

## Supplementary Appendix

This appendix has been provided by the authors to give readers additional information about their work.

Supplement to: Jha AK, DesRoches CM, Campbell EG, et al. Use of electronic health records in U.S. hospitals. *N Engl J Med* 2009;360:1628-38. DOI: 10.1056/NEJMsa0900592.

## Appendix A: Questions from the survey used in the analysis

1. Does your hospital have a computerized system for: (Fully implemented means it has completely replaced paper record for the function)

	(1) Fully Implemented Across All Units	(2) Fully Implemented in At Least One Unit	(3) Beginning to Implement in At Least One Unit	(4) Have Resources to Implement in the Next Year	(5) Do not have Resources but Considering Implementing	(6) Not in Place and not Considering Implementing
<b>Electronic Clinical Documentation</b>						
a. Patient Demographics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Physician Notes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Nursing Assessments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Problem Lists	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Medication Lists	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Discharge Summaries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Advanced Directives (i.e. DNR)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Results Viewing</b>						
a. Lab Reports	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Radiology Reports	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Radiology Images	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Diagnostic Test Results (e.g., EKG report, Echo report)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Diagnostic Test Images (e.g., EKG tracing)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Consultant Reports	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Computerized Provider Order Entry</b> (Provider (e.g., MD, APN, NP) directly enters own orders)						
a. Laboratory Tests	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Radiology Tests	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Medications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Consultation Requests	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Nursing Orders	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Decision Support</b>						
a. Clinical Guidelines (e.g., Beta blockers post-MI, ASA in CAD)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Clinical Reminders (e.g., pneumovax)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Drug Allergy Alerts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Drug-Drug Interaction Alerts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Drug-Lab Interaction Alerts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Drug Dosing Support (e.g., renal dose guidance)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Bar Coding</b>						
a. Laboratory specimens	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Tracking pharmaceuticals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Pharmaceutical administration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Supply chain management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Patient ID	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Other Functionalities</b>						
a. Telemedicine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Radio Frequency ID	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Physician Use of Personal Data Assistant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Please answer regardless of whether or not your hospital has implemented an EHR system.**

**If your hospital has implemented an EHR system, please tell us how much of a barrier each of the following was to implementation.**

**If your hospital has NOT implemented an EHR, please indicate how much of a barrier it is to implementation, even if you have no immediate plans to implement a system.**

	(1) Major Barrier	(2) Minor Barrier	(3) Not a Barrier
a. The amount of capital needed to purchase and implement an EHR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Uncertainty about the return on investment (ROI) from an EHR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Concerns about the ongoing cost of maintaining an EHR system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Resistance to implementation from physicians	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Resistance to implementation from other providers (e.g., RNs, NPs, PAs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Lack of capacity to select, contract for, and implement an EHR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Disruption in clinical care during implementation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Lack of adequate IT staff	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. Concerns about inappropriate disclosure of patient information	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. Concerns about the legality of donating a system to associated physician	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k. Concerns about illegal record tampering or "hacking"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
l. Finding an EHR system that meets your organization's needs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
m. Lack of interoperable IT systems in the market place	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
n. Concerns about a lack of future support from vendors for upgrading and maintaining the system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**The table below lists potential policy solutions for suspected barriers to a hospital's implementation of an EHR.**

- If your hospital HAS NOT implemented an EHR system please rate the impact that the proposed change in policy would have on your hospital's decision to implement an EHR. Please indicate whether the impact would be positive or negative.
- If your hospital HAS implemented an EHR, please rate the impact of the proposed change in policy on EHR implementation among hospitals generally. Please indicate whether the impact would be positive or negative.

