

**Online Supplement to “Wrong-Site Surgery in Pennsylvania During 2015–2019:  
A Study of Variables Associated With 368 Events From 178 Facilities”**

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**Appendix A.** Frequency of Wrong-Site Surgery by Procedure Group and Specific Procedure during 2015—2019

Procedure Group	Specific Procedure	Grand Total
<b>Biopsy</b>		<b>27</b>
<b>Excision</b>		<b>13</b>
<b>Injection</b>	Block (Anesthetic/Pain)	77
	Steroid	21
	Unspecified	6
	Radiation (Tracer/Therapy)	4
	Other (6 specific procedures)	8
		<b>116</b>
<b>Ophthalmic</b>	Trabeculectomy	6
	Laser Surgery	4
	Unspecified	1
	Other (3 specific procedures)	3
		<b>14</b>
<b>Orthopedic, Upper Extremity</b>	Trigger Finger Release	7
	Other (8 specific procedures)	10
		<b>17</b>
<b>Orthopedic/Podiatry, Lower Extremity</b>	Arthroscopy	3
	Other (10 specific procedures)	12
		<b>15</b>
<b>Other</b>	Needle Localization	4
	Circumcision	3
	Frenulectomy	3
	Other (26 specific procedures)	35
		<b>45</b>
<b>Spinal</b>	Fusion	11
	Discectomy with Fusion	6
	Kyphoplasty	4
	Discectomy	3
	Laminectomy with Discectomy	3
	Unspecified	3
	Other (8 specific procedures)	11
		<b>41</b>
<b>Thoracic</b>	Chest Tube Insertion	8
	Thoracentesis	3
	Other (4 specific procedures)	4
		<b>15</b>
<b>Urological</b>	Endoscopy with Stent	18
	Endoscopy without Stent	8
	Other (3 specific procedures)	5
		<b>31</b>
<b>Vascular</b>	Vascular Access Insertion	25
	Other (7 specific procedures)	9
		<b>34</b>
<b>Grand Total</b>		<b>368</b>

**Note:** The data reflect the procedure performed, which may have been different from the intended procedure. The “Other” category within the Procedure Group column consisted of 29 specific procedures, which were each associated with 4 or fewer WSS events. The “Other” category in the Specific Procedure column represents the sum of WSS events with procedures that individually had a frequency of 2 or less. The “Unspecified” subcategory represents the WSS events where the report did not provide adequate information to determine the specific procedure. The frequency of events per category are mutually exclusive to other categories.

**Appendix B.** Frequency of Wrong-Site Surgery by Procedure Group and Body Region during 2015—2019

Procedure Group	Body Region												Grand Total
	Abdomen	Breast	Chest/Thorax	Digestive System	Extremity, Lower	Extremity, Upper	Head/Neck	Hip/Pelvis	Reproductive System	Spine	Unspecified	Urinary System	
Biopsy	2	6	2		3	2	9		1	2			27
Excision		4					5		1	2	1		13
Injection		2	2		31	16	14	4		43	4		116
Ophthalmic							14						14
Orthopedic/Podiatry					14	17		1					32
Other	4	5	4	7	2		13	1	7	2			45
Spinal										41			41
Thoracic			15										15
Urological												31	31
Vascular	4		5		3	12	8	2					34
<b>Grand Total</b>	<b>10</b>	<b>17</b>	<b>28</b>	<b>7</b>	<b>53</b>	<b>47</b>	<b>63</b>	<b>8</b>	<b>9</b>	<b>90</b>	<b>5</b>	<b>31</b>	<b>368</b>

**Note:** The data reflect the body region involved and the procedure performed in the WSS events, which may have been different from the intended body region or procedure. The “Unspecified” category of body region represents the WSS events where the report did not identify the body region. The “Other” category within the Procedure Group column consisted of 29 specific procedures, which were each associated with 4 or fewer WSS events. The frequency of events per category are mutually exclusive to other categories and blank cells represent a zero frequency.

