Proposed Expansion of the Patient Safety Indicator Set

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AHRQ PSIs endorsed by OECD (after review of data limitations)

- Foreign body left in during procedure (PSI 5)
- Catheter associated bloodstream infection (PSI 7)
  - Dropped due to problems with international comparability given lack of specificity of ICD-10 code
- Postoperative pulmonary embolism or deep vein thrombosis (PSI 12)
- Postoperative sepsis (PSI 13)
- Accidental puncture and laceration (PSI 15)
- Obstetric trauma - vaginal delivery w instrument (PSI 18)
- Obstetric trauma - vaginal delivery w/out instrument (PSI 19)

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Key learnings from 2009-2011

- Many OECD countries can report PSI rates using either ICD-9-CM or ICD-10 coded data
- Age/sex standardization can be performed but has little impact on cross-country comparisons
- Same-day or short-stay cases need to be excluded
- Some exclusions (e.g., non-elective admissions) have erratic effects and must be modified or dropped for cross-country comparisons
- Mean number of coded secondary diagnoses varies greatly across countries (even with similar number of fields) and may be a major source of bias in cross-country comparison; adjustment techniques may reduce this bias

2011 recommendations to OECD HCQI program

- Consider procedure-linked or procedure-stratified indicators for future work
  - More consistent coding across hospitals and areas
  - Reduce bias due to variation in risk across countries
- Different countries use different procedure classification systems, requiring more mapping effort to ensure comparability
  - Postoperative wound dehiscence
  - Postoperative hemorrhage or hematoma
  - Postoperative respiratory failure
  - Iatrogenic pneumothorax
  - Postoperative metabolic derangement (renal failure)

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Validation findings in USA
Medical record review as gold standard

Name	VA		AHRQ		UHC	
	PPV (%) (95% CI)	Sample (n)*	PPV (%) (95% CI)	Sample (n)	PPV (%) (95% CI)	Sample (n)
Decubitus Ulcer	30 (22-40)	112	--	--	32 (30-35)	2035
Foreign Body Left in During Procedure	46 (36-55)	93	--	--	--	--
Iatrogenic Pneumothorax	**73 (64-81)**	**112**	**78 (73-82)**	**205**	**--**	**--**
Central Venous Catheter-related Bloodstream Infections	38 (29-47)	112	61 (51-71)	191	--	--
Postoperative Hip Fracture	28 (15-43)	46	--	--	--	--
Postoperative Hemorrhage or Hematoma	**75 (66-83)**	**112**	**93** **78 (62-95)**	**181**	**--**	**--**
Postoperative Physiologic and Metabolic Derangements	**63 (54-72)**	**119***	**85 (78-90)**	**94**	**--**	**--**
Postoperative Respiratory Failure	**67 (57-76)**	**112**		**--**	**83 (77-89)**	**609**
Postoperative PE or DVT	43 (34-53)	112	47 (42-52)	121	44 (37-51)	452
Postoperative Sepsis	53 (42-64)	112	41 (28-54)	164	--	--
Postoperative Wound Dehiscence	**87 (79-92)**	**112**	**--**	**--**	**--**	**--**
Accidental Puncture or Laceration	85 (77-91)	112	91 (86-94)	249	--	--

Note that procedure-linked or stratified indicators (in bold) tend to have high PPV

Validation findings in USA: POA reporting

PSI/PDI	Percentage reported as NOT POA (%)				
	NACHRI	Mich	CA	NY	Mayo
PSI 1: Complications of Anesthesia		100	100	100	94
PSI 3: Decubitus Ulcer	60	42	11	14	18
PSI 5: Foreign Body Left During Proc	80	80	64	76	54
PSI 6: Iatrogenic Pneumothorax	**89**	**100**	**73**	**65**	**78**
PSI 7: Infection Due To Medical Care	57	36	65	65	60
PSI 8: Postop Hip Fracture		0	21	26	22
PSI 9: Postop Hemorrhage or Hematoma	**97**	**100**	**79**	**71**	**87**
PSI 10: Postop Physiologic or Metabolic		**91**	**77**	**64**	**46**
PSI 11: Postop Respiratory Failure	**83**	**100**	**94**	**93**	**74**
PSI 12: Postop DVT or PE		67	46	43	40
PSI 13: Postoperative Sepsis	60	60	73	70	76
PSI 14: Postop Wound Dehiscence	**90**				**100**
PSI 15: Accidental Puncture/Laceration	93	84	87	87	85
PSI 16: Transfusion Reaction	71	N/A	58	78	50

