Risk Factors for Wrong-Site Surgery:
A Study of 1,166 Reports of Informed Consent and Schedule Errors

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Keywords: patient harm, strategies, side, procedure, patient, hospital, ambulatory surgical facility, process improvement, time-out, booking orders

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Disclosure: The authors declare that they have no relevant or material financial interests.

Submitted
December 29, 2023
Accepted
March 21, 2024
Published
July 31, 2024

Taylor MA, Yonash RA. Risk Factors for Wrong-Site Surgery: A Study of 1,166 Reports of Informed Consent and Schedule Errors. *Patient Safety*. 2024;6(1):117084. doi:10.33940/001c.117084

Abstract

Background: The accuracy of informed consent and procedural schedule are important components in a process for preventing wrong-site surgery.

Methods: In our study of a four-year period, we used the Pennsylvania Patient Safety Reporting System (PA-PSRS) database to explore the occurrence of consent and/or schedule errors at all licensed hospitals and ambulatory surgical facilities (ASFs) in Pennsylvania. We also evaluated the reports for consent and schedule error subtypes: side, procedure, site, and patient.

Results: Over a four-year period, 1,166 event reports described a consent and/or schedule error, and 86% of the reports were from hospitals and 14% were from ASFs. Among the 1,166 reports, 56% described a schedule error, 34% had a consent error, and 10% involved both error types. In the sample of reports, the frequency of error subtypes were ranked in the following sequence: side (69%), procedure (24%), site (4%), and patient (3%). The analysis also revealed similarities and differences in the distribution of error types and subtypes across hospitals and ASFs.

Conclusions: Based on the results, it is evident that consent and schedule errors are issues across many healthcare facilities. The findings by error subtype (side, procedure, site, patient) show some similarity in distribution with previous studies of wrong-site surgery events. We recommend that readers review **Table 4** and **Table 5** for a brief literature review of risk factors for consent and schedule errors and strategies for preventing and detecting the occurrence of those errors, respectively.

Informed Consent

What?
It involves a formal document and communication between a medical professional and patient/representative about the risks and benefits of planned procedure, description of the planned procedure, and alternative treatments.[1,4,9,11-15] The consent document also identifies the patient, planned procedure, side, and site.[4,14,16,17] The attending provider should obtain informed consent.[6,12,14] Consent is obtained from the patient/representative through a signature or other form of affirmation.[11,13]

When and Where?
It takes place during a clinical consult at a doctor's office, clinic, or at the facility where the procedure is performed.[11,12] When possible, consent should occur well in advance of the procedure, not the day of the procedure while the patient is in the preoperative area.[1,12]

Why?
The consent process is designed to ensure that the patient/representative understands key elements of the procedure, has an opportunity to ask questions, and makes an informed decision about whether or not to proceed with the procedure.[4,9,13,14]

Introduction

Informed consent documents and procedural schedules, in combination with other sources of information, are commonly used by surgical teams to plan for and verify the accuracy of the planned procedure.[1-4] Numerous studies and investigations have shown that the accuracy of a consent document and the procedural schedule are critical components to preventing a wrong-site surgery.[1,5-10]

Previous studies explored the frequency and/or rates of consent or schedule errors,[1,2,5-7,11,13,21-23] but we were unable to identify any that measured the occurrence of both consent and schedule errors, error subtypes (e.g., side, procedure, site, and patient), and across a large sample of healthcare facilities. Based on communication with surgical services staff at hospitals and ambulatory surgical facilities (ASFs) in Pennsylvania, consent and schedule errors are a common and ongoing issue.

The purpose of this study was to use the Pennsylvania Patient Safety Reporting System (PA-PSRS) database[a], which receives event reports from all licensed hospitals and ASFs in Pennsylvania, to explore the occurrence of consent and schedule errors over a four-year period. We also evaluated error subtypes (side, procedure, site, and patient) and error occurrence by facility type (hospital or ASF). Finally, we provide a brief literature review of risk factors and strategies to mitigate risk of consent and schedule errors.

