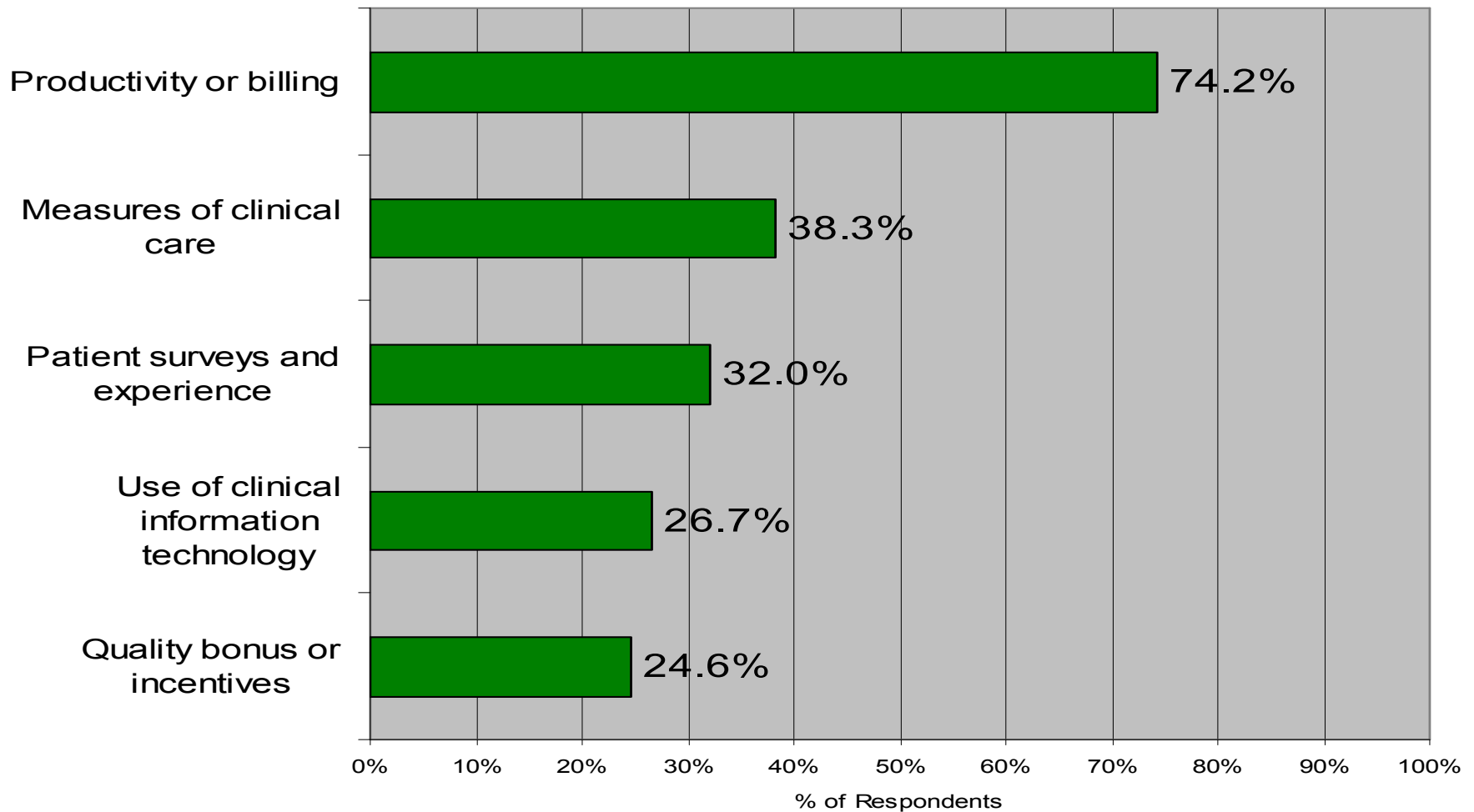
Information Technology Available	Child Health Providers (CHPs)			Differences among CHPs <sup>1</sup> P-value	All other Physicians (n=3,159)	Difference between CHPs and all other Physicians <sup>1</sup> P-value
	General Pediatricians (n=613)	Family Physicians* (n=138)	Pediatric Sub-specialists (n=270)			
Office-based Computer	77.4	82.9	89.3	<.001	81.0	.772
Internet Access	96.7	97.7	97.6	.708	96.3	.246
Dial-up connection only	14.6	15.2	7.9	.045	11.9	.454
High-speed connection	83.4	81.1	89.2	.089	85.6	.514
Email with patients (or family members)	14.4	20.4	16.8	.198	16.8	.539
Practice has a website	43.0	46.0	44.4	.795	42.0	.356
Personal Digital Assistant (PDA)	38.3	39.5	37.9	.951	37.2	.499
Electronic Health Records (EHR)	13.7	26.1	29.6	<.001	24.8	.001

\*Family physicians with at least 20% children (<18 years of age) in their practice.

<sup>1</sup>Chi square test used to identify differences among groups

Menachemi et al., (2006). *BMC Pediatrics*, 6(21).

# Compensation Factors among CHPs (N=1014)



Which, if any, of the following are factors in determining your own compensation or income?

