**Table 3. Pre-specified variables**

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| --- | --- | --- | --- |
| **Variables** | **Code** | **Definition** | **Type of variable** |
| **Preoperative** | | | |
| **Age** | Age | Age of patient with patients over 89 coded as 90+. No patients under 15 are included1 | Categorical |
| **Sex** | Gender | Gender1 | Binary |
| **Surgical specialty** | SURGSPEC | The surgical specialty of the primary surgeon performing the procedure. If the procedure is performed by a surgical specialty not included in the list of 10 specialties, the closet specialty to the primary surgeon is chosen.   * If a surgeon is privileged at a site to perform multiple specialties, the surgeon’s primary surgical specialty designation should be assigned, regardless of the case being performed. Example: If a General Surgeon performs a vascular case, such as a fem-pop bypass, then select “General Surgery” for the surgical specialty. * If a surgeon is “Board Certified” in multiple specialties then the surgeon can discuss with the SCR which surgical specialty is the most appropriate for the case being performed. Example: If a Surgeon is “Board Certified” in both Vascular Surgery and General Surgery andperforms an appendectomy, the Surgeon can designate which surgical specialty he/she would like associated with this case. * If the procedure is performed by a surgical specialty not included in the list of 10 specialties, choose the closest specialty to the primary surgeon1   Definition revised in 20132:  The surgical specialty area that best characterizes the principal operative procedure.   * Surgeon’s self-declared specialty * If a surgeon is privileged to perform cases within multiple specialties (regardless of board certification), the service line/specialty most closely relate to the principal operative procedure would be assigned. * If a Surgeon is “Board Certified” in both Vascular Surgery and General Surgery and performs an appendectomy, the surgeon’s specialty should be designated as general surgery, but if he/she performs a vascular bypass, it should be designated as vascular. | Categorical |
| **BMI (kg/m2)** |  | Underweight: <18.50  Normal: 18.50 – 24.99  Overweight: > 25.00  Obese I: 30.00 – 35.00  Obese II: 35.00 – 40.00  Obese III: > 40 | Categorical |
| **ASA**  **Classification** | ASACLAS | The American Society of Anesthesiology (ASA) Physical Status Classification of the patient’s present physical condition on a scale from 1-5 as it appears on the anesthesia record. The classifications are as follows: ASA 1 -Normal healthy patient ASA 2 -Patient with mild systemic disease ASA 3 -Patient with severe systemic disease ASA 4 -Patient with severe systemic disease that is a constant threat to life ASA 5 -Moribund patient who is not expected to survive without the  operation.1 | Categorical |
| **Ascites** | ASCITES | "YES" is entered for patients with the presence of fluid accumulation in the peritoneal cavity noted on physical examination, abdominal ultrasound, or abdominal CT/MRI within 30 days prior to the operation. Documentation should state either active or a history of liver disease (for example, jaundice, encephalopathy, hepatomegaly, portal hypertension, liver failure, or spider telangiectasia). Minimal or trace ascites would not qualify; however; malignant ascites (exclusive of liver disease) due to extensive cancer would qualify.1 | Binary |
| **Disseminated cancer** | DISCANCR | "YES" is entered for patients who have cancer that: (1) Has spread to one site or more sites in addition to the primary site AND (2) In whom the presence of multiple metastases indicates the cancer is widespread, fulminant, or near terminal. The following are reported as Disseminated Cancer: Acute Lymphocytic Leukemia (ALL), Acute Myelogenous Leukemia (AML), and Stage IV Lymphoma. The following are not reported as Disseminated Cancer: Chronic Lymphocytic Leukemia (CLL), Chronic Myelogenous Leukemia (CML), Stages I  through III Lymphomas or Multiple Myeloma. Example: A patient with a primary breast cancer with positive nodes in the axilla does NOT qualify for this definition. She has spread of the tumor to a site other than the primary site, but does not have widespread metastases. A patient with primary breast cancer with positive nodes in the axilla AND liver metastases does qualify, because she has both spread of the tumor to the