INTRAOPERATIVE TRANSITIONS OF ANESTHESIA CARE AND POSTOPERATIVE ADVERSE OUTCOMES

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INTRODUCTION:

Transfers of patient care among caregivers, "handovers," are inevitable as care for individuals often extends over shifts - and sometimes over days or weeks. The number of handovers, at least in academic hospitals, has increased as a result of duty-hour limitations.[1-4]

Critical details may be lost during handovers resulting in delays,[5] inefficiencies,[6,7] suboptimal care,[8] or even patient harm.[9,10] Consequently, the Joint Commission on Hospital Accreditation declared in 2006 that "implementing a standardized approach to handoff communications including the opportunity to ask and respond to questions" was a national patient safety goal.[11] They also identified "communication failure" to be the root cause of 65% of all sentinel events in 2006.[12] The World Health Organization similarly listed "communication during patient care handover" as one of its "High 5" patient safety initiatives.[13] Numerous studies have identified challenges associated with handovers and evaluated various systems and methods for enhancing communication and information transfer.[14-20] There are also studies evaluating anecdotal complications[21-23] and malpractice cases.[24] There is mounting evidence that care transition worsens patient outcome.

The high-risk perioperative period presents an opportunity to study care transitions and their effect on postoperative complications. Typically, a single surgical team provides care throughout an operation. However, handovers among anesthesia providers are common, and may involve attendings, residents, and certified registered nurse anesthetists (CRNAs). Currently no universally accepted guidelines or recommendations for performing intraoperative handovers exist and few studies have investigated intraoperative anesthesia care transitions.

In a previous study of 138,932 patients we found that among all providers, anesthesia care transitions were significantly associated with higher odds of experiencing any major in-hospital morbidity/mortality (Odds ratio 1.08 (95% CI: 1.05, 1.10) for each transition, $P < 0.001$). Care transitions among attending anesthesiologists and residents or nurse anesthetists were similarly

associated with harm (OR: 1.07 (98.3% CI: 1.03, 1.12) for attending and 1.07 (1.04, 1.11) for resident or nurses, both P < 0.001). Within the matched subset of residents and nurse anesthetist cases, the detrimental effect of handovers was not different (OR: 1.00 (98.3% 0.93, 1.07); P=0.92). Several subsequent publications confirmed the adverse effects of intraoperative anesthesia transfer of care on patient outcomes.[25-27]

Currently available data suffer from two major limitations. For one, most studies report single center data that might reflect handover practice (frequency of handovers and information exchange during handover) only for the institution studied, with possible limited generalizability. Second, due to limitations of the database used for the study, only administrative, billing codes or mortality data were available to evaluate outcomes. While studies could demonstrate a significant effect of intraoperative handovers on the outcomes available, it would be of great interest and value to evaluate outcomes clinically recorded using standardized definitions and of more immediate correlation with the surgical procedure, such as provided by the NSQIP database utilizing a sufficient sample size.

We therefore propose to test the hypothesis that the total number of intraoperative handovers among anesthesia providers is associated with an increase in a composite of postoperative major complications. Secondarily, we evaluate the impact on in-hospital mortality, a composite of minor and major postoperative complications, as well as independent associations for attending handovers, and for resident and CRNA handovers. We will also collect institution-specific information about local handover practices to help evaluate the extent to which handover practices moderate the association between handovers and adverse patient outcomes.

METHODS:

Institutional Review Board approval and waiver of consent will be obtained for this study.

We intend to query the MPOG database for all available cases and exclude patients < 18 years old.

Variables extracted include:

Identifier: MPOG patient identifier, MPOG institution identifier

Patient: Age, gender, race, American Society of Anesthesiologist (ASA) status

Type of procedure: (primary surgical procedure CPT code or procedure service), start date/time of procedure, end date/time of procedure, principal diagnosis

Provider: (Attending alone vs. supervised CRNA vs. supervised Resident), Sign in/out times of providers

Disposition: (PACU vs ICU)

Outcomes: Mortality, AHRQ ICD 9 complication codes (See Appendix)

Outcomes (NSQIP):

> Major complications: *Organ Space SSI, Pneumonia, Unplanned Intubation, Pulmonary Embolism, Ventilator > 48Hours, Acute Renal Failure, Stroke/CVA with neurological deficit, Coma >24 hours, Cardiac Arrest Requiring CPR, Myocardial Infarction, Bleeding Transfusions, Sepsis, Septic Shock.*
>
> Minor complications: *Superficial surgical site infection, Deep Incisional SSI, Wound Disruption, Progressive Renal Insufficiency, Urinary Tract Infection, Peripheral Nerve Injury, Graft/Prosthesis/FF, DVT/Thrombophlebitis*
>
> *Return to operating room*

Intraoperative Breaks

For residents and CRNAs, breaks of less than 40 minutes will not be counted as a handover; that is, a provider relieves someone, say for lunch, and the same initial provider returns within 40 minutes.