Methods

Data Source and Sample

We used data from reports of patient safety events that were submitted by hospitals and ASFs to the PA-PSRS acute care database, which is affiliated with the mandatory event reporting laws in Pennsylvania. The event reports include structured fields (e.g., event date, patient age, care area) and unstructured fields (i.e., free text), which are used by the reporter to describe the event and actions taken. The reports are often concise and do not include medical records.

The query and review of events for inclusion in the present study consisted of a two-phase process. In the first phase, we queried the PA-PSRS database for events that occurred within a four-year period (1/1/2019 to 12/31/2022) and met one or more of the following inclusion criteria:

- Event was classified within the PA-PSRS taxonomy as an *Error Related to Procedure/Treatment/Test - Surgery/Invasive Procedure Problem* and one of the following response options was selected: *wrong site*, *wrong side (L vs R)*, *wrong procedure*, *wrong patient*, or *preparation inadequate/wrong*.
- Event was classified within the PA-PSRS taxonomy as *Error Related to Procedure/Treatment/Test - Surgery/Invasive Procedure Problem* and at least one of the unstructured fields contained the words "left" and "right" or "incis" and "excis"[b].

Procedural Schedule

What?
It is a document and/or electronic communication used by medical staff that conveys the date, time, provider, procedure, patient, side, site, and any other pertinent information.[16-18] The schedule is based on a consultation from the provider and typically involves information from and communication among multidisciplinary team members across various departments, including the provider's office staff.[4,19]

When and Where?
Typically, the procedure is scheduled by communication between provider's office staff and staff at the procedural facility via phone, fax, email, or an electronic portal.[20,21]

Why?
It supports clinical preparation for an efficient and safely performed procedure.[2,4,18]

[a]PA-PSRS is a secure, web-based system through which Pennsylvania hospitals, ambulatory surgical facilities, abortion facilities, and birthing centers submit reports of patient safety–related incidents and serious events in accordance with mandatory reporting laws outlined in the Medical Care Availability and Reduction of Error (MCARE) Act (Act 13 of 2002).[15] All reports submitted through PA-PSRS are confidential and no information about individual facilities or providers is made public.

[b]The purpose of these criteria was to identify reports that described a wrong-side or wrong-procedure error. Event reports that describe a wrong-side error typically state both left and right sides. Additionally, when event reports describe a wrong procedure error involving incision or excision, they typically state both procedures.

- Event was classified under the Surgical Services care area group[c] and at least one of the unstructured fields contained any of the following phrases: "wrong site," "wrong side," "wrong level," "wrong procedure," "wrong patient," "time out," "incorrect side," "incorrect site," "incorrect procedure," "incorrect patient," "block," or "mark."
- Event was classified under the Surgical Services care area group and at least one of the unstructured fields contained any of the following combinations of phrases: "consent" or "schedul" and "wrong," "incorrect," or "error."

In the second phase, one researcher reviewed each report to identify those that met the inclusion criteria by describing a consent and/or schedule error, an error subtype, and that the error corresponded with an invasive operative procedure. We defined an invasive operative procedure as "…skin or mucous membranes and connective tissue is incised or an instrument is introduced through a natural body orifice."[16,24] We further defined the invasive operative procedure as beginning "regardless of setting, at the point of surgical incision; tissue puncture; or the insertion of an instrument into tissues, cavities, or organs" and ending "after counts have concluded, the surgical incision has been closed, and/or operative device(s) such as probes have been removed, regardless of setting."[16,24] Based on the query criteria and review of event reports, a total of 1,166 reports were included in the study.

Design, Analysis, and Variables Coded

We used a retrospective mixed-methods design with an exploratory sequential approach,[25] where we began with a focus on the qualitative data and then quantified those data for further analysis. The qualitative data from PA-PSRS event reports were processed through a content analysis[26-29] using a framework method[25,30,31] with categories of variables that were developed deductively based on our prior study.[3] The variables were measured by frequency and assessed using a descriptive analysis. Descriptive analysis is a quantitative method where phenomena are explored and patterns are identified with the purpose of better understanding and explaining the phenomena occurrence.[3,32] This is often achieved through visual presentation of the data that shows multiple combinations of variables and allows for a triangulation of insights.

