

Appendix 1 – Patient Safety Indicator International Classification of Diseases Codes by Cluster**Hospital-acquired infections**

A02.0, A02.1, A04.4, A04.5, A04.7, A04.8, A04.9, A08.0, A08.1, A41.0, A41.1, A41.2, A41.4, A41.50, A41.51, A41.52, A41.58, A41.80, A41.88, A41.9, A49.0, B30.9, B37.3, B37.4, B37.7, B37.80, B37.81, B95.6, B95.7, B95.8, B96.1, B96.2, B96.4, B96.5, B96.81, B96.88, B97.4, G00.3, J15.0, J15.1, J15.2, J15.5, J15.6, J15.9, J18.1, J21.0, J85.3, J86.0, J86.9, J95.01, K65.0, N39.0, N99.51, O75.30, O85.00, O86.00, O86.10, O86.20, O86.30, O86.80, P36.0, P36.1, P36.2, P36.3, P36.4, P36.8, P36.9, P38, R57.2, T81.4, T82.6, T82.7, T83.5, T83.6, T84.53, T84.54, T84.60, T84.61, T84.63, T84.64, T84.65, T84.68, T84.7, T85.7, T87.42, T87.46, T87.47, T87.48

Decubitus ulcer

L89.0, L89.1, L89.2, L89.3, L89.8, L89.9

Endocrine and metabolic complications (electrolyte abnormalities, diabetes, etc.)

E10.10, E10.63, E10.64, E11.0, E11.10, E11.11, E11.63, E11.64, E13.63, E14.63, E15, E16.0, E27.2, E89.1, E89.2, E89.3, G37.2, T50.3

Venous thromboembolic events

I26.0, I26.9, I80.1, I80.2, I82.2, O87.102

Cardiac complications

I20.0, I20.1, I20.88, I20.9, I21.0, I21.1, I21.2, I21.3, I21.4, I21.9, I22.0, I22.1, I22.8, I22.9, I46.1, I46.9, I47.2, I48.1, I49.00, I49.01, I50.0, I50.1, I50.9, J81, O74.20, S26.811, T82.0, T82.1, T82.2, T82.5, T82.6, T82.7, T82.8, T82.9

Respiratory complications

J15.0, J15.1, J15.2, J15.5, J15.6, J15.9, J18.1, J21.0, J38.01, J38.02, J38.09, J69.0, J69.8, J85.3, J86.0, J86.9, J94.2, J95.00, J95.01, J95.02, J95.03, J95.08, J95.1, J95.2, J95.5, J95.80, J95.81, J95.88, J95.9, J96.0, S20.2, S22.200, S22.300, S22.400, S22.410, S22.490, S27.000, S27.001, S27.100, S27.200, S27.300, S27.310, T17.3, T17.4, T17.5, T17.8, T17.9, T71, T79.7, T81.81

Hemorrhagic events

D62, D68.3, J94.2, J95.00, O71.701, O71.704, O71.801, O72.00, O72.10, O72.20, O90.20, P12.0, S06.4, S06.5, S06.6, S27.100, S27.200, S27.300, S36.090, S36.091, S36.150, S36.151, S36.800, S36.810, S37.000, S37.300, T79.2, T81.0

Drug-related adverse events

D68.3, E16.0, E88.3, H91.0, I95.2, O74.50, T36.0, T36.1, T36.5, T36.8, T36.9, T37.8, T38.0, T38.3, T39.0, T39.1, T39.3, T39.8, T40.2, T40.3, T40.4, T40.6, T41.2, T41.3, T42.0, T42.1, T42.4, T42.6, T42.7, T43.0, T43.2, T43.4, T43.5, T43.8, T44.5, T44.7, T45.0, T45.1, T45.5, T45.7, T45.8, T46.0, T46.1, T46.2, T46.4, T46.5, T47.4, T48.0, T48.6, T49.0, T50.1, T50.2, T50.9, T80.8, T80.9, T81.80, T88.2, T88.3, T88.6

Adverse events related to fluid management

E86.0, E86.8, E87.7, G37.2, T50.3, T80.8, T80.9

Obstetrical complications affecting mother (for females only)

