AHRQ Present on Admission (POA) – User Overview

Jeffrey Geppert, EdM, JD, Battelle Memorial Institute
John Bott, MSSW, MBA, Contractor, Agency for Healthcare Research and Quality

May 12, 2010
2:00 to 3:30 pm ET
***Toll Free:* 1-877-601-3553; Passcode: AHRQ POA**

AHRQ QI 2010 webinars to date

- **January 12 and 14**
  - AHRQ QIs, Version 4.1 – Overview
- **January 25 and 27**
  - AHRQ QIs, Version 4.1 – Additional Detail
- **May 12**
  - AHRQ QIs use of Present on Admission – User Overview
- **May 14**
  - AHRQ QIs use of Present on Admission – Technical Overview

Agenda

- POA Overview (15 minutes)
  - Issues
  - Value
  - Approach
  - List of AHRQ QIs that use POA
- POA Model Steps (25 minutes)
  - Patient Safety Indicator (PSI) example
  - Inpatient Quality Indicator (IQI) example
- Discussion (30-45 minutes)

POA Overview

- POA
  - Present at the time the order for inpatient admission occurs. Conditions that develop during an outpatient encounter, including emergency department, are considered present on admission (UB-04, 2007).
  - Applies to principal and secondary diagnoses
  - Distinguishes pre-existing comorbidities from complications that occur during the current hospital visit

POA Overview (cont.)

- Studies of POA use
  - Pine (2007) supported value of POA codes and numerical laboratory values in databases to improve predictive power of risk-adjustment models
  - Houchens (2008) found impact of POA on PSIs identification and rate calculation for 3 of 13 PSIs in analysis
  - Glance (2008) compared impact of POA based on AHRQ QI IQI mortality measures on hospital quality compared to enhanced administrative data
    - Ultimately POA use is needed to support use of data as QI
- National Quality Forum (NQF) supports use of POA data (e.g., foreign body left in during procedure and pediatric pressure ulcer)
  - Use of POA data will begin as soon as it is available

POA Overview (cont.)

- AHRQ QI uses of POA
  - Informs development and use
    - Cases where outcome (i.e., principal diagnosis) is likely POA are excluded from the denominator for some indicators
    - Conditions used in risk-adjustment were selected based on POA likelihood
    - After AHRQ QI software v. 3.1, POA data used for calculation of indicators as available
      - Exclude cases
      - Identify whether co-morbidity in risk adjustment
- Centers for Medicare and Medicaid (CMS) use for Medicare claims
- Some states that collect POA data use them in public reports of AHRQ QI data

POA Overview: Issues

- POA data are not collected in all states, hospitals or for all patients within a given hospital
  - 9 states provided POA data for the State Inpatient Databases (2007 SID) created by AHRQ under the Healthcare Cost and Utilization project (HCUP)
  - 22 states provided POA data for the 2008 SID
  - Additional states collect POA, but have yet to include it in their HCUP data submission

POA Overview: Issues (cont.)

- Deficit Reduction Act of 2005 (DRA)
  - Adjust Medicare payments for certain hospital-acquired conditions (i.e., complications)
  - Hospitals required to submit POA information on inpatient discharges on or after January 1, 2008 (unless exempt)

- CMS currently formulating a plan to study the accuracy of POA documentation

POA Overview: Value

- AHRQ QI Models inform users of adverse hospital events for various populations of at risk patients
- Predictive model is informed by administrative data (i.e., claim or discharge abstracts) that have known limitations and up to 30 or more different diagnoses

- **POA is the only way to distinguish between comorbidities and complications yielding more accurate AHRQ QI Models**

POA Overview: Value (cont.)

- Prediction can improve over time as additional states and payers collect POA
- Individual hospitals can decide to collect POA
- Applies to other enhanced administrative data (e.g., laboratory or key clinical findings)

POA Overview: Value (cont.)