The patient gender, patient age, event date, and facility type (hospital or ASF) were identified in structured fields of the reports. Through review of the unstructured fields, a researcher identified the error type (consent, schedule, or consent & schedule, which are mutually exclusive categories) and error subtype (side, procedure, site, or patient, which are mutually exclusive categories), which are both defined in **Table 1**.

Table 1. Definitions and Examples of Error Types and Subtypes

Error Types	Definition	De-Identified Examples From PA-PSRS
Consent	The consent form contained incorrect information related to the subtype (procedure, side, site or patient's name/ identifier).	Patient having right craniotomy for tumor removal and consent written for left side. Surgeon notified and consent fixed prior to surgery.
Schedule	The procedural schedule contained incorrect information related to the subtype.	Case scheduled incorrectly as right knee arthroscopy. Patient arrived and registration confirmed the procedure to be performed. Patient said it was left knee arthroscopy.
Consent & Schedule	Both the consent form and the procedural schedule contained incorrect information related to the subtype.	Patient's paperwork was sent from surgeon's office. The scheduling sheet and consent stated the procedure was to be on the right hand; the correct procedure was on the left hand.
Error Subtypes	**Definition**	**De-Identified Examples From PA-PSRS**
Side	The procedure was listed to be performed on the wrong side, right versus left.	Patient stated she was having a right hip replacement. The operating room schedule incorrectly stated left side.
Procedure	The wrong procedure was listed.	Online operating room consent stated procedure was for a hysterectomy. Patient to have a hysteroscopy, not hysterectomy.
Site	The wrong site was listed.	Patient is here for left knee arthroplasty and the surgeon consented the patient for left hip. Both patient and surgeon signed.
Patient	The wrong patient name and/or identifier was listed.	Nurse contacted ordering neurologist to request that she speak to concerned patient at bedside to help her understand exactly why this procedure (lumbar puncture) was necessary. This is when the ordering neurologist acknowledged that the orders were entered for the incorrect patient.

Note: Details of the PA-PSRS event narratives have been modified for readability and to preserve confidentiality.

[c]Within PA-PSRS, the event reporter chooses among 168 care areas to indicate the location where an event occurred. In order to simplify our analysis, we sorted each of the care areas into higher-level care area groups.

Results

Patient Age, Patient Gender, and Facility Type

Among the 1,166 event reports, 81% (950 of 1,166) identified the patient gender; 49% (462 of 950) were male and 51% (488 of 950) were female. Patient age had a mean of 55 years and a median of 61 years (minimum of <1 year, 25th percentile of 45 years, 75th percentile of 71 years, and a maximum of 99 years)[d]. The 1,166 event reports were submitted by 104 hospitals and 56 ASFs.

Error Type and Subtype

See **Figure 1** and **Figure 2** for graphs that show the distribution of consent and/or schedule errors. The consent or schedule errors were identified as occurring alone in 90% (1,052 of 1,166) of the reports and concurrently in 10% (114 of 1,166) of the reports. Across a four-year period, 66% (772 of 1,166) of the event reports included a schedule error, either alone (56%, 658 of 1,166) or concurrent with a consent error (10%, 114 of 1,166). The consent errors were reported in 44% of the events (34% alone, 394 of 1,166; 10% concurrent with schedule errors, 114 of 1,166). Across each of the error types (consent and/or schedule), **Figure 2** shows a year-over-year decrease with a similar pattern and proportion.

Table 2 shows that error subtypes ranged in percentage and were ranked in the following order: side (69%, n=808), procedure (24%, n=281), site (4%, n=47), and patient (3%, n=30). This ranking of subtypes is identical within each category of error type: schedule, consent, and consent & schedule. Within each category of error subtype, the relative proportion of consent & schedule errors varied. For example, within the side subtype the schedule errors (n=466) were reported nearly two times more than the consent errors (n=252), but within the site subtype the schedule (n=21) and consent (n=23) errors were nearly equal. Across the categories of error type and subtype, the most frequent combination of errors was a schedule error that identified the wrong side (40%, n=466). In contrast, consent & schedule errors and wrong patient errors were the least frequent combination, which had a zero frequency across the total sample of event reports.