# Pay for Performance and EHR Use

Compensation Factor:	Odds Ratio
<b>Productivity or billing</b>	<b>1.81 (1.10 – 2.96)</b>
Measures of clinical quality	.97 (.67 – 1.41)
Patient surveys & experience	1.03 (.70 – 1.51)
<b>Use of clinical IT</b>	<b>1.91 (1.23 – 2.81)</b>
Quality bonus of incentives	.98 (.65 – 1.49)

Note: statistical models control for practice size, practice setting (e.g., academic), provider type, high-volume Medicaid provider, & Sophisticated computer user



# Future Work with data

- ✘ Compare rural and urban physicians
- ✘ Continue to examine how pay for performance is influencing EHR adoption (and other IT adoption)
- ✘ Other sub-analyses of the data

## **EHR Studies from the FSU College of Medicine Center on Patient Safety**

**Menachemi, N.,** Brooks, R. (2006). EHR and Other IT Adoption among Ambulatory Physicians: Results of a Large-Scale Statewide Analysis. *Journal of Healthcare Information Management*, 20(3). 79-87

**Menachemi, N.,** et al. (2006). Growth Charting the Use of Electronic Health Records and other Information Technologies among Child Health Providers in Florida. *BMC Pediatrics*, 6(21).

**Menachemi, N.** (2006). Barriers to Ambulatory EHR: Who are “imminent adopters” and how do they differ from other physicians? *Informatics in Primary Care*, 14(2).

**Menachemi, N.,** et al. (2006). The Proliferation of Electronic Health Records among Obstetrician-Gynecologists. *Quality Management in Health Care*, (15)3. 150-156.

Brooks, R., **Menachemi, N.** (2006). Physician use of email with patients: factors influencing electronic communication and adherence to best practices. *Journal of the Internet Medical Research*, 8(1) e2.

**Menachemi, N.,** et al. (2006). Examining the Adoption of EHR and PDA use by Family Physicians in Florida. *Informatics in Primary Care*, 14(1). 1-9.

Ford, E., **Menachemi, N.,** Phillips, T. (2006). Predicting the Adoption of Electronic Health Records by Physicians: When will Health Care be Paperless? *Journal of the American Medical Informatics Association*, 13(1). 106-12.

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**Menachemi, N., et al. (2006).** The Relationship of Managed Care Penetration and other Factors with the use of CPOE by Physicians in the Ambulatory Setting. *Working Paper*

**Menachemi, N., Brooks, R. (2006).** Examining the use of information technologies among rural and urban ambulatory physicians in Florida. *Working Paper*

**Menachemi, N., et al. (2006)** Incomplete EHR Adoption: Lagged Diffusion of Patient Safety and Cost Control Functions. *Working Paper*

**Menachemi, N., et al (2006)** The Influence of Paper Mix on EHR Adoption by Physicians. *Working Paper*

## Other Information Technology Studies from the FSU College of Medicine

**Menachemi, et al.,** (2005) Hospital Information Technology and Positive Financial Performance: A different approach to ROI. *Journal of Healthcare Management* 51(1) 40-59.

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Warner & **Menachemi, et al,** (2005). Information Technologies Relevant to Pharmacy Practice in Hospitals. *Hospital Pharmacy*, 40(3), 233-239.

**Menachemi, et al.,** (2005) Characteristics of Hospitals that Outsource Information System Functions. *Journal of Healthcare Information Management* 19(1), 63-69.

Burke & **Menachemi, et al.,** (2005). The Diffusion of Information Technologies Supporting the IOM's Quality Chasm Care Aims. *Journal of Healthcare Quality*, 27(1), 24-32, 39.

Brooks & **Menachemi, et al.,** (2005) Patient Safety-Related Information Technology Utilization in Urban and Rural Hospitals. *Journal of Medical Systems*, 29(2), 103-109.

**Menachemi, et al.,** (2004). Adoption Factors Associated with Patient Safety Related Information Technologies. *Journal of Healthcare Quality*, 26(6), 39-44.

Burke & **Menachemi** (2004). Opening the Black Box: Measuring Hospital Information Technology Capability. *Health Care Management Review*, 29(3), 207-217.

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**Menachemi & Brooks (2006)** Reviewing the benefits of Electronic Health Records and Associated Patient Safety Technologies. *Journal of Medical Systems*, 30(3). 159-168.

Burke, **Menachemi & Brooks (2006)** Hospital CIOs: Assessing their fit in the organization and their influence on information technology capabilities. *Health Care Manager*, 25(2).

**Menachemi et al. (2004)** Factors Affecting the Adoption of Telemedicine – A Multiple Adopter Perspective. *Journal of Medical Systems*, 28(6), 617-632.

**Menachemi et al. (2006)**. To outsource or not to outsource: Examining the effects of outsourcing IT functions on financial performance in hospitals *Working Paper*

Bhattacharjee et al. (2006) Differential Performance Effects of Healthcare Information Technology Investments. *Working Paper*

**Menachemi et al. (2006)** The Relationship between Pediatric Volume & Information Technology Adoption in Hospitals. *Working Paper*

**Menachemi et al. (2006)** The effect of Payer-Mix on Hospital IT adoption. *Working Paper*