- Purpose is to develop an approach to allow AHRQ to use the POA data where observed
  - AHRQ QI models based on multi-state SID
  - Models are unbiased risk-adjusted rate estimates for hospitals
    - Using records that may or may not include POA data

POA Overview: Approach

- Two sets of algorithms needed to incorporate POA information
  - 1. Develop response variables and comorbidity factor covariates in the **presence** of POA data
    - Less measurement error thereby more accurate and based on fewer assumptions
  - 2. Develop response variables and comorbidity factor covariates in the **absence** of POA data
    - Use observed POA data to estimate probability of POA for response and comorbidity factors for patients that do not have POA data
    - Provide hospital with risk-adjusted rate that would be "most likely" had they collected POA data
- Observed and estimated data are used to develop the final AHRQ QI models

POA Overview: AHRQ IQIs use of POA

	Measure Specifications *	Risk Adjustment
IQI #08 - Esophageal Resection Mortality		X
IQI #09 - Pancreatic Resection Mortality		X
IQI #11 - AAA Repair Mortality		X
IQI #12 - CABG Mortality		X
IQI #13 - Craniotomy Mortality		X
IQI #14 - Hip Replacement Mortality		X
IQI #15 - AMI Mortality		X
IQI #16 - CHF Mortality		X
IQI #17 - Acute Stroke Mortality		X
IQI #18 - GI Hemorrhage Mortality		X
IQI #19 - Hip Fracture Mortality		X
IQI #20 - Pneumonia Mortality		X
IQI #30 - PTCA Mortality		X
IQI #31 - Carotid Endarterectomy Mortality		X
IQI #32 - AMI Mortality WO Transfer		X

* Used in defining the numerator and / or denominator / exclusions

POA Overview: AHRQ PSIs use of POA

	Measure Specifications *	Risk Adjustment
PSI #03 - Pressure Ulcer	X	X
PSI #04 - Death among Surgical Inpatients with Serious Treatable Complications		X
PSI #05 - Foreign Body left in During Procedure	X	X
PSI #06 - Iatrogenic Pneumothorax	X	X
PSI #07 - Central Venous Catheter-related BSI	X	X
PSI #08 - Post-op Hip Fracture	X	X
PSI #09 - Post-op Hemorrhage or Hematoma	X	X
PSI #10 - Post-op Physiologic & Metabolic Derangement	X	X
PSI #11 - Post-op Respiratory Failure	X	X
PSI #12 - Post-op PE or DVT	X	X
PSI #13 - Post-op Sepsis	X	X
PSI #14 - Post-op Wound Dehiscence		X
PSI #15 - Accidental Puncture or Laceration		X
PSI #16 - Transfusion Reaction	X	X
PSI #17 - Birth Trauma - Injury to Neonate		X

* Used in defining the numerator and / or denominator / exclusions

POA Overview: AHRQ PDIs & NQIs use of POA

	Measure Specifications *	Risk Adjustment
PDI #01 - Accidental Puncture or Laceration		X
PDI #02 - Pressure Ulcer	X	X
PDI #03 - Foreign Body left in During Procedure	X	X
PDI #05 - Iatrogenic Pneumothorax	X	X
PDI #06 - Pediatric Heart Surgery Mortality		X
PDI #08 - Post-op Hemorrhage or Hematoma	X	X
PDI #09 - Post-op Respiratory Failure	X	X
PDI #10 - Post-op Sepsis	X	X
PDI #11 - Post-op Wound Dehiscence		X
PDI #12 - Central Venous Catheter-related BSI	X	X
PDI #13 - Transfusion Reaction	X	X
NQI #01 - Iatrogenic Pneumothorax in Neonates	X	X
NQI #02 - Neonatal Mortality		X
NQI #03 - Blood Stream Infections in Neonates	X	X

* Used in defining the numerator and / or denominator / exclusions

POA Model Steps

1. Determine whether the discharge has POA data
   a. Determines if record has data
2. Create discharge level flags for the indicator
   a. Flag outcome of interest and population at risk
   b. Flag for exclusion based on POA
3. Create discharge level flags for covariates
   a. Covariates are flagged based on relevant AHRQ QIs
4. Calculate predicted value for covariate
   a. When POA data are available actual value of P and X comorbidity used; without POA data the software predicts a value for each (X) covariate
5. Calculate predicted values for each discharge record
   a. Use actual or predicted covariate values to calculated three predicted values for each discharge record
6. Calculate observed, expected and risk-adjusted rate for each hospital
   a. Observed and expected rate for each hospital is an aggregate of actual and predicted values for each discharge record in the hospital

POA Model Steps: PSI #13

1. Determine whether the discharge has POA data
   a. POA data from Version 4.1 reference population (2007 SID)

	Overall	Postoperative Sepsis
No Present on Admission Data	18,365,066	557,822
Present on Admission Data	9,004,680	252,377
Total	27,369,746	810,199
No Present on Admission Data	67.1%	68.8%
Present on Admission Data	32.9%	31.1%
Total	100.0%	100.0%

Source: HCUP State Inpatient Databases (SID). Healthcare Cost and Utilization Project (HCUP). 2007. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/sidoverview.jsp.