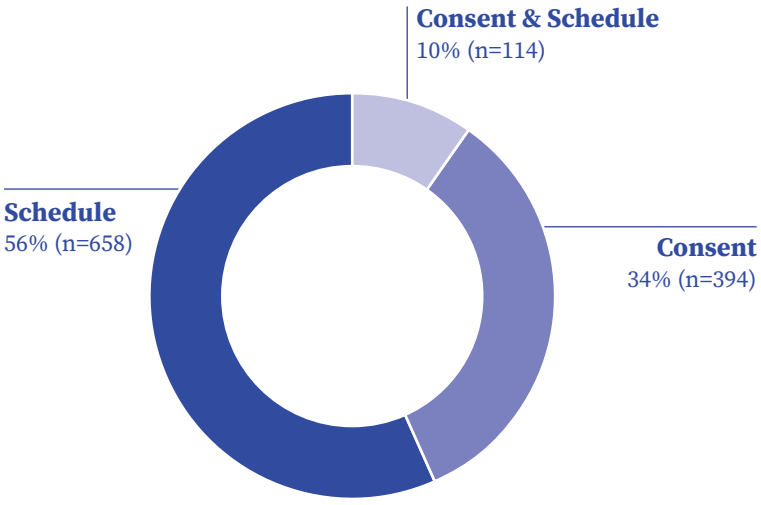
Facility Type by Error Type and Error Subtype

As presented in **Figure 3**, 86% (n=1,003) of events were reported by hospitals and 14% (n=163) by ASFs. Readers should note that our results only represent the distribution of events reported to PA-PSRS and may not represent the true distribution of occurrence across facilities.

Table 3a and **Table 3b** correspond with findings from hospitals and ASFs, respectively, and both show the distribution of error type and error subtype. A close review of **Table 3a** and **Table 3b** reveal a pattern of findings very similar to those shown in **Table 2**, which displays the error type and subtype collapsed across facility type. Despite the similarities in findings between the two facility types, there are a few noteworthy differences in the distributions across **Table 3a** and **Table 3b** that are highlighted below:

- Schedule errors were reported 9 percentage points greater at hospitals (58%, 578 of 1,003) than at ASFs (49%, 80 or 163).
- Side errors were reported 14 percentage points more at hospitals than at ASFs; however, procedure errors were 18 percentage points higher at ASFs (40%, 65 of 163) than at hospitals (22%, 216 of 1,003).
- Among the ASFs, the percentage of reports with a wrong-side schedule error (25%) was very similar to the percentage with a wrong-side consent error (23%). In contrast, at hospitals the wrong-side schedule errors (42%) were reported twice as often as the wrong-side consent errors (21%).
- For hospitals, the percentage of wrong-procedure schedule errors (11%) were comparable to the wrong-procedure consent errors (9%). The ASFs reported nearly twice as many wrong-procedure schedule errors (23%) than wrong-procedure consent errors (13%).
- Hospitals reported patient errors as being a small percentage of the distribution (3%, 30 of 1,003) and ASFs reported 0.

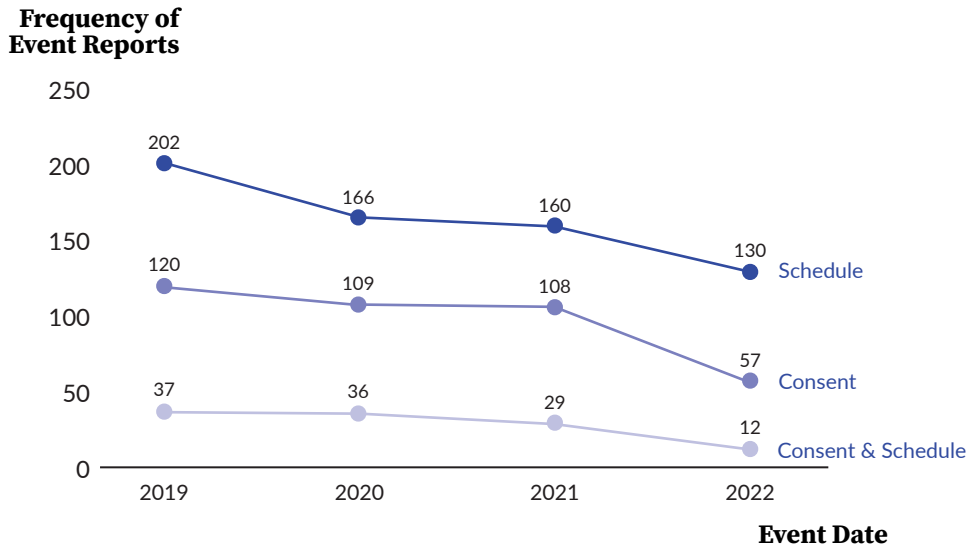
Figure 1. Frequency and Percentage of Error Type Across 2019–2022; N=1,166 PA-PSRS Event Reports