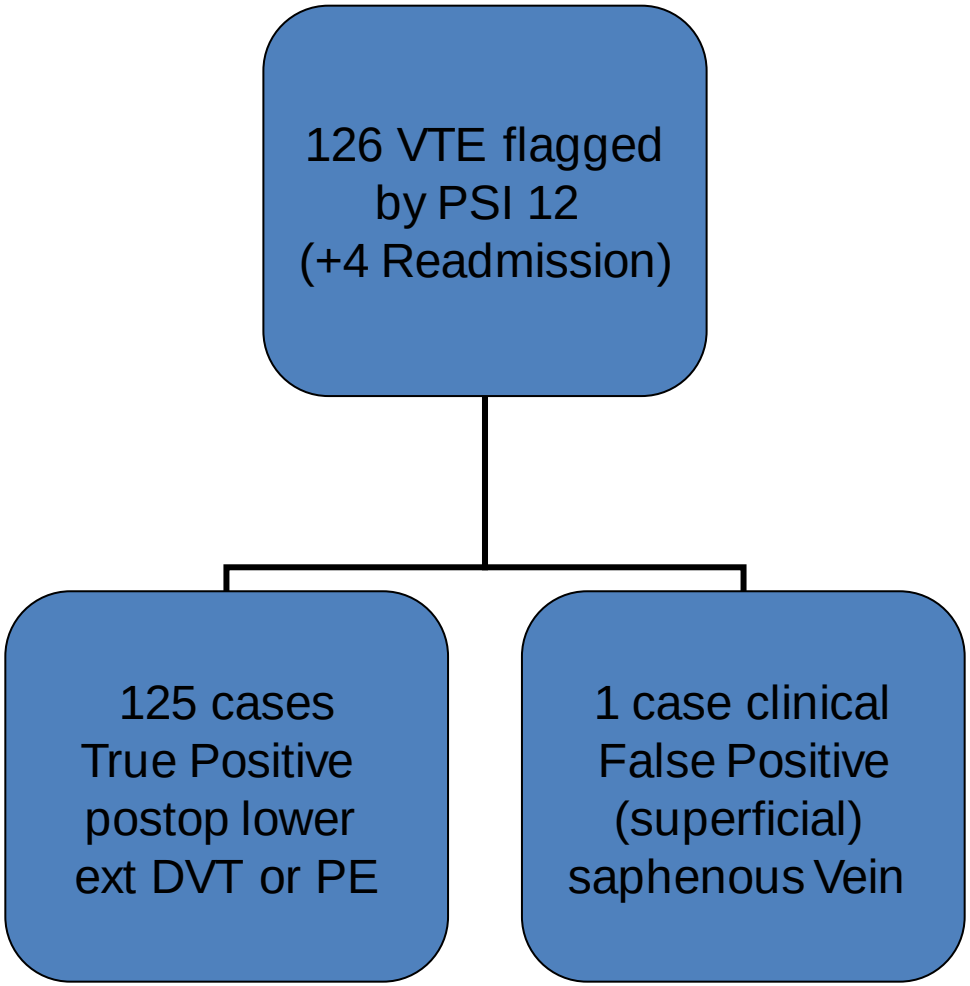
Procedure-linked and stratified PSIs (highlighted) are unlikely to be present on admission.