If the same provider returns after more than 40 minutes we assume that clinical course and surgery have proceeded to such a degree that a full formal handover is justified, and we will count it as such.

To assess transitions of care, temporary or permanent, we rely on exact documentation of current caregivers in the anesthesia record. Instances of short breaks that might not be completely documented will not be electronically discoverable, but we assume these breaks are of brief nature and probably have limited influence on medical decision making and the overall course of the patient. To estimate this effect, we will calculate the variation of number and duration of breaks documented for each center.

Transfer of Care

Work hour restrictions and transitions from regular day personal to call team coverage are daily staffing challenges for operating room coordinators. Especially during afternoon hours, when care is transitioned to late and night teams the likelihood of multiple handovers in a relative short period of time increases. To estimate the extent and effect of this, we will consider scenarios

where caregiver *A* transitions to caregiver *B,* and caregiver *B* to caregiver *C* with *B* signed into the case for ≤ 30 (≤ 45) minutes as "*short care episodes*". If caregiver *A* transitions to caregiver *B* and case end is within ≤ 30 (≤ 45) minutes of this transition, we will also consider it a "*short care episodes*". We will attempt to identify if this is more likely to occur during specific segments of the day (morning, lunch, afternoon, evening, night) and if *short care episode* handovers are more likely to result in adverse outcomes compared to other types of handovers.

In addition, we will describe current transfer of care practice and its variation by center using a frequency distribution by hour of day (00:00-24:00) and stratified by caregiver role (overall/ faculty/resident/CRNA). We will also calculate the occurrence of transfers of care in relation to the case progress by analyzing case duration on a relative scale of 100% and describe handovers in relation to percent of case duration. This will allow us to further characterize the anatomy of current handover practice pattern and their relationship to start, maintenance and end of anesthesia services. We will identify high frequency handover sites and compare to low frequency handover sites to identify if there are differences in patient outcomes between propensity-matched patients.

Checklist Use

Intraoperative transitions of care vary in practice from hospital to hospital. While some hospitals might have implemented a formal process including a checklist, other hospitals might use a less structured approach and rely on clinical communication. As an adjunct to the database analyses, we will conduct structured interviews of all data contributing centers to elicit details about the local procedures used during intraoperative transitions of care. The structured interview will be conducted by telephone and will collect information about both intraoperative handovers and short breaks. The responses from the structured interviews will be distilled into categorical variables reflecting handover practices. These variables will be added to multivariable models testing the association between intraoperative handovers and patient outcomes. In so doing, the study team will be able to evaluate the extent to which handover practices influence the association between handovers and patient outcomes. Open-ended questions from the structured interview will constitute preliminary data for future observational and interventional studies aimed at understanding and improving intraoperative handovers. The interview instrument is presented in Appendix 2.

Cost of Care

The goal of the Michigan Value Collaborative (MVC) is to help Michigan hospitals achieve their best possible patient outcomes at the lowest reasonable cost. It is a partnership between Michigan hospitals and Blue Cross and Blue Shield of Michigan/Blue Care Network. MVC is coordinated out of the University of Michigan and includes 75 participating acute care hospitals

throughout the state of Michigan. The MVC data registry contains BCBSM Participating Provider Option claims data and Medicare Fee-for-Service claims data; payment data from both payers are standardized to the Medicare mean payment for that service.

In a recent collaborative effort MVC cost data has been linked to perioperative MPOG records for hospitals contributing to both efforts. Since this data is limited to Michigan MPOG/MVC sites we will evaluate if sample size is sufficient to permit exploration of the relationship between intraoperative transfers of care and the following cost variables recorded in the MVC dataset. Each payment type will be analyzed separately.