Note: The categories of Error Type and Subtype are mutually exclusive per event report. Consent & Schedule=concurrent occurrence of both consent errors and schedule errors in a single event report.

[d]Patient age was able to be obtained from all but one of the event reports.

Figure 2. Frequency of Error Type by Year; N=1,166 PA-PSRS Event Reports



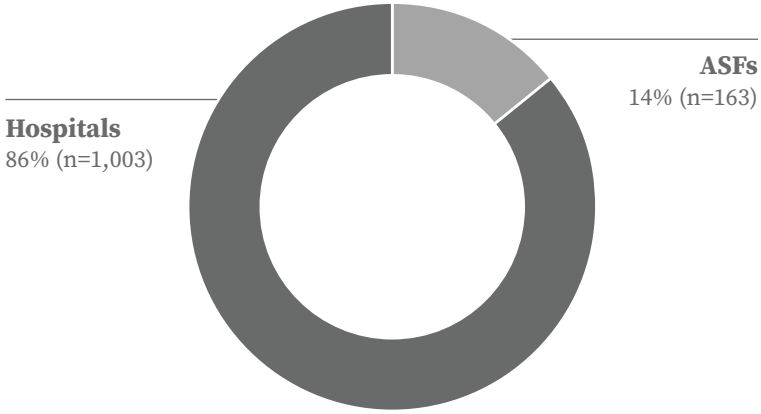
Note: The categories of Error Type and Subtype are mutually exclusive per event report.
Consent & Schedule=concurrent occurrence of both consent errors and schedule errors in a single event report.

Table 2. Percentage and Frequency of Error Type and Subtype Across 2019–2022; N=1,166 PA-PSRS Event Reports

	Error Subtype				
Error Type	**Side**	**Procedure**	**Site**	**Patient**	**Total**
Schedule	40% (466)	13% (151)	2% (21)	2% (20)	**56% (658)**
Consent	22% (252)	9% (109)	2% (23)	1% (10)	**34% (394)**
Consent & Schedule	8% (90)	2% (21)	<1% (3)	-	**10% (114)**
Total	**69% (808)**	**24% (281)**	**4% (47)**	**3% (30)**	**100% (1166)**

Note: The categories of Error Type and Subtype are mutually exclusive per event report. The parenthetical numbers represent the frequency.
Consent & Schedule=concurrent occurrence of both consent errors and schedule errors in a single event report.

Figure 3. Percentage and Frequency of Consent and/or Schedule Errors Across 2019–2022; N=1,166 PA-PSRS Event Reports



Note: The figure only represents the distribution of events reported to PA-PSRS and may not represent the true distribution of occurrence at facilities.

Table 3a. Hospitals Only: Percentage and Frequency of Error Type and Subtype Across 2019–2022; n=1,003 PA-PSRS Event Reports

	Error Subtype				
Error Type	**Side**	**Procedure**	**Site**	**Patient**	**Total**
Schedule	42% (425)	11% (114)	2% (19)	2% (20)	**58% (578)**
Consent	21% (214)	9% (87)	2% (21)	1% (10)	**33% (332)**
Consent & Schedule	8% (76)	1% (15)	<1% (2)	-	**9% (93)**
Total	**71% (715)**	**22% (216)**	**4% (42)**	**3% (30)**	**100% (1,003)**

Table 3b. ASFs Only: Percentage and Frequency of Error Type and Subtype Across 2019–2022; n=163 PA-PSRS Event Reports

	Error Subtype				
Error Type	**Side**	**Procedure**	**Site**	**Patient**	**Total**
Schedule	25% (41)	23% (37)	1% (2)	-	**49% (80)**
Consent	23% (38)	13% (22)	1% (2)	-	**38% (62)**
Consent & Schedule	9% (14)	4% (6)	1% (1)	-	**13% (21)**
Total	**57% (93)**	**40% (65)**	**3% (5)**	**-**	**100% (163)**

Note: The categories of Error Type and Subtype are mutually exclusive per event report. The parenthetical numbers represent the frequency. Consent & Schedule=concurrent occurrence of both consent and schedule errors in a single event report. The tables only represent the distribution of events reported to PA-PSRS and may not represent the true distribution of occurrence at facilities.