axilla and other major organs.1  Definition revised in 20143:  "YES" is entered for patients who have a primary cancer that has metastasized or disseminated to a major organ AND the patient also meets AT LEAST ONE of the following criteria: The patient has received active treatment for the cancer within one year of their ACS NSQIP assessed procedure surgery date. If the ACS NSQIP assessed surgical procedure is the treatment for the metastatic cancer, assign disseminated cancer to the case. The extent of disease is first appreciated at the time of the surgical procedure in question. The patient has elected not to receive treatment for the metastatic disease, but such treatment was indicated. The patient’s metastatic cancer has been deemed untreatable. Information is obtained within 30 days following the principal operative procedure indicating disseminated cancer was present at the time of the principal operative procedure. The following are reported as Disseminated Cancer: Acute Lymphocytic Leukemia (ALL), Acute Myelogenous Leukemia (AML), and Stage IV Lymphoma A patient with primary breast cancer with positive nodes in the axilla, liver metastases and is also receiving chemotherapy  at the time of the assessed ACS NSQIP surgical procedure;   * A patient with colon cancer with liver metastasis and/or peritoneal seeding with tumor, who received their last dose of chemotherapy and radiation therapy 2 months prior to their ACS NSQIP assessed procedure; * A patient with preoperative Stage III colon cancer is admitted for a colectomy. Upon entering the abdomen the surgeon identifies cancer which has spread to the surrounding organs; * A patient with a history of Stage IV Lymphoma who received their second round of chemotherapy two months prior to surgery; * Cancer treatments include not only chemotherapy and radiation therapy, but also surgery and hormone therapy; * Patient undergoes mastectomy for breast cancer and a CT on postop day 22 reveals a metastatic lesion on the liver. | Binary |
| **History of congestive heart failure** | HXCHF | "YES" is entered in patients with congestive heart failure. Congestive heart failure is the inability of the heart to pump a sufficient quantity of blood to meet the metabolic needs of the body or can do so only at increased ventricular filling pressure. Only newly diagnosed CHF within the previous 30 days or a diagnosis of chronic CHF with new signs or symptoms in the 30 days prior to surgery fulfills this definition. Common manifestations are:   * Abnormal limitation in exercise tolerance due to dyspnea or fatigue * Orthopnea (dyspnea on lying supine) * Paroxysmal nocturnal dyspnea (PND-awakening from sleep with dyspnea) * Increased jugular venous pressure -Pulmonary rales on physical examination * Cardiomegaly * Pulmonary vascular engorgement.1   Definition revised in 20143:  "YES" is entered in patients with congestive heart failure. Congestive heart failure is the inability of the heart to pump a sufficient quantity of blood to meet the metabolic needs of the body or can do so only at increased ventricular filling pressure. Only newly diagnosed CHF within the previous 30 days or a diagnosis of chronic CHF with new signs or symptoms in the 30 days prior to surgery fulfills this definition. Common manifestations are:   * Abnormal limitation in exercise tolerance due to dyspnea or fatigue * Orthopnea (dyspnea on lying supine) * Paroxysmal nocturnal dyspnea (PND-awakening from sleep with * dyspnea) * Increased jugular venous pressure -Pulmonary rales on physical   examination   * Cardiomegaly * Pulmonary vascular engorgement. Pulmonary edema Newly diagnosed CHF or a diagnosis of chronic CHF with current signs or symptoms, in the 30 days prior to the principal operative procedure or at the time the patient is being considered as a candidate for surgery. Diagnosis in the medical record should be noted as congestive heart failure (CHF).   The following updates starts from July 2014: Patients with  documentation which indicates that pulmonary edema is not an exacerbation of CHF would not be assigned. Notes: Common CHF manifestations may include:   * Abnormal limitation in exercise tolerance due to dyspnea or fatigue * Orthopnea (dyspnea when lying supine) * Paroxysmal nocturnal dyspnea (PND-awakening from sleep with dyspnea) * Increased jugular venous pressure (JVP) * Pulmonary rales on physical examination * Cardiomegaly * Pulmonary vascular engorgement * Pulmonary edema in the setting of chronic CHF | Binary |