POA Model Steps: PSI #13 (cont.)

2. Create discharge level flags for the indicator
   - POA data, P = 38.3%, which is percent of the cases flagged in outcome of interest that are excluded from population at risk [1,436 / (1,436 + 2,312)]

	Discharges without POA Data	Discharges with POA Data		
tpps13/ qpps13 (P)	Missing	0	1	Total
0	549,614	248,629	0	798,243
1	8,208	2,312	1,436	11,956
Total	557,822	250,941	1,436	810,199
0	98.53%	98.51%	0.00%	98.51%
1	1.47%	0.92%	0.57%	1.49%
Total	100.00%	99.43%	0.57%	100.00%

Source: HCUP State Inpatient Databases (SID). Healthcare Cost and Utilization Project (HCUP). 2007. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/sidoverview.jsp.

Note: tpps13 = inclusion in numerator; qpps13 = inclusion in denominator; (P) = cases flagged in outcome of interest excluded from population at risk because outcome is POA; 0 – does not meet inclusion; 1 = meets inclusion.

POA Model Steps: PSI #13 (cont.)

3. Create discharge level flags for covariates
   - Proportion of cases flagged for covariates both without and with POA data

		All Discharges	Discharges with POA Data	
	Covariate	Without POA Z	Without POA Z	With POA X
N		810,199	252,377	252,377
CV1	FEMALE	0.562	0.568	0.568
CV2	POPCAT 5to8	0.082	0.084	0.084
. . .				
CV9	MDRG 503	0.052	0.053	0.053
. . .				
CV17	MDC 4	0.015	0.014	0.014
. . .				
CV23	TRNSFER	0.021	0.022	0.022
CV24	COMORB CHF	0.043	0.037	0.029
CV25	COMORB VALVE	0.035	0.039	0.036
CV26	COMORB PULMCIRC	0.008	0.008	0.006
CV27	COMORB HTN_C	0.565	0.569	0.530
CV28	COMORB PARA	0.017	0.017	0.014
CV29	COMORB CHRNLUNG	0.187	0.181	0.165
CV30	COMORB HYPOTHY	0.106	0.107	0.100
CV31	COMORB RENLFAIL	0.054	0.050	0.046
CV32	COMORB LIVER	0.013	0.015	0.014
CV33	COMORB OBESE	0.118	0.122	0.115
CV34	COMORB WGHTLOSS	0.017	0.015	0.008
CV35	COMORB ALCOHOL	0.016	0.015	0.014
CV36	COMORB DEPRESS	0.089	0.087	0.081

Source: HCUP State Inpatient Databases (SID). Healthcare Cost and Utilization Project (HCUP). 2007. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/sidoverview.jsp.
Note: X = covariate for discharge records that contain POA data; Z = covariates for all discharge records that meet the inclusion criteria for the population at risk.

POA Model Steps: PSI #13 (cont.)

4. Calculate predicted value for covariates
   - Predicted value for each comorbidity is calculated
     - Four probabilities
       1. No discharge covariates if no covariates meet inclusion for the population at risk
       2. Discharge covariate if no covariates meet inclusion for the population at risk
       3. No discharge covariates if there is a covariate included for the population at risk
       4. Discharge covariate if there is a covariate included for the population at risk

POA Model Steps: PSI #13 (cont.)

Table denoting 4 probabilities:

		Pr(X=0 if Z=0)	Pr(X=1 if Z=0)	Pr(X=0 if Z=1)	Pr(X=1 if Z=1)
CV24	COMORB CHF	1.000	0.000	0.219	0.781
CV25	COMORB VALVE	1.000	0.000	0.070	0.930
CV26	COMORB PULMCIRC	1.000	0.000	0.208	0.792
CV27	COMORB HTN_C	1.000	0.000	0.069	0.931
CV28	COMORB PARA	1.000	0.000	0.188	0.812
CV29	COMORB CHRNLUNG	1.000	0.000	0.090	0.910
CV30	COMORB HYPOTHY	1.000	0.000	0.061	0.939
CV31	COMORB RENLFAIL	1.000	0.000	0.088	0.912
CV32	COMORB LIVER	1.000	0.000	0.066	0.934
CV33	COMORB OBESE	1.000	0.000	0.060	0.940
CV34	COMORB WGHTLOSS	1.000	0.000	0.444	0.556
CV35	COMORB ALCOHOL	1.000	0.000	0.090	0.910
CV36	COMORB DEPRESS	1.000	0.000	0.075	0.925

Source: HCUP State Inpatient Databases (SID). Healthcare Cost and Utilization Project (HCUP). 2007. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/sidoverview.jsp.
Note: X = covariate for discharge records that contain POA data; Z = covariates for all discharge records that meet the inclusion criteria for the population at risk.