Discussion

Consent and schedule errors create inefficiencies[1,2,11,18,33] and additional costs in patient care[2,11,13] and are a risk factor for wrong-site surgery.[1,5-10] Our analysis, which presents findings across all combinations of error type, error subtype, and facility type, allows for a triangulation of variable relations and a more complete understanding of the distribution of consent and schedule errors. We believe that the results can be used by healthcare organizations as a basis for their own investigation into consent and schedule errors.

Our study revealed that schedule errors occurred more frequently than consent errors, which is inconsistent with previous research.[1] Our study expanded upon much of the previous literature by revealing the distribution of error types and subtypes across hospitals and ASFs. The distribution of error subtypes in our study (side, procedure, site, and patient) is similar with the occurrence reported in prior studies.[2,21,22]

When comparing the error subtype distribution between our current study and our previous study on wrong-site surgery,[3] we found similarities with side errors being the most frequent and patient errors as the least frequent; however, the occurrence of procedure errors and site errors was inconsistent across studies. This difference in distribution could be attributed to the lack of specificity in describing the site in the consent document and procedural schedule; therefore, a site error would be less likely to be detected.

Our results also show that there has been a decrease in reporting of consent and schedule errors from 2019 to 2022. It is unclear if this finding reflects a true reduction in errors and/or an underreporting of errors. Readers should note that all consent and schedule errors are mandatory reportable events under MCARE (Act 13 of 2002) within the commonwealth of Pennsylvania. Despite the possibility of underreporting,[6] it remains the responsibility of each healthcare organization to ensure that their processes are adequately designed and staff are making efforts to detect and prevent the errors which create a risk for patient harm.

We recommend that stakeholders view **Table 4** and **Table 5** for a concise literature review of preprocedural factors (prior to patient's arrival at procedural facility) that may increase the possibility of consent and schedule errors, and preprocedural strategies for mitigating the risk of those errors, respectively. The PA-PSRS event reports often lacked detail sufficient to pinpoint the factors that contributed to the event occurrence and/or strategies that the organization chose to mitigate risk; therefore, the content listed in the two tables was largely derived from a literature review of articles that ranged in levels of evidence, including expert opinion.[34] In addition to the items listed in **Table 4** and **Table 5**, we recommend that readers review references 4, 11, 13, 35, and 36 for additional information related to the processes of informed consent and references 2, 4, 19, and 20 for additional information related to procedural schedules.

Table 4. Preprocedural Risk Factors That May Increase the Likelihood That Consent and Schedule Errors Occur and Are Undetected During the Preprocedural Phase