Obstetric trauma (PSI 18/19): validation findings

- California Obstetric Validation Study (Romano et al., 2005):
  - Stratified random cluster sample of 1,662 records from 52 hospitals (51% vaginal)
  - Sensitivity=90% (95% CI, 82-96%) and PPV=90-95%
  - Adjusted sensitivity=93% (95% CI, 82-97%) and PPV=73%
- Clinical research data set (Brubaker et al. 2007):
  - 393 indicator-positive and 383 indicator-negative vaginal deliveries
  - Sensitivity=77% (95% CI, 72-81%)
  - Specificity=99.7% (95% CI, 98.5-99.4%)
  - PPV could not be estimated due to the sampling design, but should be approximately 93% given a typical prevalence of 5%
- English NHS study (Bottle and Aylin, 2008):
  - 955 cases from 18 English NHS trusts sampled
  - PPV=85% (none present at admission, 15% miscoded)

PSI 12: Postoperative DVT/PE after TKA

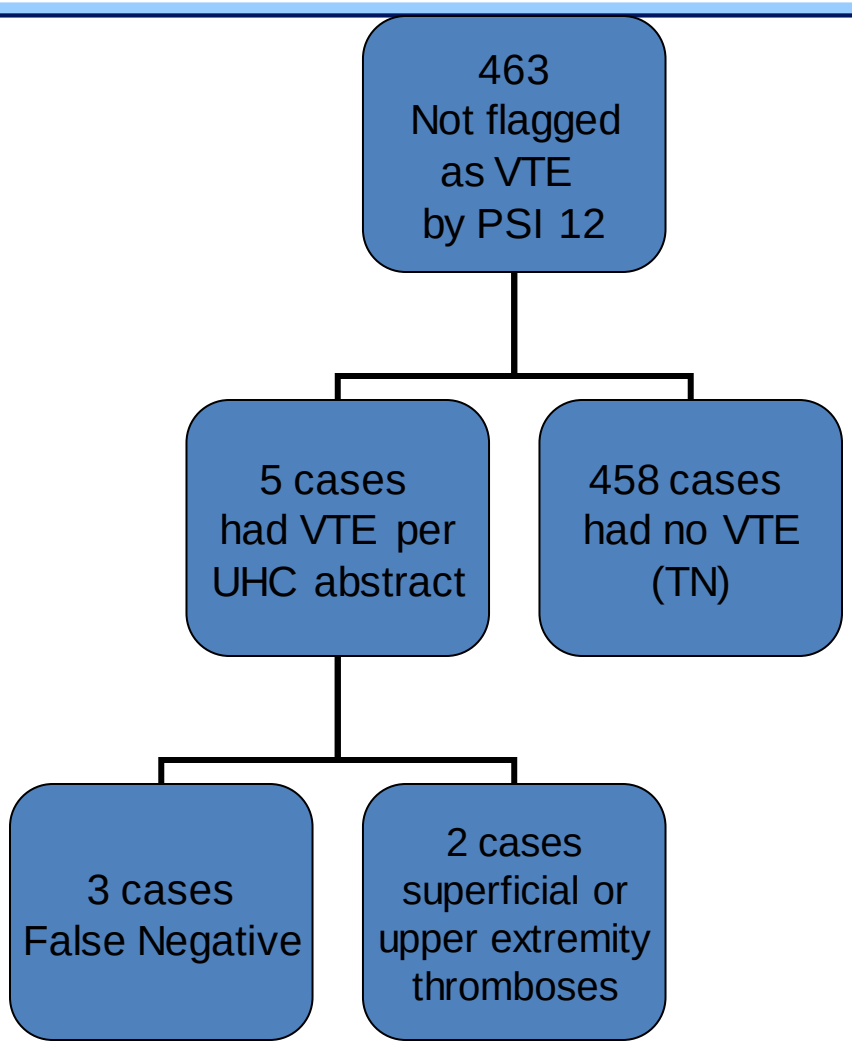
Follow-up study of PPV in 15 academic centers



- Positive Predictive Value
  = TP / (TP + FP)
  = 0.992
- Overall updated PPV from 7 volunteer hospitals
  = 126/156 = 81%
  Most FPs due to acute preoperative events (19) or miscoded location of DVT (10)