**Appendix C. Frequency of Wrong-Site Surgery by Body Region and Body Parts during 2015—2019**

Body Region	Body Parts	Grand Total	
<b>Abdomen</b>	Abdominal Cavity	6	
	Liver	3	
	Spleen	1	<b>10</b>
<b>Breast</b>	Breast Mass	17	<b>17</b>
<b>Chest/Thorax</b>	Chest	19	
	Lung	4	
	Other (4 body parts)	5	<b>28</b>
<b>Digestive System</b>	Lower GI Tract	5	
	Upper GI Tract	2	<b>7</b>
<b>Extremity, Lower</b>	Knee	24	
	Thigh	9	
	Foot	7	
	Leg	5	
	Unspecified	6	
	Other (2 body parts)	2	<b>53</b>
<b>Extremity, Upper</b>	Finger	13	
	Arm	12	
	Hand	9	
	Shoulder	5	
	Elbow	4	
	Wrist	3	
	Unspecified	1	<b>47</b>
<b>Head/Neck</b>	Eye	22	
	Neck	13	
	Thyroid	9	
	Ear	3	
	Scalp	3	
	Other (10 body parts)	13	<b>63</b>
<b>Hip/Pelvis</b>	Hip	4	
	Other (3 body parts)	4	<b>8</b>
<b>Reproductive System</b>	Female	5	
	Male	4	<b>9</b>
<b>Spine</b>	Lumbar	45	
	Unspecified	20	
	Cervical	15	
	Thoracic	9	
	Sacral	1	<b>90</b>
<b>Unspecified</b>	Unspecified	5	<b>5</b>
<b>Urinary System</b>	Ureter	25	<b>31</b>
	Kidney(s)	5	
	Unspecified	1	
<b>Grand Total</b>		<b>368</b>	

**Note:** The data reflect the body region involved in the WSS events, which may have been different from the intended body region. The “Unspecified” category of body region or body part represents the WSS events where the report did not provide adequate information to determine the region or part. The “Other” category under middle column represents the sum of WSS events where the unique body parts each had a frequency of 2 or less. The frequency of events per category are mutually exclusive to other categories.

**Appendix D. Frequency of Wrong-Site Surgery by Clinician Specialty and Procedure Group during 2015—2019**

Clinician Specialty	Procedure Group											Grand Total
	Biopsy	Excision	Injection	Ophthalmic	Ortho Upper Extremity	Ortho/Podiatry Lower Extremity	Other	Spinal	Thoracic	Urological	Vascular	
Anesthesia			32								2	34
Dermatology	2	4					3					9
Ear, Nose, and Throat			3				4					7
Foot/Ankle	1		1			4						6
Gastroenterology	1						3					4
General Surgery	4	7	4				10		3	2	3	32
Gynecology							4					4
Interventional Radiology	19		5				7	1	3	1	16	52
Neurosurgery		1					3					4
Ophthalmology			8	14								22
Orthopedics	1		15		17	11						44
Other			2				5		4		4	15
Pain Management			45				3	6				54
Spinal Surgery								34				34
Thoracic Surgery									5		2	7
Urology		1					2			28		31
Vascular			1				1				7	9
<b>Grand Total</b>	<b>27</b>	<b>13</b>	<b>116</b>	<b>14</b>	<b>17</b>	<b>15</b>	<b>45</b>	<b>41</b>	<b>15</b>	<b>31</b>	<b>34</b>	<b>368</b>

**Note:** The data reflect the procedure performed, which may have been different from the intended procedure. The “Other” category within the Procedure Group variable consisted of 29 specific procedures, which were each associated with 4 or fewer WSS events. The clinician specialty “Other” category consisted of 10 different specialties, which were each associated with two or fewer WSS events. Many of the injections reviewed were administered by anesthesiologists and pain management specialists. Anesthesiologists tend to care for the patient during the perioperative period whereas the pain management specialists (many of whom are anesthesiologists) treat a patient’s pain both in the surgical setting as well as ancillary departments and outpatient care. These two points were the basis upon which the related events were classified as either an anesthesia event or a pain management event. The frequency of events per category are mutually exclusive to other categories and blank cells represent a zero frequency.