| **Diabetes mellitus** | DIABETES | The treatment regimen of the patient’s chronic, long-term management (> 2 weeks). Diabetes mellitus is a metabolic disorder of the pancreas whereby the individual requires daily dosages of exogenous parenteral insulin or a non-insulin anti-diabetic agent to prevent a hyperglycemia/metabolic acidosis. Patients with insulin resistance that routinely take anti-diabetic agents are included. Patients whose diabetes is controlled by diet alone are not included. No: no diagnosis of diabetes or diabetes controlled by diet alone. Non-Insulin: a diagnosis of diabetes requiring therapy with a non-insulin anti-diabetic agent (such as oral agents or other non-insulin agents). Insulin: a diagnosis of diabetes requiring daily insulin therapy.1  Definition revised in 20143:  The treatment regimen of the patient’s chronic, long-term management (> 2 weeks). Diabetes mellitus is a metabolic disorder of the pancreas whereby the individual requires daily dosages of exogenous parenteral insulin or a noninsulin anti-diabetic agent to prevent a hyperglycemia/metabolic acidosis. Patients with Insulin resistance (e.g., polycystic ovarian syndrome) that routinely  take anti-diabetic agents are included; Patients who prescribed oral or insulin treatment and are noncompliant are included; Patients whose diabetes are controlled by diet alone are not included. No: no diagnosis of diabetes or diabetes controlled by diet alone. Non-Insulin: a diagnosis of diabetes requiring therapy with a non-insulin anti-diabetic agent (such as oral agents or other noninsulin agents). Insulin: a diagnosis of diabetes requiring daily insulin therapy.  Note: If the patient requires treatment with both non-insulin and insulin, assign insulin.1 | Categorical |
| **Renal failure** |  | Creatinine >1.5 mg/dL4 | Binary |
| **Dialysis** | DIALYSIS | "YES" is entered if the patient has acute or chronic renal failure requiring treatment with peritoneal dialysis, hemodialysis, hemofiltration, hemodiafiltration, or ultrafiltration within 2 weeks prior to the principal operative procedure. The medical record must document that such a treatment was indicated.1 | Binary |
| **History of COPD** | HXCOPD | "YES" is entered for patients with chronic obstructive pulmonary disease (such as emphysema and/or chronic bronchitis) resulting in any one or more of the following:   * Functional disability from COPD (e.g., dyspnea, inability to perform ADLs) * Hospitalization in the past for treatment of COPD * Requires chronic bronchodilator therapy with oral or inhaled agents. * An FEV1 of <75% of predicted on pulmonary function testing. Patients are not included whose only pulmonary disease is asthma, an acute and chronic inflammatory disease of the airways resulting in bronchospasm. Patients are not included with diffuse interstitial fibrosis or sarcoidosis.1   Definition revised in 20132:  COPD [emphysema and/or chronic bronchitis/bronchiectasis/ bronchiolitis obliterans organizing pneumonia (BOOP)] is a progressive disease that makes it hard to breathe. ‘Progressive’ means the disease gets worse over time. “COPD can cause coughing that produces large amounts of mucus . . ., wheezing, shortness of breath, chest tightness, and other symptoms” (National Heart Lung  and Blood Institute, 2010) 2. Medical record must document that there is a historical or current diagnosis of COPD AND at least one of the following, within the 30 days prior to the principal operative procedure or at the time the patient is being considered as a candidate  for surgery: Functional disability from COPD (e.g., dyspnea, inability to perform ADLs) Or Requires chronic bronchodilator therapy with oral or inhaled agents Or Hospitalization in the past for treatment of COPD Or An FEV1 of <75% of predicted on a prior pulmonary function test (PFT).  