PSI 12: Postoperative DVT/PE after TKA

Follow-up study of NPV in 15 academic centers



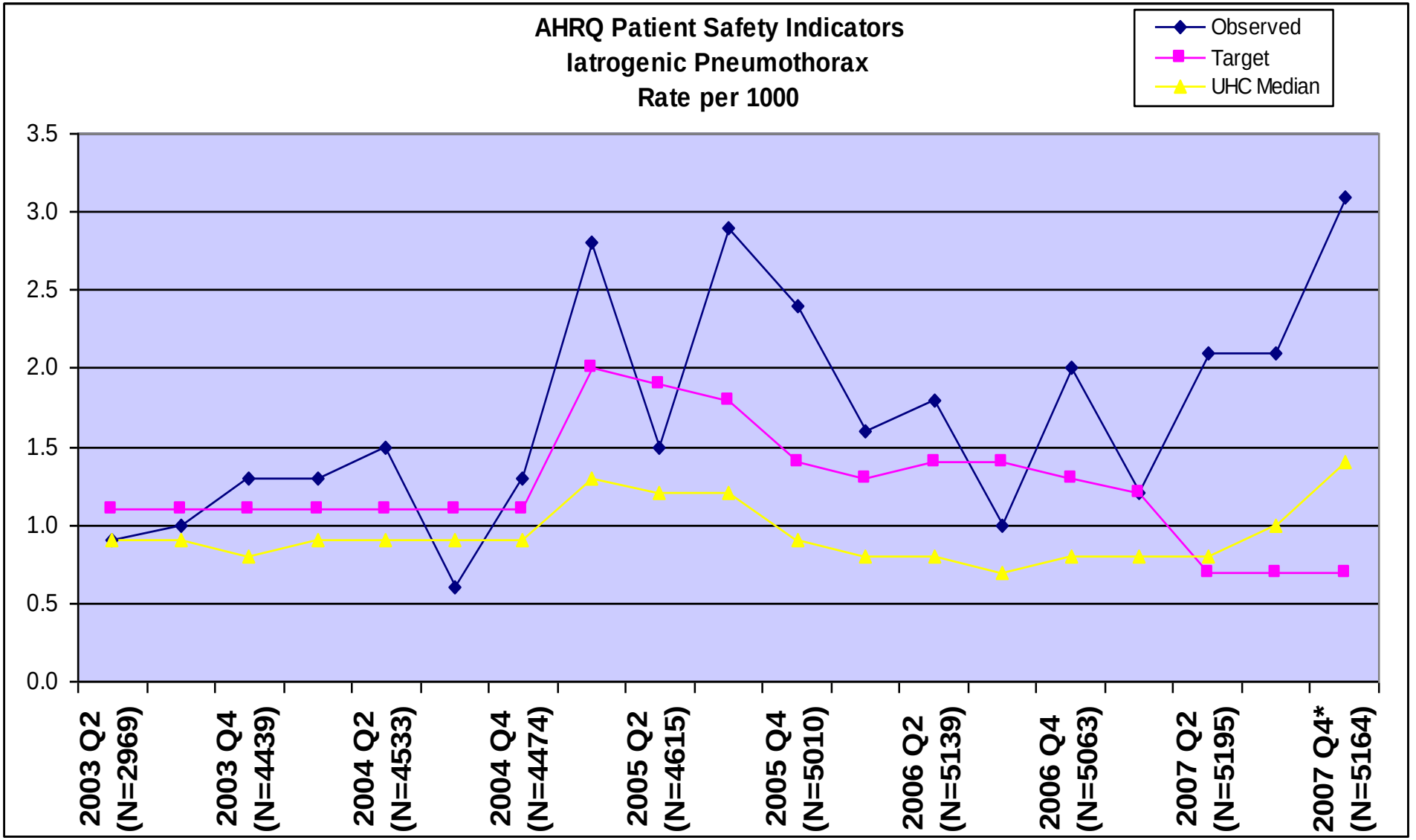
- Negative Predictive Value
  = TN / (FN + TN)
  = 458 / (458+3) = 0.993
- Previous sensitivity estimate from 33 teaching hospitals:
  96% (95% CI: 86-100%)
  100% if limited to acute DVT or PE