**Appendix E. Frequency of Wrong-Site Surgery by Clinician Specialty and Body Region during 2015—2019**

Clinician Specialty	Body Region												Grand Total
	Abdomen	Breast	Chest/Thorax	Digestive System	Extremity, Lower	Extremity, Upper	Head/Neck	Hip/Pelvis	Reproductive System	Spine	Unspecified	Urinary System	
Anesthesia			2		20	8				3	1		34
Dermatology			1			1	5			1	1		9
Ear, Nose, and Throat							7						7
Foot/Ankle					6								6
Gastroenterology				3					1				4
General Surgery	4	8	5	3	1		6		1	1	1	2	32
Gynecology									4				4
Interventional Radiology	4	9	6		2	8	14	3		5		1	52
Neurosurgery			1				3						4
Ophthalmology							22						22
Orthopedics					17	26		1					44
Other			6	1	2	3	2	1					15
Pain Management					1		2	3		46	2		54
Spinal Surgery										34			34
Thoracic Surgery	1		6										7
Urology									3			28	31
Vascular	1		1		4	1	2						9
<b>Grand Total</b>	<b>10</b>	<b>17</b>	<b>28</b>	<b>7</b>	<b>53</b>	<b>47</b>	<b>63</b>	<b>8</b>	<b>9</b>	<b>90</b>	<b>5</b>	<b>31</b>	<b>368</b>

**Note:** The data reflect the body region involved in the WSS events, which may have been different from the intended body region. The “Unspecified” category of body region represents the WSS events where the report did not identify the body region. The clinician specialty “Other” category consisted of 10 different specialties, which were each associated with two or fewer WSS events. The frequency of events per category are mutually exclusive to other categories and blank cells represent a zero frequency.

**Appendix F.** Frequency of Wrong-Site Surgery by Procedure Group, Facility Type, and Hospital Procedure Location during 2015–2019

Procedure Group	Facility Type and Hospital Procedure Location					Grand Total
	ASF	Hospital			Total	
		IR	OR	Other		
Biopsy	1	19	7		26	27
Excision	1		11	1	12	13
Injection	40	7	67	2	76	116
Ophthalmic	13		1		1	14
Orthopedic, Upper Extremity	10		7		7	17
Orthopedic/Podiatry, Lower Extremity	3		11	1	12	15
Other	6	7	27	5	39	45
Spinal	3	1	37		38	41
Thoracic		3	4	8	15	15
Urological	1	1	29		30	31
Vascular		16	11	7	34	34
<b>Grand Total</b>	<b>78</b>	<b>54</b>	<b>212</b>	<b>24</b>	<b>290</b>	<b>368</b>

**Note:** The category of hospitals includes children hospitals, critical access hospitals, and long-term acute care hospitals. All ASFs were individually licensed surgical facilities. The data reflect the procedure performed, which may have been different from the intended procedure. The “Other” category within the Procedure Group column consisted of 29 specific procedures, which were each associated with 4 or fewer WSS events. The frequency of events per category are mutually exclusive to other categories and blank cells represent a zero frequency.

**Appendix G.** Frequency of Wrong-Site Surgery by Body Region, Facility Type and Hospital Procedure Location during 2015—2019

Body Region	Facility Type and Hospital Procedure Location					Grand Total
	ASF	Hospital			Total	
		IR	OR	Other		
Abdomen		4	6		10	10
Breast		9	8		17	17
Chest/Thorax		6	11	11	28	28
Digestive System	1		5	1	6	7
Extremity, Lower	8	2	40	3	45	53
Extremity, Upper	15	8	21	3	32	47
Head/Neck	26	14	20	3	37	63
Hip/Pelvis		3	4	1	8	8
Reproductive System	1		6	2	8	9
Spine	25	7	58		65	90
Unspecified	1		4		4	5
Urinary System	1	1	29		30	31
<b>Grand Total</b>	<b>78</b>	<b>54</b>	<b>212</b>	<b>24</b>	<b>290</b>	<b>368</b>