Definition revised in 20143:  COPD [emphysema and/or chronic bronchitis/bronchiectasis/ bronchiolitis obliterans organizing pneumonia (BOOP)] is a progressive disease that makes it hard to breathe. ‘Progressive’ means the disease gets worse over time. “COPD can cause coughing that produces large amounts of mucus . . ., wheezing, shortness of breath, chest tightness, and other symptoms” (National Heart Lung and Blood Institute, 2010) 2. Medical record must document that there is a historical or current diagnosis of COPD AND at least one of the following, within the 30 days prior to the principal operative procedure or at the time the patient is being considered as a candidate for surgery: Functional disability from COPD (e.g., dyspnea, inability to perform ADLs) Or Requires chronic bronchodilator therapy with oral or inhaled agents or other medication specifically targeted to this disease Or Hospitalization in the past for treatment of COPD Or An FEV1 of <75% of predicted on a prior pulmonary function test (PFT). Patients whose only pulmonary disease is asthma, an acute and chronic inflammatory disease of the airways resulting in bronchospasm are not included. Patients with diffuse interstitial fibrosis, sarcoidosis, or silicosis are not included.  Notes: Utilize post bronchodilator values if available.1 | Binary |
| **Systemic sepsis** | PRSEPIS | Sepsis is a vast clinical entity that takes a variety of forms. The spectrum of disorders spans from relatively mild physiologic abnormalities to septic shock. The most significant level is reported using the following criteria:   * SIRS (Systemic Inflammatory Response Syndrome): SIRS is a widespread inflammatory response to a variety of severe clinical insults. This syndrome is clinically recognized by the presence of two or more of the following within the same time frame: ­Temp >38 degrees C or <36 degrees C ­HR >90 bpm ­RR >20 breaths/min or PaCO2 <32 mmHg(<4.3 kPa) ­WBC >12,000 cell/mm3, <4000 cells/mm3, or >10% immature (band) forms ­Anion gap acidosis: this is defined by either: [Na + K] – [CL + HCO3 (or serum CO2]. If this number is greater than 16, then an anion gap acidosis is present. Na – [CL + HCO3 (or serum CO2]. If this number is greater than 12, then An anion gap acidosis is present. \*If anion gap lab values are performed at your facilities lab, ascertain which formula is utilized and follow guideline criteria. * Sepsis: Sepsis is the systemic response to infection. Report this variable if the patient has clinical signs and symptoms of SIRS listed above and meets either A or B:   A. One of the following: - Positive blood culture; - Clinical documentation of purulence or positive culture from any site for which there is documentation noting the site as the acute case of sepsis.  B. Suspected pre-operative clinical condition of infection, or bowel infarction, which leads to the surgical procedure. The findings during the Principal Operative Procedure must confirm this suspected diagnosis with one or more of the following: - Confirmed infarcted bowel requiring resection; - purulence in the operative site; - enteric contents in the operative site; - or positive intra-operative cultures.   * Septic Shock: Report this variable if the patient has sepsis AND documented organ and/or circulatory dysfunction. Examples of organ dysfunction include: oliguria, acute alteration in mental status, acute respiratory distress. Examples of circulatory dysfunction include: hypotension, requirement of inotropic or vasopressor agents.1   Definition revised in 20143:  Sepsis is a vast clinical entity that takes a variety of forms. The spectrum of disorders spans from relatively mild physiologic abnormalities to septic shock. The most significant level is reported using the following criteria:   * SIRS (Systemic Inflammatory Response Syndrome): SIRS is a widespread inflammatory response to a variety of severe clinical insults. This syndrome is clinically recognized by the presence of two or more of the following within the same time frame: ­Temp >38 degrees C or <36 degrees C ­HR >90 bpm ­RR >20 breaths/min or PaCO2 <32 mmHg(<4.3 kPa) ­WBC >12,000 cell/mm3, <4000 cells/mm3, or >10% immature (band) forms ­Anion gap acidosis: this is defined by either: [Na + K] – [CL + HCO3 (or serum CO2]. If this number is greater than 16, then an anion gap acidosis is present. Na – [CL + HCO3 (or serum CO2]. If this number is greater than 12, then An anion gap acidosis is present. \*If anion gap lab values are performed at your facilities lab, ascertain which formula is utilized and follow guideline criteria. * Sepsis: Sepsis is the systemic response to infection. Report this variable if the patient has clinical signs and symptoms of SIRS listed above and meets either A or B:   A. One of the following: - Positive blood culture; - Clinical documentation of purulence or positive culture from any site for which there is documentation noting the site as the acute case of sepsis.  