O08.6, O29.50, O70.20, O70.30, O70.90, O71.10, O71.11, O71.18, O71.30, O71.40, O71.50, O71.60, O71.70, O71.80, O72.00, O72.10, O72.20, O74.20, O74.30, O74.50, O74.60, O74.80, O75.10, O75.30, O75.40, O75.40, O75.60, O85.00, O86.00, O86.10, O86.20, O86.30, O86.80, O87.10, O89.40, O89.50, O89.80, O90.00, O90.10, O90.20

Complications directly related to surgery

H59.80, M96.6, O75.401, O75.40, O86.00, O90.00, S26.811, S27.001, S36.091, S36.151, S36.411, S36.461, S37.111, S37.211, S37.311, T81.0, T81.1, T81.2, T81.3, T81.52, T81.58, T81.59, T81.6, T81.81, T81.88, T81.9

Traumatic injuries (nonprocedural) arising in hospital

S01.00, S01.01, S01.10, S01.20, S01.30, S01.40, S01.50, S01.70, S01.80, S01.90, S02.000, S02.100, S02.200, S02.300, S02.480, S02.490, S02.5, S02.890, S03.0, S05.0, S05.1, S05.8, S05.9, S06.0, S06.1, S06.25, S06.35, S06.4, S06.5, S06.6, S06.85, S06.9, S09.0, S09.8, S09.9, S10.1, S10.9, S13.48, S14.38, S20.2, S20.4, S20.8, S22.200, S22.300, S22.400, S22.410, S22.490, S27.000, S27.100, S27.200, S27.300, S27.310, S27.810, S27.860, S30.0, S30.1, S30.80, S30.81, S30.88, S30.9, S31.200, S31.400, S32.100, S32.400, S32.500, S32.700, S32.800, S33.5, S35.1, S35.2, S35.5, S36.090, S36.150, S36.460, S36.610, S36.810, S37.000, S37.090, S37.110, S37.190, S37.210, S37.290, S37.300, S37.310, S37.390, S37.610, S39.08, S39.8, S39.9, S40.0, S40.8, S40.9, S41.10, S41.11, S42.010, S42.020, S42.090, S42.190, S42.200, S42.210, S42.220, S42.280, S42.290, S42.300, S42.390, S42.400, S42.480, S43.000, S43.090, S43.100, S46.00, S46.08, S49.7, S49.8, S49.9, S50.0, S50.1, S50.7, S50.8, S50.9, S51.00, S51.01, S51.70, S51.80, S51.90, S52.000, S52.100, S52.300, S52.500, S52.580, S52.590, S52.600, S52.800, S59.8, S59.9, S60.0, S60.2, S60.7, S60.8, S60.9, S61.00, S61.70, S61.80, S61.90, S62.000, S62.500, S62.690, S62.800, S63.100, S63.59, S69.8, S69.9, S70.0, S70.1, S70.8, S70.9, S71.10, S71.11, S72.000, S72.010, S72.080, S72.090, S72.100, S72.190, S72.200, S72.300, S72.410, S72.420, S72.490, S72.800, S72.900, S73.000, S73.090, S74.18, S75.0, S79.9, S80.0, S80.1, S80.7, S80.8, S80.9, S81.00, S81.01, S81.80, S81.81, S81.90, S81.91, S82.000, S82.100, S82.200, S82.300, S82.400, S82.500, S82.600, S82.800, S82.890, S83.6, S89.8, S89.9, S90.0, S90.1, S90.3, S90.7, S90.8, S90.9, S91.00, S91.10, S91.20, S91.30, S92.000, S92.300, S92.400, S92.500, S93.49, S99.8, S99.9, T00.1, T00.8, T00.9, T09.0, T11.0, T11.1, T13.0, T13.1, T14.0, T14.9, T20.0, T20.2, T21.0, T21.1, T21.2, T21.3, T22.0, T22.4, T23.0, T23.2, T24.0, T24.2, T25.0, T25.2, T71, T79.2, T79.6, T79.7