Error Type	Risk Factors
Consent	Patient/representative consents to erroneous information.[6] This could be attributed to challenges with the patient/representative having a low level of health literacy, anxiety, and inattention to the form, and the provider offering insufficient and/or incomprehensible information during the consent process.[1,13,36-39]
	Consent is obtained by a person other than the attending provider.[4,12,14,33,40] This is a concern because the person may not be sufficiently knowledgeable with the planned procedure. Nevertheless, some U.S. states legally permit staff other than the attending physician to obtain informed consent.[41]
	Nonstandardized and/or paper-based forms.[4]
Schedule	Absent, inconsistent, and/or incorrect information on the consent form.[20,42]
	*Scheduler does not confirm the accuracy of primary documents.[20,22,42]
	*Scheduler receives only a verbal order.[20,22,42]
	*Scheduler is not sufficiently knowledgeable with the clinical content.[42]
	*Scheduler is simultaneously booking multiple cases.[42]
	Greater heterogeneity in procedures performed by the provider.[18]
	On scheduling forms, fields that allow for open text and/or are presented in a sequence inconsistent with the flow of topics.[19]
	When using both hardcopy and electronic scheduling forms, there is risk of error when fields do not match.[19]
	Hardcopy scheduling forms that have multiple versions and/or layouts that are inconsistent with other medical records.[19]
**Both Consent and Schedule	Absent, inconsistent, and/or incorrect information in the primary documents (e.g., history, physical, and/or provider's procedural orders).[20]
	Handwriting on primary documents that includes cross-outs and/or illegible content.[1,4,11,20,22,42]
	Use of abbreviations, particularly those that are error-prone and/or unapproved by the procedural facility.[1,4,11,20,22,42]
	Failure of staff at provider's office to reconcile all primary documents that are used to verify accuracy of the planned procedure.[6]
	Tasks that rely on manual verification and vigilance, as opposed to automated cross-checking.[1]
	Breakdown in communication between providers and their office staff, and among procedural facility intra- and interdepartmental staff.[1,42]
	Staff at provider's office are not receptive to inquiries about potential errors.
	Nonstandardized workflow and communication.[40]
	Disconnect between electronic documentation systems.[40,42]

Note: This list is comprised of preprocedural risk factors (prior to patient's arrival at procedural facility) that could contribute to the occurrence of consent and schedule errors and the failure to detect those errors during the preprocedural phase. The risk factors in this list were largely derived from a literature review of articles that ranged in levels of evidence, including expert opinion.[34] *"Scheduler" refers to both the person at the provider's office and the person at the facility where the procedure will be performed. **The risk factors corresponding with the "Both Consent and Schedule" error type could cause, independently or concurrently, consent and schedule errors and prevent detection of those errors.

Table 5. Preprocedural Strategies That May Reduce the Occurrence of Consent and Schedule Errors and Increase the Detection of Those Errors During the Preprocedural Phase

Error Type	Strategies
Consent	Consent is obtained by the attending provider.[6,12,14]
	Train new providers on the process for effectively obtaining informed consent.[13,43]
	Make all records easily accessible to staff while they obtain the patient's consent.[22]
	Active involvement by the patient/representative.[14,44-46] Some have recommended that the patient/representative be required to "sayback" or "readback" the consent to the provider.[6,14]
	Engagement of the patient/representative is particularly important during the consent process when the patient is a child or is nonverbal, comatose, or has an intellectual or developmental disability.[35,44]
	Use layman's terms, in addition to technical terminology, that can be understood by the patient/representative.[4,14,45] This will help the patient/representative detect potential consent errors. The patient is often the most consistent source of accurate information.[6,33]
	Obtain consent prior to the preoperative phase and, ideally, prior to the day of the procedure (e.g., at the provider's office, clinic, inpatient bedside).[12,14] As much as possible, consent should be obtained in a situation that may induce the least stress for the patient/representative.[4]
	Check accuracy of the consent document the same day that scheduling orders are created.[11]
	Create a standardized consent form template and processes.[13,14,43] Consider developing forms where information is added through checkboxes or drop-down menus, as opposed to free response.[4,13]
	Consider utilizing an electronic consent system to manage the documents.[13,43]
	If handwritten consent is accepted by the procedural facility, then it must be legible and without cross-outs.[20]
	Communicate (e.g., email, posters, meeting) with all relevant staff about the occurrence of errors and the potential effect.[11,13] Provide staff with individualized feedback on errors.[11,13]
	Meet with leadership to get buy-in on efforts to increase accuracy of consent forms.[13]
	Involve a quality improvement team or develop a departmental workgroup to target errors, depending on the prevalence of errors and extent of other deficiencies.[13]
	Audit accuracy of consent documents to create a baseline and a benchmark for improvement.[13]
	Train staff who schedule procedures to review primary documents and detect consent errors.[11]
Schedule	Scheduling is performed by a person knowledgeable of the procedure and other relevant clinical content.[44]
	Compare the scheduled procedure with other primary documents to ensure accuracy of the order.[1,46]
	Provider takes responsibility for the accuracy of the scheduled procedure.[8]
	Accept only written orders for a procedure.[1,20,46]
	If verbal orders are accepted, then use a "readback" and "hearback" technique to confirm each order.[42,47]
	When possible, the scheduling process should be standardized across all procedures.[1,46]
	Use computer automation when scheduling the procedure.[48]
	Use a centralized scheduling process.[49]
	Audit accuracy of procedural orders and schedule.[21]
**Both Consent and Schedule	In patient's records, the procedural provider should note in sufficient detail the indication, recommended procedure, site, and side.[6,7,16,17]
	Use only approved abbreviations or do not allow use of abbreviations.[17,20,45,48]
	Use an integrated paperless system with templates for obtaining consent and scheduling procedures.[4] This can streamline the administrative process and help to ensure that documents are accurate and easily accessible.
	Use a review and verification system with independent and redundant steps to help ensure that information is consistent and accurate.[33] This may consist of a simple checklist and/or some type of automated monitoring tool.[1,7,13,21,23] For a template checklist to be used by a provider's office, see the Patient Safety Authority's website.[50] The system should target primary documents, not secondary documents.[33]
	One to two days prior to the procedure, review and reconcile all primary documents: history, physical, provider's procedural orders, consent form, and procedural schedule.[11,20,33,48] Accurate reconciliation is the shared responsibility of the procedural provider and the facility where the procedure will be performed.[16]
	If revisions are made to a primary document, ensure that all relevant perioperative services receive the current documents.[7]
	Create a guidance document on requirements for consent and scheduling forms to be clear and acceptable.[13,21] Distribute the guidance document to providers' offices as a form of education. Train the perioperative staff on best practices, as needed.[13,21] Thereafter, return the unacceptable documents to the office.[20]
	In support of process improvement, develop a culture of open communication between providers' offices and the procedural facility.[51] This may involve 360-degree feedback and active participation among all relevant staff who have a role in creating and processing primary documents.