B. Suspected pre-operative clinical condition of infection, or bowel infarction, which leads to the surgical procedure. The findings during the Principal Operative Procedure must confirm this suspected diagnosis with one or more of the following: - Confirmed infarcted bowel requiring resection; - purulence in the operative site; - enteric contents in the operative site; - or positive intra-operative cultures.   * Septic Shock: Report this variable if the patient has sepsis AND documented organ and/or circulatory dysfunction. Examples of organ dysfunction include: oliguria, acute alteration in mental status, acute respiratory distress. Examples of circulatory dysfunction include: hypotension, requirement of inotropic or vasopressor agents. The presence of pneumatosis along with the presence of SIRS is assigned. | Categorical |
| **Hypertension requiring medication** | HYPERMED | The diagnosis of HTN must be documented in the patient’s medical record and the condition is severe enough that it requires antihypertensive medication (for example, diuretics, beta blockers, ACE inhibitors, calcium channel blockers), within 30 days prior to the principal operative procedure or at the time the patient  is being considered as a candidate for surgery.1  Definition revised in 20132:  Hypertension (HTN) is the term used to describe high blood pressure. Blood pressure is a measurement of the force against the walls of your arteries as your heart pumps blood through your body. High blood pressure (hypertension) is when your blood pressure is 140/90 mmHg or above most of the time.” The diagnosis of HTN must be documented in the patient’s medical record and the condition is severe enough that it requires antihypertensive medication, within 30 days prior to the principal operative procedure or at the time the patient is being considered as a candidate for surgery. The patient must have been  receiving or required long-term treatment of their chronic hypertension for > 2 weeks.1 | Binary |
| **Steroid use for chronic condition** | STEROID | Patient has required the regular administration of oral or parenteral corticosteroid (e.g. Prednisone, Decadron) medications or immunosuppressant medications, within the 30 days prior to the principal operative procedure or at the time the patient is being considered as a candidate for surgery, for a chronic medical condition (e.g. COPD, asthma, rheumatologic disease, rheumatoid arthritis, inflammatory bowel disease). A one-time pulse, limited short course, or a taper of less than 10 days duration would not qualify. Do not include topical corticosteroids applied to the skin or corticosteroids  administered by inhalation or rectally. Do not include patients who only receive short course steroids (duration 10 days or less) in the 30 days prior to surgery.1 | Binary |
| **Dyspnea** | DYSPNEA | Dyspnea may be symptomatic of numerous disorders that interfere with adequate ventilation or perfusion of the blood with oxygen and is defined as difficult, painful or labored breathing. The intent of this variable is to capture the usual or typical level of dyspnea (patient’s baseline), within the 30-days prior to surgery. The intent is not to include patients solely because of an acute respiratory condition leading to intubation prior to surgery, but rather to reflect a chronic disease state. Characterize the patient's dyspnea status when they were in their usual state of health, prior to the onset of the acute illness, within the 30 days prior to surgery. (1) No dyspnea (2) Dyspnea upon moderate exertion (for example-is unable to climb one flight of stairs without shortness of breath) (3) Dyspnea at rest (for example: cannot complete a sentence without needing to take a breath)  Note: Acute pre-op dyspnea associated with the acute illness will be captured through other variables like pre-op vent dependence, emergency status or ASA Class. The previous requirement that the patient has to themselves state that they are symptomatic has been removed: not all patients are able to verbalize this symptomatology.1 | Categorical |
| **Anemia** |  | Anemia if hematocrit <0.395 | Binary |