Anesthesia-related complications

O29.50, O74.20, O74.30, O74.50, O74.60, O74.80, O89.40, O89.50, O89.80, T41.2, T41.3, T88.2, T88.3, T88.4, T88.5

Delirium

F05.0, F05.1, F05.8, F05.9

Central nervous system complications

E11.0, E15, F05.0, F05.1, F05.8, F05.9, G00.3, G37.2, G97.2, O74.30, O89.40, S06.0, S06.1, S06.25, S06.35, S06.4, S06.5, S06.6, S06.85, S06.9

Gastrointestinal

A02.0, A04.4, A04.5, A04.7, A04.8, A04.9, A08.0, A08.1, B37.80, B37.81, K22.3, K65.0, K91.0, K91.3, S27.810, S27.860, S36.150, S36.151, S36.411, S36.460, S36.461, S36.610, T18.1, T18.2, T18.3, T18.9, T28.2, T85.5

Severe events proximally threatening to life or to major vital organs

G37.2, I21.0, I21.1, I21.2, I21.3, I21.4, I21.9, I22.0, I22.1, I22.8, I22.9, I26.0, I46.1, I46.9, I47.2, I49.00, I49.01, J96.0, K22.3, K65.0, O74.20, O74.30,

Appendix 2 - Mapping of PSI clusters to NSQIP complications

PSI Cluster	NSQIP complications
Cardiac	Postoperative myocardial infarction Cardiac arrest requiring CPR
Fluid management	Postoperative acute renal failure Postoperative renal insufficiency
Hemorrhage	Postoperative bleeding requiring transfusion Postoperative stroke
Respiratory	Postoperative pneumonia Postoperative unplanned intubation Postoperative ventilation
Venous thromboembolism	Postoperative pulmonary embolism Postoperative deep vein thrombosis
Infection	Postoperative superficial SSI Postoperative deep SSI Postoperative organ space SSI Postoperative pneumonia Postoperative Urinary tract infection Postoperative sepsis Postoperative septic shock
Surgical complication	Unplanned return to operating room Postoperative superficial SSI Postoperative deep SSI Postoperative organ space SSI Postoperative wound disruption

CPR: cardiopulmonary resuscitation; SSI: surgical site infection

Appendix 3-Demographic characteristics of NSQI/PSI concordant and discordant episodes					
	NSQIP+/ PSI+	NSQIP+/ PSI-	NSQIP- /PSI+	NSQIP- /PSI-	TOTAL
	N=1,328	N=1,087	N=736	N=9,747	N=12,898
Age (mean, \pm SD)	67 \pm 15	62 \pm 16	65 \pm 17	58 \pm 17	60 \pm 17
Female (n, %)	52.8%	57.0%	49.0%	56.6%	55.7%
Elective admission (%)	52.9%	62.1%	61.1%	73.8%	69.2%
Length of stay in days (mean, \pm SD)	23 \pm 24	9 \pm 10	12 \pm 14	4 \pm 5	7 \pm 12
Diabetes (%)	21.1%	18.7%	17.4%	13.4%	15.1%
Smoker (%)	22.7%	21.8%	19.9%	18.6%	19.5%
Dyspnea (%)	14.3%	10.6%	9.6%	5.9%	7.7%
Functionally dependant (%)	11.6%	7.7%	7.5%	2.7%	4.6%
SIRS \leq 48hrs of surgery (%)	5.4%	4.9%	3.2%	2.5%	3.2%
Sepsis < 48hrs of surgery (%)	5.4%	2.5%	3.3%	1.1%	1.9%
Septic shock < 48hrs of surgery (%)	2.9%	1.1%	0.9%	0.0%	0.6%
Ventilator Dependent (%)	2.9%	1.0%	0.5%	0.1%	0.6%
COPD (%)	12.2%	7.5%	8.7%	4.1%	5.7%
Ascites (%)	2.9%	1.6%	1.4%	0.4%	0.9%
Congestive Heart Failure (%)	3.3%	1.4%	1.6%	0.3%	0.8%
Hypertension (%)	55.8%	47.6%	50.4%	37.5%	41.7%
Acute Renal Failure \leq 24 hrs (%)	1.5%	0.8%	0.4%	0.1%	0.3%
Dialysis (%)	2.8%	2.7%	1.7%	0.8%	1.3%
Disseminated Cancer (%)	9.4%	9.2%	7.5%	4.2%	5.6%
> 10% weight loss (%)	5.5%	3.9%	3.0%	1.2%	2.1%
Immunosuppressed (%)	6.4%	6.8%	4.5%	2.5%	3.6%
Bleeding disorder (%)	8.6%	6.2%	4.7%	2.5%	3.8%
Preoperative Transfusions (%)	6.5%	3.0%	2.2%	0.4%	1.5%
Elixhauser score (mean, \pm SD)	5 \pm 6	3 \pm 6	4 \pm 5	2 \pm 4	3 \pm 5
ASA score <2 (%)	9.6%	19.9%	17.9%	39.0%	32.0%