POA Model Steps: PSI #13 (cont.)

5. Calculate predicted values for each discharge record
   - Predicted value calculations for typical discharge record without POA data

POA Model Steps: PSI #13 (cont.)

- Table for Step 5
  - Value for outcome is less for covariate with POA than covariate without POA because some flagged comorbidities are assumed to be complications

	Covariate	Z	Beta(Y|Z)	[Y|Z] Z*Beta(Y|Z)	X	Beta(Y|X)	[Y|X] X*Beta(Y|X)	Beta(P|X)	[P|X] X*Beta(P|X)
N		1	-5.311	-5.311	1.000	-5.7350	-5.7350	-6.4847	-6.4847
CV 1	FEMALE	1	-0.122	-0.122	1.000	-0.1235	-0.1235	-0.1465	-0.1465
CV 2	POPCAT 5to8	0	-0.691	0.000	0.000	-0.7197	0.0000	-0.6386	0.0000
CV 3	POPCAT 9to13	0	-0.215	0.000	0.000	-0.2364	0.0000	-0.2013	0.0000
CV 4	POPCAT 14to14	0	0.172	0.000	0.000	0.2241	0.0000	0.1100	0.0000
CV 5	POPCAT 15to15	0	0.239	0.000	0.000	0.2263	0.0000	0.3277	0.0000
CV 6	POPCAT 16to16	0	0.346	0.000	0.000	0.3517	0.0000	0.5081	0.0000
CV 7	POPCAT 17to17	1	0.348	0.348	1.000	0.4246	0.4246	0.4192	0.4192
CV 8	POPCAT 18to18	0	0.223	0.000	0.000	0.2117	0.0000	0.4607	0.0000
	Sum of Column			-3.7006			-4.2647		-4.4308
	Predicted value			0.0241			0.0138		0.0117

Source: HCUP State Inpatient Databases (SID). Healthcare Cost and Utilization Project (HCUP). 2007. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/sidoverview.jsp.

Note: X = covariate for discharge records that contain POA data; Z = covariates for all discharge records that meet the inclusion criteria for the population at risk; Y = outcome.

POA Model Steps: PSI #13 (cont.)

6. Calculate observed, expected and risk-adjusted rate for each hospital
   - Some have POA data and some do not

Discharge	Denom.	Y	[Y|Z]	[Y|X]	P	[P|X]	E / C	1-F	C*G
		A	B	C	D	E	F	G	H
Record 1	1	1	0.02411	0.01478	.	0.01176	0.7957	0.2043	0.0030
Record 2	1	1	0.02411	0.01478	.	0.01176	0.7957	0.2043	0.0030
Record 3	1	0	0.00224	0.00134	.	0.00109	0.0000	1.0000	0.0013
Record 4	1	0	0.07063	0.05094	0	0.02703	0.0000	1.0000	0.0509
Record 5	1	0	0.00257	0.00125	.	0.00173	0.0000	1.0000	0.0013
Record 6	1	0	0.00209	0.00120	0	0.00084	0.0000	1.0000	0.0012
Record 7	1	0	0.01511	0.00970	.	0.00948	0.0000	1.0000	0.0097
Record 8	1	1	0.09408	-	1	0.04448	1.0000	0.0000	0.0000
Record 9	1	1	0.03075	0.02053	.	0.00934	0.4549	0.5451	0.0112
More . . .									
Hospital		**Y**					**POA**		**Expected**
Sum	1953	18					5		16.0108
Average		0.00921					0.00256		0.00819
Hospital		**Observed**							**Expected**
Rate		0.00667							0.00821
O/E		0.811							
Risk-adjusted		0.00709							

Source: HCUP State Inpatient Databases (SID). Healthcare Cost and Utilization Project (HCUP). 2007. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/sidoverview.jsp.
Note: X = covariate for discharge records that contain POA data; Z = covariates for all discharge records that meet the inclusion criteria for the population at risk.