Note: This list is comprised of preprocedural strategies that were largely derived from a literature review of articles that ranged in levels of evidence, including expert opinion.[34] **The strategies corresponding with the "Both Consent and Schedule" error type could be effective in preventing and detecting both consent and schedule errors, which may occur independently or concurrently.

Limitations

Prior studies[2,11,13,21-23] explored the rates of consent and/or schedule errors; however, we chose not to calculate rates for several reasons. First, a rate would reflect a reporting rate, not an occurrence rate, which could be misunderstood by the reader. Additionally, our definition of an invasive operative procedure[16,24] is broader than the inclusion criteria used by our reference procedural volume database (Pennsylvania Department of Health's annual survey of Health Facilities),[52] which could cause an erroneous estimation of the rate.

Through our previous study,[3] we found that PA-PSRS reports of wrong-site surgery infrequently noted risk factors (i.e., factors that contributed to the occurrence of the event). Therefore, we chose not to explore the relation between consent and schedule errors and wrong-site surgery out of concern that the results would produce a substantial underestimation of the relation between the variables. Finally, we were unable to explore the frequency of consent and schedule errors according to clinician specialty and type of planned procedure due to those variables being infrequently reported in our sample of PA-PSRS reports.

Conclusion

Based on previous research, consent and schedule errors have been shown to create workflow inefficiencies, additional costs, and considerable risk for wrong-site surgery. Our analysis and results expand upon previous studies by showing a triangulation of variables across the occurrence of consent and schedule errors, error subtypes (side, procedure, site, and patient), and facility type. The findings reveal that the errors are an ongoing challenge in Pennsylvania and distribution of error types vary across hospitals and ambulatory surgical facilities. We believe that our data can be used as a basis for staff to investigate the prevalence of errors at their own facilities. We anticipate that provider offices, clinics, and hospitals will find value in **Table 4** and **Table 5**, which provide a brief literature review of risk factors for consent and schedule errors, and strategies for preventing and detecting the occurrence of those errors, respectively. A review of the content in those tables reveals that there are many factors that may contribute to consent and schedule errors and that many of the strategies are interrelated and may require notable resources to implement. Nevertheless, we believe that the efforts and investments required to reduce the occurrence of those errors can both produce net financial benefits and ensure patient safety.

Note

This analysis was exempted from review by the Advarra Institutional Review Board.

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