General Surgery (%)	40.0%	26.8%	40.2%	24.0%	27.3%
Gynecology (%)	5.6%	12.6%	5.3%	12.5%	11.2%
Neurosurgery (%)	7.8%	9.4%	6.5%	9.3%	9.0%
Orthopedics (%)	19.8%	26.6%	21.8%	28.4%	26.7%
Otolaryngology (%)	4.2%	3.4%	4.5%	7.4%	6.4%
Plastics (%)	1.8%	2.4%	1.4%	1.8%	1.8%
Thoracic (%)	3.1%	2.7%	6.0%	3.4%	3.5%
Urology (%)	4.3%	5.9%	3.4%	7.1%	6.4%
Vascular (%)	13.4%	10.1%	10.9%	6.2%	7.8%
ASA: American Society of Anesthesiologists; COPD: Chronic Obstructive Pulmonary Disease; NSQIP: National Surgical Quality Improvement Program; PSI: Patient Safety Indicators; SIRS: Systemic Inflammatory Response Syndrome; SD: standard deviation					

Appendix 4 - 2x2 table of NSQIP and PSI results by cluster and subgroup

		<u>NSQIP Myocardial Infarction of Cardiac Arrest</u>	
		Present	Absent
<u>PSI Cardiac</u>			
Present		82	186
Absent		173	12 457

NSQIP: National Surgical Quality Improvement Program; PSI: Patient Safety Indicator

		<u>NSQIP Renal Insufficiency or Failure</u>	
		Present	Absent
<u>PSI Fluid</u>			
Present		12	78
Absent		100	12 708

NSQIP: National Surgical Quality Improvement Program; PSI: Patient Safety Indicator

		<u>NSQIP Postoperative bleeding or stroke</u>	
		Present	Absent
<u>PSI Hemorrhagic</u>			
Present		295	203
Absent		1003	11 397

NSQIP: National Surgical Quality Improvement Program; PSI: Patient Safety Indicator

		<u>NSQIP Surgical Site Infection, Pneumonia, Urinary Tract Infection or Sepsis</u>	
		Present	Absent
<u>PSI Infection</u>			
Present		562	354
Absent		343	11 639

NSQIP: National Surgical Quality Improvement Program; PSI: Patient Safety Indicator

**NSQIP Unplanned
Intubation,
Pneumonia,
Ventilation**

<u>PSI Respiratory</u>	Present	Absent
Present	99	118
Absent	259	12 422

NSQIP: National Surgical Quality Improvement Program; PSI: Patient Safety Indicator

**NSQIP Unplanned
Return to Operating
Room, Surgical Site
Infection, Wound
Disruption**

<u>PSI Surgery</u>	Present	Absent
Present	180	548
Absent	347	11 823

NSQIP: National Surgical Quality Improvement Program; PSI: Patient Safety Indicator

**NSQIP Venous
Thromboembolism**

<u>PSI Venous Thromboembolism</u>	Present	Absent
Present	19	19
Absent	78	12 782

NSQIP: National Surgical Quality Improvement Program; PSI: Patient Safety Indicator

**Elective-NSQIP Any
Complications**

<u>Elective-PSI Any</u>	Present	Absent
Present	678	675
Absent	380	7 191

NSQIP: National Surgical Quality Improvement Program; PSI: Patient Safety Indicator