**Note:** The category of hospitals includes children hospitals, critical access hospitals, and long-term acute care hospitals. All ASFs were individually licensed surgical facilities. The data reflect the body region involved in the WSS events, which may have been different from the intended body region. The “Unspecified” category of body region represents the WSS events where the report did not provide adequate information to determine the region. The frequency of events per category are mutually exclusive to other categories and blank cells represent a zero frequency.



## Appendix H. Strategies to Reduce the Likelihood of Wrong-Site Surgery

**Preoperative Verification and Reconciliation.** The verification and reconciliation process is typically initiated by the admitting nurse in the preoperative area, but ultimately includes all staff members. The process includes the verification of the procedure to be performed with the patient or patient representative and allows for review of all relevant documents. Any discrepancies are immediately resolved with the attending surgeon.

1. Preoperative verification starts with initial scheduling of the procedure at the physician's office, where accurate information must be utilized. At the surgical facility, the responsibility of verification and reconciliation includes all staff members, including the scheduling staff, registration clerks, ancillary and nursing staff, attending surgeon, and the patients themselves.<sup>1-7</sup>
2. Staff should review the operating/procedure room schedule, patient history and physical, consent form, and other relevant patient documents. Any discrepancies should be reconciled with the attending surgeon.<sup>1,2,3,5-8</sup>
3. The patient should be identified in an active voice and verified using two unique identifiers (e.g., What is your full name? What is your date of birth? What procedure are you having performed today?).<sup>1,3,5-7</sup>

**Site Marking.** The marking of the surgical site is a preoperative procedure that allows the surgeon to mark the surgical site after a verbal confirmation with the patient or patient representative, and the attending nurse. The site mark acts as a visual confirmation to not only the surgeon, but the entire surgical team.

4. The site should be marked by the physician responsible for the procedure prior to the patient entering the operating/procedure room. The mark must be confirmed by the attending nurse and coincide with all relevant information (schedule, history and physical examination document, consent). Additionally, the mark must be confirmed by an alert patient or confirmed by a patient representative if the patient is a minor or mentally incapacitated.<sup>1,3,5-10</sup>
5. The mark should be made with an indelible marker using the provider's initials or a standardized unambiguous mark used throughout the facility.<sup>1,3,5-13</sup>
6. The mark should be made as close to the incision site as possible and visible in the prepped and draped field.<sup>1,3,6-10</sup>

**Timeout and Intraoperative Verification.** The timeout is the final pause prior to initiating a surgical procedure and should include all staff participating in the procedure. Intraoperatively, a verification process should be utilized to ensure accuracy (site and side) for the consented procedure.

7. All noncritical activities in the operative suite should stop during the timeout, including music and nonessential talking that could distract team members.<sup>1,3,5,6,9</sup>
8. The timeout should be performed after the patient is prepped and draped immediately prior to skin incision.<sup>1,3,6,12,13</sup>
9. All relevant patient documents should be available and confirmed during the timeout process.<sup>1,3,6</sup>
10. The site mark should be referenced in the prepped and draped field during the timeout.<sup>3,6,13</sup>
11. All members of the surgical team should verbally verify agreement with the surgical site and relevant documents.<sup>1,3,5-7,9,12,13</sup>
12. Staff should be engaged and empowered to speak up with any concerns during the timeout process.<sup>1,3,5,6,11-14</sup>
13. A separate timeout should be performed for separate procedures, including anesthetic blocks, with all staff involved in the procedure.<sup>1,3,6,9,13</sup>
14. Utilize intraoperative imaging (e.g. X-ray, fluoroscopy) to verify spinal level, rib resection level, or ureter to be stented.<sup>3,5,6,9,15</sup>

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