| **Transfusion** | Preop Transfusion of >= 1 unit of  whole/packed RBCs in 72 hours prior to  surgery | Preoperative loss of blood necessitating any transfusion (minimum of 1 unit) of whole blood/packed red cells transfused during the 72 hours prior to surgery start time, including any blood transfused in the emergency room. If greater than 200 units, enter 200 units.1 | Binary |
| **Elective surgery** | ELECTSURG | "YES" is entered if the patient is brought to the hospital or facility for a scheduled (elective) surgery from their home or normal living situation on the day that the procedure is performed.  ENTER NO (Exclude) FOR the following:   * Patients who are inpatient at an acute care hospital (example: patient transferred from another acute care hospital to your hospital for surgery) * Patients who are transferred from an ED * Patients who are transferred from a clinic * Patients who undergo an emergent/urgent surgical case * Patients admitted to the hospital on the day(s) prior to a scheduled procedure for any reason (e.g. cardiac or pulmonary workup or "tuning", bowel cleanout, TPN, hydration, anticoagulation reversal etc.)   ENTER YES (Include) FOR the following:   * Patients staying with friends or family, or in a local hotel, because of logistics (example: patient lives 50 miles from the hospital and stays in a hotel across from the hospital the night before their scheduled (elective) surgery) * Patients who come from their present "home" (which may include patients whose home is a nursing home, assisted care facility, prison or other nonhospital institution)1   The intent is to identify a relatively homogeneous group of patients who are well enough to come from home, to allow for more meaningful comparative analyses.1 | Binary |
| **Procedural risk** |  | Intrinsic cardiac risk (Appendix 1)  0=intermediate risk  1=high-risk | Binary |
| **Intraoperative** | | | |
| **Operation time** | Total operation time | Total operation time in minutes1 | Continuous |
| **Postoperative** | | | |
| **Any complication** | **Acute renal failure**: DOPRENAFL | Days from Operation until Acute Renal Failure Complication1 | Binary |
| **Bleeding transfusion**: DOTHBLEED | Days from Operation until Bleeding Transfusions Complication1 |
| **DVT/Thrombophlebitis**: DOTHDVT | Days from Operation until DVT/Thrombophlebitis Complication1 |
| **Sepsis**: DOTHSYSEP | Days from Operation until Sepsis Complication1 |
| **Septic shock**: DOTHSESHOCK | Days from Operation until Septic Shock Complication1 |
| **Pneumonia**: DOUPNEUMO | Days from Operation until Pneumonia Complication1 |
| **Ventilation**: DFAILWEAN | Days from Operation until On Ventilator > 48 Hours Complication1 |
| **Pulmonary embolism**: DPULEMBOL | Days from Operation until Pulmonary Embolism Complication1 |
| **CVA/Stroke with neurological deficit**: DCNSCVA | Days from Operation until Stroke/CVA Complication1 |
| **Wound disruption**: DDEHIS | Days from Operation until Wound Disruption Complication1 |
| **Deep incisional SSI**: DWNDINFD | Days from Operation until Deep Incisional SSI Complication1 |
| **Organ space SSI**: DORGSPCSSI | Days from Operation until Organ/Space SSI Complication1 |
| **Unplanned reoperation 1**: RETORPODAYS | Days from principal operative procedure to Unplanned Reoperation 11 |
| **Unplanned reoperation 2**: RETOR2PODAYS | Days from principal operative procedure to Unplanned Reoperation 21 |

BMI: body mass index; ASA: American Society of Anesthesiologists; COPD: chronic obstructive pulmonary disease

1 Surgeons ACo. User Guide for the 2012 ACS NSQIP Participant Use Data File 2013 [cited 2019 August 9]. Available from: https://www.facs.org/~/media/files/quality%20programs/nsqip/ug12.ashx.

2 Surgeons ACo. User Guide for the 2013 ACS NSQIP Participant Use Data File (PUF) 2014 [cited 2019 August 9]. Available from: <https://www.facs.org/-/media/files/quality> programs/nsqip/2013\_acs\_nsqip\_puf\_user\_guide.ashx?la=en.

3 Surgeons ACo. User Guide for the 2014 ACS NSQIP Participant Use Data File (PUF) 2015 [cited 2019 August 9]. Available from: https://www.facs.org/-/media/files/quality-programs/nsqip/nsqip\_puf\_userguide\_2014.ashx?la=en.

4 Gupta PK, Gupta H, Sundaram A, Kaushik M, Fang X, Miller WJ et al. Development and validation of a risk calculator for prediction of cardiac risk after surgery. *Circulation* 2011; 4(4): 381-387

5 Wu WC, Schifftner TL, Henderson WG, Eaton CB, Poses RM, Uttley G, et al. Preoperative hematocrit levels and postoperative outcomes in older patients undergoing noncardiac surgery. *JAMA* 2007; 297(22):2481-8