PSI 6: Iatrogenic pneumothorax

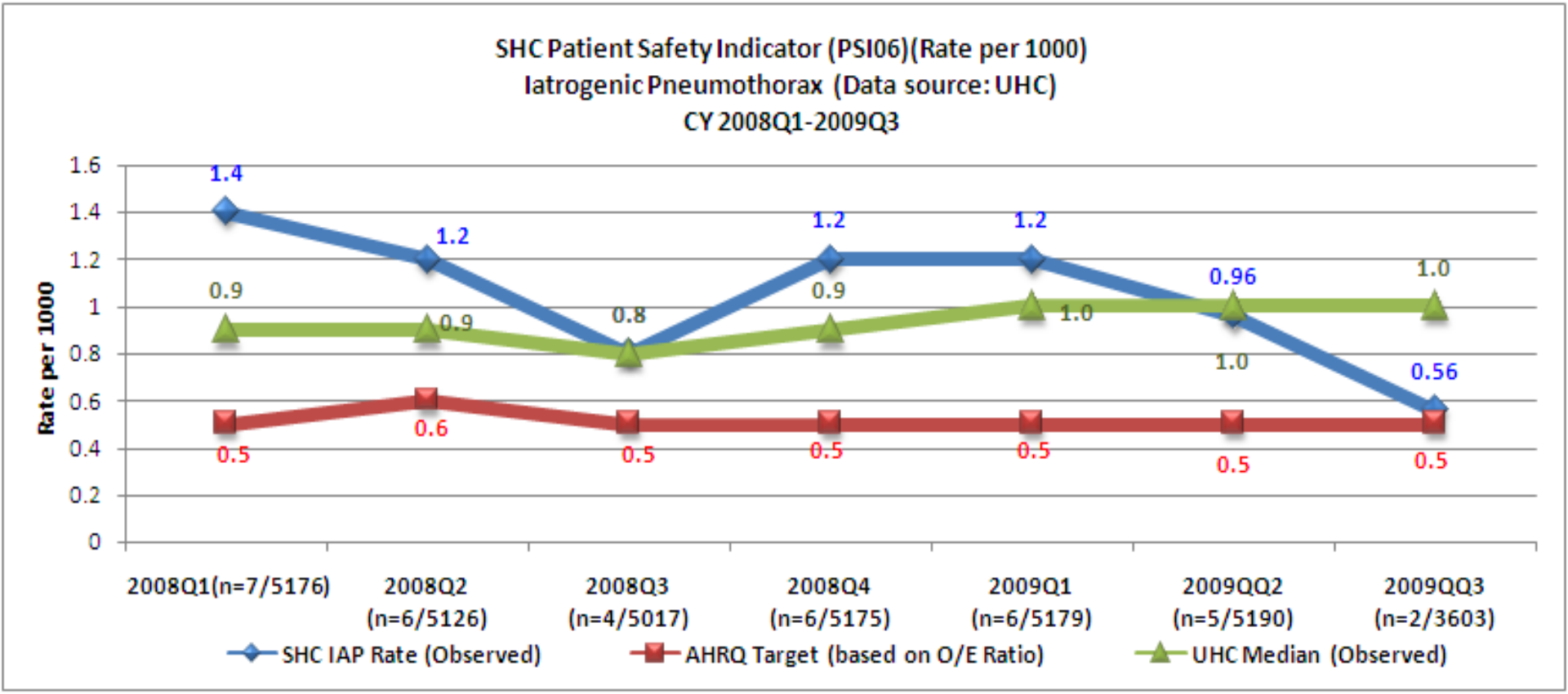
- Overall PPV 73% (VA) or 78% (nonfederal)
- FPs due to inadequate documentation, such as "rule out" pneumothorax without alternative diagnosis established after study (CXR or CT)
- Most TPs related to failure to use "bedside" ultrasound guidance during placement of central venous catheters, especially in the OR, ICU, and ED (proven to reduce iatrogenic injury during IJ/SC vein placement)

Case study: Iatrogenic pneumothorax

One hospital's experience recognizing and responding



Iatrogenic Pneumothorax Data



Note that this hospital was able to reduce its IP rate well below the median for teaching hospitals (UHC) and to achieve benchmark/target performance.