- total index payments
- total post discharge payments
- total readmission payments
- total professional fee payments
- total episode payments

STATISTICAL ANALYSIS:

PRIMARY ANALYSIS

We will assess the association between the total number of intraoperative handovers among anesthesia providers and a collapsed composite (any versus one) of 14 major 30-day morbidities, using a multivariable logistic regression. The total number of intraoperative handovers among anesthesia providers includes handovers among attending, residents, and CRNAs. We will adjust for the following pre-specified confounding variables for the analysis: age, gender, race, American Society of Anesthesiologist (ASA) physical status, start time of surgery, duration of surgery, institution, principal diagnosis and procedure (see the next paragraph for details), institution, and process of intraoperative transition of care. In addition, we will assess the heterogeneity of the handovers effect across the institution by testing the handovers-by-institution interaction in a separate logistic regression. We will also assess the interaction between number of handovers and process of intraoperative transition of care.

We will adjust for severity of procedure (in terms of risk of outcome) as follows: first, we will characterize each patient's primary procedure using the U.S. Agency for Healthcare Research and Quality's single-level Clinical Classifications Software (CCS) for International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) procedure codes. Due to large number of categories, we will adjust for severity of procedure as a continuous co-variable by using the incidence of the collapsed composite outcome for each CCS category. CCS categories with a frequency less than 20 will be collapsed into one category, if any. Similarly, diagnosis related risk

for the collapsed composite outcome will be estimated and adjusted for in the analysis in a similar fashion.

We will conduct a sensitivity analysis, where we will compare each number of handovers with no handovers using propensity score matching and exact matching to adjust for potential confounders. First, a 1-to-1 propensity score matched data set will be obtained as follows: we will estimate the probability (i.e., the propensity score) of having 1 handover (vs. no handovers) using logistic regression based on all the potential confounding variables adjusted in the above analysis (except for institution, which will be exactly matched). A greedy distance-matching algorithm will be used, restricting successful matches to those at the same institution and those whose logit of the estimated propensity scores are within 0.2 the standard deviation on the logit of the propensity score of one another. Similarly, we will obtain the other propensity matched sets of patients (i.e., 2 handovers vs. no, 3 handovers vs. no, etc.). Thereafter, logistic regression models will be used to compare the matched groups.

SECONDARY ANALYSES

For information purposes and to inform future studies, we will evaluate the relationships between the total number of anesthesia handovers and the collapsed composite of major morbidities in the following subsets of cases: (1) those not started in regular work hours (before 7 am and 5 pm); (2) those in ASA 3 or 4 patients; and (3) those cases more than 4 hours. Each analysis will use the same statistical method as the primary analysis.

We will assess the relationships between the collapsed composite of major morbidities and (1) number of attending handovers and (2) number of resident and CRNA handovers separately, using one single multivariable logistic regression. Also, we will assess the impact of (1) the total number of intraoperative handovers among anesthesia providers, (2) the attending handovers, as well as (3) the resident and CRNA handovers on the collapsed composite of minor morbidities. The relationship between the total number of short-care episodes, defined as a non-break shorter than 30 or 45 minutes, will also be assessed.

A Bonferroni correction will be used to control the type I error; thus, the significance criterion will be 0.005 for each of the secondary analysis (a total of 10 analyses; 0.05/10). For all the analyses, total number of intraoperative handovers among anesthesia providers, the number of attending handovers, and number of resident and CRNA handovers will be truncated to facilitate modeling, if necessary.

Explanatory analyses will be performed to describe the distributions of short care episodes. We will examine the frequency distribution by segment of the day (morning, lunch, afternoon, evening, night). Another explanatory analyses will be performed to illustrate the frequency

distribution of handovers, stratified by center and by caregiver role (overall/ faculty/resident/CRNA). A third analysis will be performed to assess where handovers are occurring, by examining the frequency distribution relative to the percent case duration.

Lastly, we will calculate the mean and median number of handovers per case at each site in order to identify high-frequency and low-frequency handover sites. We will compare the differences in composite outcome rate via analysis using a propensity-score matching algorithm. A categorical handover frequency variable will be defined as the exposure, and all matching variables will be the same as in the primary analysis except for institution.

Sensitivity analyses

A planned sensitivity analysis will be performed to exclude cases that are either long (defined as the top 5th percentile of surgical times) since handovers will always occur or short (defined as the bottom 5th percentile of surgical times) since handovers will most likely never occur. In addition, we will also investigate the association of the time of day the operation started as it relates to handovers and complications.