**Emergency-NSQIP
Any Complications**

<u>Emergency-PSI Any</u>	Present	Absent
Present	650	412
Absent	356	2556

NSQIP: National Surgical Quality Improvement Program; PSI: Patient Safety Indicator

Orthopedics-NSQIP
Any Complications

<u>Orthopedics-PSI Any</u>	Present	Absent
Present	270	227
Absent	270	2683

NSQIP: National Surgical Quality Improvement Program; PSI: Patient Safety Indicator

General Surgery-
NSQIP Any
Complications

<u>General Surgery-PSI Any</u>	Present	Absent
Present	548	420
Absent	153	2406

NSQIP: National Surgical Quality Improvement Program; PSI: Patient Safety Indicator

LoS>30 days-NSQIP
Any Complications

<u>LoS>30 days-PSI Any</u>	Present	Absent
Present	338	72
Absent	44	44

LoS: length of stay; NSQIP: National Surgical Quality Improvement Program; PSI: Patient Safety Indicator

**Appendix 5 - International Classification of Diseases-
Tenth Edition Codes with prevalence >1%**

PSI cluster	ICD-10 code	% with code
Any	K913	6.7
	T814	6.4
	N390	4.1
	D62	3.4
	T810	3.4
	T812	2.8
	T813	2.4
	F058	2.3
	D649	2.0
	I959	2.0
	N990	1.9
	J189	1.9
	R520	1.7
	R000	1.6
	E876	1.5
	R33	1.2
	N179	1.0
I4890	1.0	
Cardiac	T828	17.0
	J81	14.0
	I214	13.7
	I500	12.7
	I219	8.7
	T825	6.7
	T827	5.7
	I2088	4.3
	I469	3.7
	I472	2.3
	I211	1.3
	I209	1.0
	I228	1.0
	I481	1.0
	I4900	1.0
T8279	1.0	
Fluid	E877	39.8
	E860	28.0
	E868	28.0
	T808	4.3

Hemorrhagic	
D62	48.2
T810	47.3
D683	2.2
Infection	
T814	43.4
N390	27.9
A419	5.4
A047	4.8
R572	4.5
K650	2.7
T827	1.5
T835	1.1
Respiratory	
J690	20.9
J960	13.4
T8181	10.6
J9580	8.7
J9609	7.5
J952	5.9
J9600	4.7
J152	3.5
J9588	3.5
J150	2.8
J3801	2.0
J9500	2.0
J942	1.6
J151	1.2
J155	1.2
J9501	1.2
J9502	1.2
J9601	1.2
T178	1.2
Surgery	
T810	32.4
T812	27.2
T813	23.1
T8188	9.5
T8181	3.3
M966	2.5
T811	1.7
Venous thromboembolism	
I802	56.1
I269	39.0
I801	2.4
I822	2.4

ICD-International Classification of
Diseases

Appendix 6 - proportion of episodes of care with each PSI and NSQIP complication

PSI Cluster	Percent of episodes with cluster*
Infection	7.1
Ulcer	0.4
Endocrine or metabolic	0.3
Venous thromboembolism	0.3
Cardiac	2.1
Respiratory	1.7
Hemorrhagic	3.9
Drug	0.2
Fluid	0.7
Surgery	5.6
Trauma in hospital	0.4
CNS	2.0
Delirium	2.0
Gastrointestinal	4.7
NSQIP complication	
Renal Failure	0.5
Ventilation	1.4
Septic shock	1.2
Sepsis	0.8
Blood Transfusion	9.8
Intubation	0.8
Wound disruption	0.3
Pneumonia	1.8
Postoperative organ space SSI	1.1
Postoperative superficial SSI	2.3
Postoperative deep SSI	0.5
Myocardial infarction	0.6
Renal insufficiency	0.5
Deep vein thrombosis	0.4
Pulmonary embolism	0.4
Stroke	0.4
Cardiac arrest requiring CPR	0.1

CNS-central nervous system; CPR-cardiopulmonary resuscitation; NSQIP: National Surgical Quality Improvement Program; PSI: Patient Safety Indicator; SSI: surgical site infection