	(1) Major Positive Impact	(2) Minor Positive Impact	(3) No Impact	(4) Minor Negative Impact	(5) Major Negative Impact
a. Change the law to protect physicians from personal liability for record tampering by external parties or for privacy and security breaches	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Future HIPAA claims attachment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Published lists of certified EHRs to assure presence of necessary capabilities and functions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Objective evaluations of EHR capabilities and implementation experiences ("consumer reports" for EHRs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Technical assistance for implementation and process change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Incentives for the purchase and implementation of an EHR (e.g., tax credits, low interest loans, grants)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Additional reimbursement for the use of an EHR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix B: Adoption of basic and comprehensive EHR systems, adjusted for hospital characteristics

		Have Comprehensive EHR System	Have Basic* EHR System	Have No EHR System	Over-all P-value
Hospital Size		<b>Percent</b> (Standard Error)			
Size	Small (6-99 beds)	1.5 (0.5)	6.3 (0.9)	92.1 (1.0)	0.07
	Medium (100 beds -399 beds)	1.6 (0.3)	7.4 (0.8)	91.1 (0.8)	
	Large (400+ beds)	1.8 (0.8)	9.3 (2.0)	88.9 (2.3)	
Region					
Region	Northeast	1.1 (0.5)	6.6 (1.1)	92.3 (1.2)	0.84
	Midwest	1.8 (0.4)	6.8 (0.8)	91.4 (0.9)	
	South	1.3 (0.4)	7.8 (0.8)	90.8 (0.9)	
	West	1.8 (0.6)	7.4 (1.2)	90.8 (1.3)	
For-profit hospitals		1.0 (0.4)	5.0 (1.1)	94.0 (1.2)	0.08
Private non-profit hospitals		1.5 (0.3)	8.0 (0.7)	90.5 (0.7)	
Public hospitals		2.7 (0.7)	6.9 (1.1)	90.5 (1.3)	
Major Teaching Hospitals		1.9 (0.9)	13.8 (3.0)	84.4 (3.1)	0.03
Minor Teaching		1.8 (0.7)	8.7 (1.4)	89.4 (1.5)	
Non-Teaching		1.4 (0.3)	6.1 (0.6)	92.5 (0.6)	
Member of a System		2.3 (0.5)	7.8 (0.8)	89.9 (0.9)	0.008
Not a member of a system		1.0 (0.2)	6.7 (0.6)	92.3 (0.7)	
Urban hospitals		1.8 (0.3)	7.8 (0.6)	90.3 (0.6)	0.01
Rural hospitals		0.7 (0.3)	5.2 (1.1)	94.2 (1.1)	
Hospitals with CCU		1.5 (0.4)	7.0 (0.8)	91.4 (0.9)	0.57
Hospitals without CCU		1.4 (0.3)	7.4 (0.7)	91.2 (0.7)	

## Appendix C: Expert Consensus Panel

<p><b>Carmella Bocchino, R.N., M.B.A.</b> Senior Vice President, Medical Affairs America's Health Insurance Plans</p>	<p><b>Mark V. Pauly, Ph.D.</b> Bendheim Professor Health Care Systems Department The Wharton School University of Pennsylvania</p>
<p><b>Paul Cleary, Ph.D.</b> Dean of Public Health Yale School of Medicine</p>	<p><b>Mary A. Pittman, Dr.P.H.</b> President Health Research &amp; Educational Trust</p>
<p><b>Francois deBrantes</b> National Coordinator Bridges To Excellence</p>	<p><b>Sarah Hudson Scholle, M.P.H., Dr.P.H.</b> National Committee for Quality Assurance</p>
<p><b>Terry Hammons, M.D., S.M.</b> Sr. VP, Research and Information Medical Group Management Association</p>	<p><b>Bruce Siegel, M.D., M.P.H</b> Research Professor Department of Health Policy George Washington University School of Public Health and Health Services</p>
<p><b>Bernard L. Hengesbaugh, M.B.A.</b> Chief Operating Officer American Medical Association</p>	<p><b>Paul Tang, M.D.</b> Palo Alto Medical Foundation</p>
<p><b>Kevin Kearns, M.B.A.</b> President &amp; CEO Health Choice Network, Inc.</p>	<p><b>John R. Lumpkin, M.D., M.P.H.</b> Senior Vice President and Director Health Care Group The Robert Wood Johnson Foundation</p>
<p><b>Mark Leavitt, M.D., Ph.D.</b> Chair, CCHIT</p>	<p><b>Sally C. Morton, Ph.D.</b> Vice President for Statistics &amp; Epidemiology RTI International</p>
<p><b>Michael W. Painter, J.D., M.D.</b> Senior Program Officer The Robert Wood Johnson Foundation</p>	

Please note that the affiliations were correct at the time of their participation. Not all members participated in the selection of criteria for EHR adoption.