Sample size consideration

In a retrospective analysis previously performed at our institution based on 135,810 adults who had non-cardiac surgery at our institute main campus between 2005 and 2012, there were 61%, 21%, 11%, 5%, and 3% patients had no intraoperative anesthesia handovers, 1, 2, 3, and more than 4 handovers, respectively. The estimated odds ratio for a collapsed composite of in-hospital mortality and major morbidities was 1.08 (1.05, 1.10) for each increase in the total number of anesthesia handovers. Also, in another retrospective analysis previously performed at our institution, we observed an incidence rate of 15% for the collapsed composite of major morbidities.[28]

The sample size consideration is based on our primary outcome of the collapsed composite of major morbidities. We would need 31,124 patients to have adequate power to detect an odds ratio of 1.08 or more for each increase in the total number of handovers, assuming an incidence rate of 15% and a Poisson distribution of number of total handovers with mean of 0.6. We expect to have approximate 60,000 patients in the NISQIP database; thus, we will have adequate power. SAS software version 9.3 (SAS Institute, Cary, NC, USA) will be used for all statistical analysis.

Qualitative analysis

We will generate a limited qualitative dataset from the open-ended questions in the interview instrument. We will use a content analysis approach to analyze these data. Findings from the qualitative data analysis will help us parameterize the categorical variables reflecting institutional handover practices and will inform future handover studies.

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VARIABLES REQUESTED

Standardized Views Requested		
General Case Information	Note: For each Charge_Capture_Primary_Anesthesia_Code, Surgery Code, and Diagnosis Code, we will need the codes reported in separate columns	
ASA Class		
Patient Demographics		
Case Times		
Provider Sign In/Out times: For each time that any of the following are in the database.		
6000	Staff Level - Anesthesia Attending	
6001	Staff Level - Anesthesia Resident CA1	
6002	Staff Level - Anesthesia Resident CA2	
6003	Staff Level - Anesthesia Resident CA3	
6004	Staff Level - Anesthesia Resident - Unspecified Year	
6005	Staff Level - Anesthesia CRNA	
MPOG Concept ID	**Concept Name**	**Concept Type**
50302	Compliance - Anesthesiology faculty PACU discharge order	Intraoperative Events, Interventions, and Observations
70420	Assessment and Plan - Discharge Planning	Preoperative Observations
NSQIP Variables (For those instutions that have NSQIP)		
All complications		
Return to OR		
Additional Variable		
In-hospital Mortality (currently we are working with hospitals to extract this data.		

APPENDIX 1. DESCRIPTIONS OF INDIVIDUAL IN-HOSPITAL SURGICAL MORTALITY/MORBIDITIES

In-hospital mortality/morbidity	AHRQ*	ICD-9†	
Cardiac	16.10.2.1	429.4	Functional disturbances after cardiac surgery Cardiac insufficiency after cardiac surgery or due to prosthesis Heart failure after cardiac surgery or due to prosthesis Postcardiotomy syndrome Postvalvulotomy syndrome *Excludes:* *Cardiac failure in the immediate postoperative period (997.1)*
		458.21	Hypotension of hemodialysis Intradialytic hypotension
		458.29	Other iatrogenic hypotension Postoperative hypotension
		997.1	Cardiac: arrest during or resulting from a procedure insufficiency during or resulting from a procedure Cardiorespiratory failure during or resulting from a procedure Heart failure during or resulting from a procedure *Excludes:* *The listed conditions as long-term effects of cardiac surgery or due to the presence of cardiac prosthetic device (429.4)*
Respiratory	16.10.2.2	518.7	TRALI
		997.3	Respiratory complications *Excludes:* *Iatrogenic (postoperative) pneumothorax (512.1)* *Iatrogenic pulmonary embolism (415.11)* *Mendelson's syndrome in labor and delivery (668.0)* *specified complications classified elsewhere, such as:* *Adult respiratory distress syndrome (518.5)* *Pulmonary edema, postoperative (518.4)* *Respiratory insufficiency, acute, postoperative (518.5)* *Shock lung (518.5)* *Tracheostomy complications (519.00–519.09)* *TRALI (518.7)*
		997.31	Ventilator-associated pneumonia Use additional code to identify organism
		997.39	Other respiratory complications mendelson's syndrome resulting from a procedure Pneumonia (aspiration) resulting from a procedure
Gastrointestinal	16.10.2.3	564.2	Postgastric surgery syndromes Dumping syndrome Jejunal syndrome Postgastrectomy syndrome Postvagotomy syndrome *Excludes:* *Malnutrition after gastrointestinal surgery (579.3)* *Postgastrojejunostomy ulcer (534.0–534.9)*
		564.3	Vomiting after gastrointestinal surgery Vomiting (bilious) after gastrointestinal surgery
		564.4	Other postoperative functional disorders Diarrhea after gastrointestinal surgery *Excludes:* *Colostomy and enterostomy complications (569.60–569.69)*
		569.6 569.71 569.79	Colostomy and enterostomy complications