POA Model Steps: IQI

- IQI Example
  - Note how differs from PSI

			Variables Names		Pr(X=0 if Z=0)	Pr(X=1 if Z=0)	Pr(X=0 if Z=1)	Pr(X=1 if Z=1)
			ZIntercept	XIntercept	1.000000	0.000000	0.000000	1.000000
POPCAT	5	8	ZCV1	XCV1	1.000000	0.000000	0.000000	1.000000
POPCAT	9	9	ZCV2	XCV2	1.000000	0.000000	0.000000	1.000000
POPCAT	10	10	ZCV3	XCV3	1.000000	0.000000	0.000000	1.000000
POPCAT	11	11	ZCV4	XCV4	1.000000	0.000000	0.000000	1.000000
POPCAT	12	12	ZCV5	XCV5	1.000000	0.000000	0.000000	1.000000
POPCAT	14	16	ZCV6	XCV6	1.000000	0.000000	0.000000	1.000000
POPCAT	17	17	ZCV7	XCV7	1.000000	0.000000	0.000000	1.000000
POPCAT	18	18	ZCV8	XCV8	1.000000	0.000000	0.000000	1.000000
APRDRG	'1611'	'1612'	ZCV9	XCV9	0.998609	0.001391	0.000000	1.000000
APRDRG	'1613'	'1614'	ZCV10	XCV10	1.000000	0.000000	0.163446	0.836554
APRDRG	'1621'	'1622'	ZCV11	XCV11	0.998679	0.001321	0.000000	1.000000
APRDRG	'1623'		ZCV12	XCV12	0.999110	0.000890	0.383648	0.616352
APRDRG	'1624'		ZCV13	XCV13	1.000000	0.000000	0.556787	0.443213
APRDRG	'1651'	'1652'	ZCV14	XCV14	0.989480	0.010520	0.000330	0.999670
APRDRG	'1653'		ZCV15	XCV15	0.994822	0.005178	0.290526	0.709474
APRDRG	'1654'		ZCV16	XCV16	1.000000	0.000000	0.612440	0.387560
APRDRG	'1731'	'1734'	ZCV17	XCV17	1.000000	0.000000	0.000000	1.000000
APRDRG	'1742'		ZCV18	XCV18	0.986535	0.013465	0.093861	0.906139
APRDRG	'1743'		ZCV19	XCV19	0.993795	0.006205	0.309075	0.690925
APRDRG	'1744'		ZCV20	XCV20	0.999986	0.000014	0.293496	0.706504
APRDRG	'1901'		ZCV21	XCV21	0.989029	0.010971	0.000109	0.999891
APRDRG	'1902'		ZCV22	XCV22	0.977964	0.022036	0.059794	0.940206
APRDRG	'1903'		ZCV23	XCV23	0.981557	0.018443	0.095684	0.904316
APRDRG	'1904'		ZCV24	XCV24	0.999948	0.000052	0.226945	0.773055
MDC	5		ZCV25	XCV25	0.999993	0.000007	0.000000	1.000000
TRNSFER			ZCV26	XCV26	1.000000	0.000000	0.000000	1.000000

Source: HCUP State Inpatient Databases (SID). Healthcare Cost and Utilization Project (HCUP). 2007. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/sidoverview.jsp.
Note: X = covariate for discharge records that contain POA data; Z = covariates for all discharge records that meet the inclusion criteria for the population at risk; Y = outcome.

Discussion

- For your consideration:
  - Did this webinar meet your needs?
    - Content? Scope?
  - How will the information presented be useful to you?
  - Is there anything we did not cover or didn't address in enough detail for you?

- Your questions:
  - Questions about what you heard today?
    - If we don't answer your question today, then we will post a response on the AHRQ QI website

For more information…

AHRQ QIs

- Web site: http://qualityindicators.ahrq.gov/
  - AHRQ QI documentation and software are available at the AHRQ QI web site
- Present on Admission White Paper:
  - http://www.qualityindicators.ahrq.gov/downloads/webinars/Using%20Present%20on%20Admission.pdf
- Staff:
  - Mamatha Pancholi Mamatha.Pancholi@ahrq.hhs.gov
  - John Bott John.Bott@ahrq.hhs.gov