PSI 9: Postoperative Hemorrhage/Hematoma

- Screens for hemorrhage or hematoma requiring operative treatment following a surgical procedure
- 31 hospitals from 11 states participated
- N=181 flagged and N=281 unflagged records
  - PPV = 78% (95% CI 62-95%) or 93% from coding alone
  - NPV = 99.7% (98.9-99.9%)
  - Sensitivity = 49% (26-72%)
  - Specificity = 99.9% (99.7-100%)
- Sensitivity was improved to 87% by adding certain procedure codes to indicator denominator
- Specification of diagnosis codes as “postoperative” may improve PPV in some versions of ICD-10

PSI 10: Postoperative Physiologic or Metabolic Derangement

- Screens for acute kidney injury requiring dialysis and diabetes-related coma, ketoacidosis, or hyperosmolarity after elective surgical procedure
- 35 hospitals from 11 States participated
- N=94 flagged and N=230 unflagged records
  - PPV = 84.9% (95% CI 78.0-91.9%)
  - NPV = 98.7% (97.3-100.0%)
  - Sensitivity = 96.3% (90.4-100.0%)
  - Specificity = 94.2% (86.2-100.0%)
- Problem: requires way to identify elective surgery or diagnoses present on admission

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Hospital-level Pediatric Quality Indicators (PDIs)

Indicator name	Panel recommendations Internal QI	Comp Report	Tailored Risk Adjustment or Stratification
Accidental puncture and laceration	Acceptable (-)	No	Number and type of procedures, MDC
Decubitus ulcer	Acceptable (-)	Acceptable (-)	High risk group
Foreign body left in after procedure	Acceptable (+)	Acceptable (+)	Too rare
Iatrogenic pneumothorax in neonates	Acceptable (+)	Acceptable (-)	
Iatrogenic pneumothorax, non-neonates	Acceptable (+)	Acceptable (-)	
Pediatric heart surgery mortality	Acceptable (+)	Acceptable (+)	Specialized risk adjustment with RACHS-1 System (Jenkins et al)
Pediatric heart surgery volume	Acceptable (+)	Acceptable (+)	
Postoperative hemorrhage/hematoma	Acceptable (+)	Acceptable (+)	High risk (coagulopathy)
Postoperative respiratory failure	Acceptable (+)	Acceptable (-)	
Postoperative sepsis	Acceptable (-)	No	High risk, intermediate risk (complex)
Postoperative wound dehiscence	Acceptable (+)	Acceptable (+)	
Selected infection due to medical care	Acceptable (-)	No	High risk, intermediate risk (complex)
Transfusion reaction	Acceptable (+)	Acceptable (-)	Too rare

Highlighted PDIs are closely related to existing OECD PSIs.

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National Association of Children's Hospitals and Related Institutions' (USA) assessment of PDI preventability

	N reviewed	Preventable	Uncertain
PDI 1: Accidental Puncture/Laceration	247	32%	36%
PDI 2: Decubitus Ulcer	138	51	28
PDI 3: Foreign Body Left During Procedure	45	44	36
PDI 4: Iatrogenic Pneumothorax (neonates)	10	10	10
PDI 5: Iatrogenic Pneumothorax (non-neonates)	148	29	35
PDI 8: Postop Hemorrhage or Hematoma	140	13	44
PDI 9: Postop Respiratory Failure	108	14	26
PDI 10: Postoperative Sepsis	133	26	41
PDI 11: Postop Wound Dehiscence	44	34	41
PDI 12: Infection Due To Medical Care	145	40	41
PDI 13: Transfusion Reaction	5	0	20

Scanlon MC, et al. Pediatrics 2008; 121:e1723-e1731.
Highlighted PDIs were judged <50% non-preventable.

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Recommendations for consideration

- Exclude indicators that require present on admission (POA) coding or exclusion of non-elective cases
  - Postoperative physiologic or metabolic derangement
  - Postoperative respiratory failure
- To minimize burden on countries, treat pediatric indicators as a separate stratum within corresponding adult indicators

Recommendations for consideration

- Postoperative hemorrhage or hematoma*
- Postoperative wound dehiscence*
- Add pediatric stratification of Accidental puncture or laceration
- Consider pediatric stratification of Retained surgical item or unretrieved device fragment (new name for Foreign body left in)
- Consider Iatrogenic pneumothorax*
  - High PPV and preventability, but potential coding problem due to variable coding instructions in different countries using ICD-10