		579.3	Other and unspecified postsurgical nonabsorption Hypoglycemia after gastrointestinal surgery malnutrition after gastrointestinal surgery
		997.4	Digestive system complications Complications of: Intestinal (internal) anastomosis and bypass, not elsewhere classified, except that involving urinary tract Hepatic failure specified as due to a procedure Hepatorenal syndrome specified as due to a procedure Intestinal obstruction NOS specified as due to a procedure *Excludes:* *Specifi gastrointestinal complications classifi elsewhere, such as: Blind loop syndrome (579.2)* *Colostomy or enterostomy complications (569.60–569.69) Gastrojejunal ulcer (534.0–534.9)* *Gastrostomy complications (536.40–536.49) Infection of esophagostomy (530.86) Infection of external stoma (569.61)* *Mechanical complication of esophagostomy (530.87) Pelvic peritoneal adhesions, female (614.6) Peritoneal adhesions (568.0)* *Peritoneal adhesions with obstruction (560.81) Postcholecystectomy syndrome (576.0) Postgastric surgery syndromes (564.2) Vomiting after gastrointestinal surgery (564.3)*
In-hospital mortality/morbidity	AHRQ*	ICD-9†	Descriptions
Urinary	16.10.2.4	997.5	Urinary complications Complications of: External stoma of urinary tract Internal anastomosis and bypass of urinary tract, including that involving intestinal tract Oliguria or anuria specified as due to procedure Renal: Failure (acute) specified as due to procedure Insufficiency (acute) specified as due to procedure Tubular necrosis (acute) specified as due to procedure *Excludes:* *Specified complications classified elsewhere, such as:* *Postoperative stricture of:* *Ureter (593.3)* *Urethra (598.2)*
Bleeding	16.10.2.5	998.1	Hemorrhage or hematoma or seroma complicating a procedure *Excludes:* *Hemorrhage, hematoma, or seroma:* *Complicating cesarean section or puerperal perineal wound (674.3)* *Due to implanted device or graft (996.70–996.79)*
		998.11	Hemorrhage complicating a procedure
		998.12	Hematoma complicating a procedure
		998.13	Seroma complicating a procedure
Infection	16.10.2.6	519.01	Infection of tracheostomy Use additional code to identify type of infection, such as: Abscess or cellulitis of neck (682.1) Septicemia (038.0-038.9) Use additional code to identify organism (041.00-041.9)
		536.41	Infection of gastrostomy Use additional code to identify type of infection, such as: Abscess or cellulitis of abdomen (682.2) Septicemia (038.0-038.9) Use additional code to identify organism (041.00-041.9)
		530.86	Infection of esophagostomy Use additional code to specify infection
		997.62	Infection (chronic) Use additional code to identify the organism

998.5	Postoperative infection *Excludes:* *Bleb associated endophthalmitis (379.63)* *Infection due to:* *Implanted device (996.60–996.69)* *Infusion, perfusion, or transfusion (999.31–999.39)* *Postoperative obstetrical wound infection (674.3)*
998.51	Infected postoperative seroma Use additional code to identify organism
998.59	Other postoperative infection Abscess: postoperative Intraabdominal postoperative Stitch postoperative Subphrenic postoperative Wound postoperative Septicemia postoperative Use additional code to identify infection
999.3	Other infection Infection after infusion, injection, transfusion, or vaccination Sepsis after infusion, injection, transfusion, or vaccination Septicemia after infusion, injection, transfusion, or vaccination Use additional code to identify the specified infection, such as: septicemia (038.0-038.9) *Excludes:* *The listed conditions when specified as:* *Due to implanted device (996.60–996.69)* *Postoperative NOS (998.51–998.59)*

APPENDIX 2. MPOG HANDOFF STRUCTURED INTERVIEW

Start of Block: Default Question Block

Q1
"The goal of this interview is to understand how your group approaches transitions of care that happen during intraoperative care. These transitions are sometimes called handoffs or handovers. These questions should take 5-10 minutes to answer. You can refuse to answer any question.

I will be audio recording your responses so that I can check the accuracy of my notes. I will delete this recording once another member of the research team has checked it.

Do you have any questions before we begin?"

Q2
"What is your clinical role in your anesthesia group?"