* Include adult/pediatric stratification

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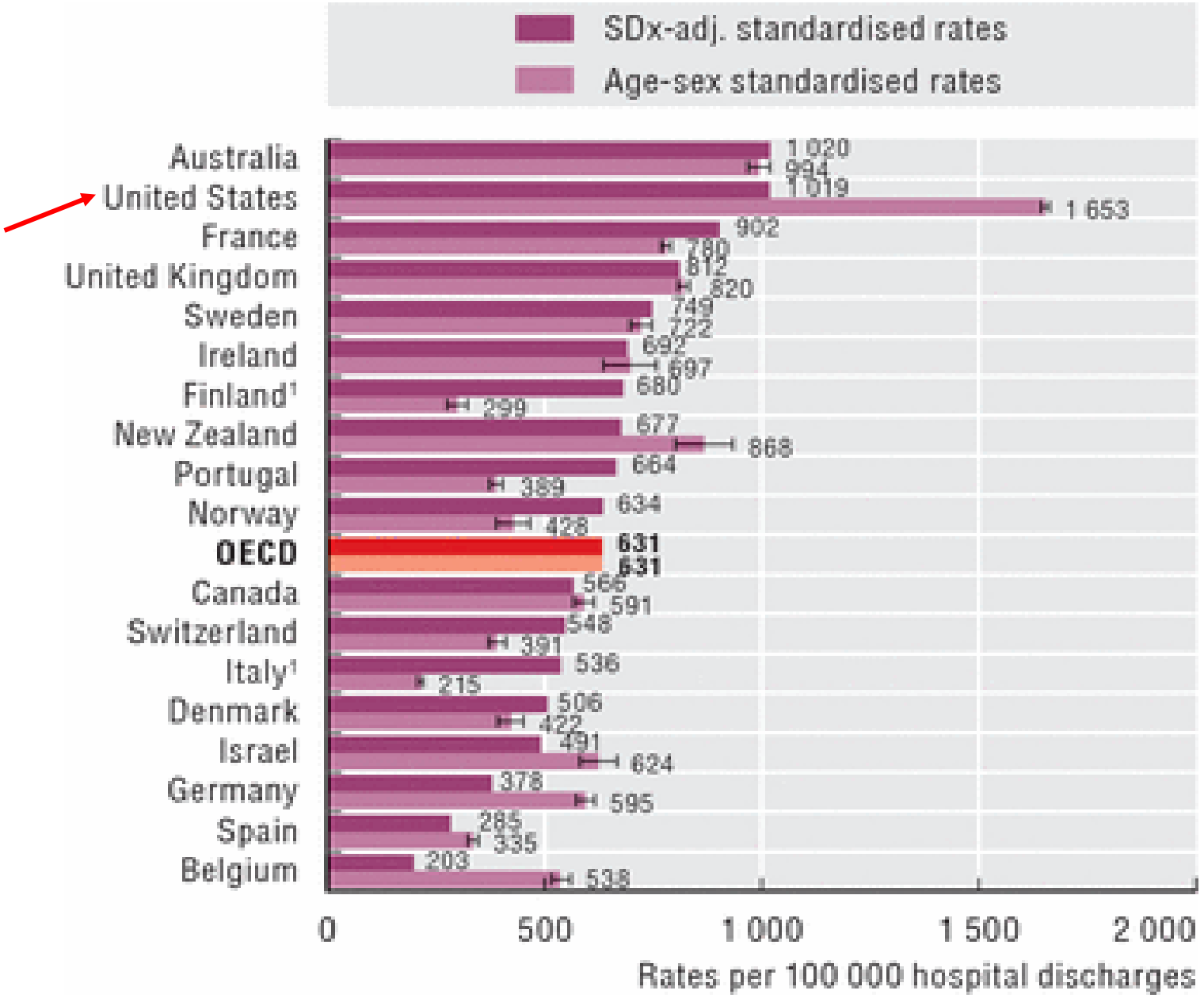
Reminder

- These indicators may still be susceptible to bias due to variation in coding intensity across hospitals
- Recommend continuing to collect data on mean number of secondary diagnoses among cases at risk (denominator) for adjustment

Postoperative pulmonary embolism or deep vein thrombosis, 2009



***Source*: OECD Health Care Quality Indicators Data 2011 (OECD).**