*(**Interviewer:** allow the respondent to answer unprompted. Record their response and choose the response that is closest to what the respondent says. Use "other clinical role" if you are unsure.)*

- ○ Attending anesthesiologist (1)

_____

- ○ CRNA (certified registered nurse anesthetist) (2)

_____

- ○ Anesthesia resident or fellow (3)

_____

- ○ Other clinical role (4) _____

- ○ No clinical role (5) _____

Q10 "What is your administrative role in your anesthesia group?"

_____

Q3 "The following questions are about your clinical environment. The goal of these questions is to learn how your OR workflow is structured."

Q8
"What types of clinicians provide anesthesia care at your institution?"

*(**Interviewer:** Multiple options are possible; check all that are mentioned by the respondent. If the respondent does not mention trainees, prompt them by asking "Do any anesthesia trainees work in your environment? (If yes:) Which types of trainees?")*

☐ Attending anesthesiologists (MD, DO) (1)
_____

☐ CRNAs (Certified registered nurse anesthetists) (2)
_____

☐ AAs (Anesthesia assistants) (3)
_____

☐ Resident anesthesiologists (4)
_____

☐ SRNAs (Student registered nurse anesthetists) (5)
_____

☐ Other (6) _____

Q9
"Are any limitations on which clinicians can work on which types of cases? (If yes:) Please describe them."

*(**Interviewer:** If asked for clarification, say "For example, do CRNAs only work in certain types of cases?")*

_____

Q4
"On weekdays, when do planned surgical cases typically start?"

*(**Interviewer:** This is also known as the "first start" time, typically between 6:30 and 8:30 am. It is also common for one weekday to start later than the others, to allow for educational conferences.)*

_____

Q6
"On weekdays, is there a typical time that planned surgical cases end? If so, what is that time?"

*(**Interviewer:** There will be heterogeneity in answers here. We are looking for the time that OR cases usually end, or the time that a "late shift" comes in for relief.)*

_____

Q7 "How is the weekend OR schedule different from the weekday OR schedule?"

_____

Q5 "The next several questions ask about how intraoperative handoffs are conducted at your institution. For these questions, we are not talking about short breaks. Consider only those handoffs in which the clinician who is being relieved is not expected to return."

Q11
"Does your institution use a structured process to conduct intraoperative handoffs? (If yes:) Please describe the process for conducting intraoperative handoffs."

*(**Interviewer:** By "structured process" we mean defined expectations for conducting handoffs. This could be an EMR prompt, a paper or electronic checklist, use of mnemonic, or other system that provides a framework for conducting handoffs.)*

- ○ Yes (1) _____
- ○ No (2) _____
- ○ Not sure (3) _____

Q12
(If Q11=yes) "Who is expected to follow the structured handoff process?"

☐ Everyone (or similar response) (1)
_____

☐ Attending anesthesiologists (2)
_____

☐ CRNAs (3) _____

☐ Trainees (incl. residents, SRNAs) (4)
_____

Q13 (If Q11=yes) "How long has the structured handoff process been in place?"

_____

Q16 "What are the expectations about intraoperative handoffs at your institution? For example, what guidance do you give clinicians about when, or when not to, handoff care to another person?"

_____

Q17 "How are intraoperative handoffs reflected in the anesthesia record?"

_____

Q14
"Do you monitor or audit intraoperative handoffs in any way?"

*(**Interviewer:** Ask this question of all respondents, even the ones without a structured handoff process.)*

- ○ Yes (1) _____
- ○ No (2) _____
- ○ Not sure (3) _____

Q15 (If Q14=yes) "Please describe how intraoperative handoffs are monitored or audited."

_____

Q18
"The next several questions are specifically about short breaks."

*(**Interviewer:** If the respondent needs clarification, say "Short breaks are times when the clinician who is being relieved is expected to return. This may include relief for meals, lectures, or personal matters.")*

Q19
"Does your institution use a structured process for handoffs happening at short breaks? (If yes:) Please describe this process."

- ○ Yes (1) _____
- ○ No (2) _____
- ○ Not sure (3) _____

Q20 "What are the expectations about handoffs for short breaks? For example, what guidance do you give clinicians about when, or when not to, handoff care to another person?"

_____

Q21 "Thank you for taking the time to answer our questions. Do you have any comments or questions for the research team?"

_____

Q22 "Is it okay to contact you with follow up questions?"

- ○ Yes (1) _____
- ○ No (2) _____
- ○ Other (3) _____

End of Block: Default Question Block