

HHS Action Plan to Prevent Healthcare-Associated Infections: AMBULATORY SURGICAL CENTERS

I. Introduction

In response to increasing concerns about the public health impact of healthcare-associated infections (HAIs), the U.S. Department of Health and Human Services (HHS) developed an Action Plan to Prevent Healthcare-Associated Infections (HHS Action Plan).¹ The initial HHS Action Plan, released in January 2009, focused on a first tier of six high priority HAI-related areas within the acute care hospital setting. These areas include surgical site infection (SSI), central-line associated bloodstream infection, ventilator-associated pneumonia, catheter-associated urinary tract infection, *Clostridium difficile* infection, and Methicillin-resistance *Staphylococcus aureus* (MRSA) infection. The HHS Action Plan utilized subject matter experts to identify key actions in HAI prevention in hospitals, and included recommendations for surveillance, research, communication, and metrics for measuring progress towards national goals.

While the initial focus of the HHS Action Plan was on acute care, inpatient settings, the HHS Steering Committee for the Prevention of Healthcare-Associated Infection acknowledged the need for addressing HAI prevention across the healthcare continuum, including outpatient settings. As part of Tier 2 of the HHS Action Plan, ambulatory surgical centers and end-stage renal disease facilities were selected as focus areas. The following document represents a culmination of several months of deliberation by subject matter experts across HHS to summarize HAI prevention issues specific to ambulatory surgical centers and present key actions needed to assure safe care in these settings.

II. Background

Healthcare-associated infections are a leading cause of death in the United States, and can cause needless suffering and expense. In 2002, the subset of all HAIs with their onset in the hospital was estimated to account for approximately 1.7 million infections and 99,000 deaths in U.S. hospitals.² These estimates come from U.S. hospitals, but HAIs can occur in any healthcare setting. One setting which has demonstrated tremendous growth both in the volume and complexity of procedures being performed is ambulatory surgical centers (ASCs).

Ambulatory surgical centers are defined by the Centers for Medicare and Medicaid Services (CMS) as distinct entities that operate exclusively to provide surgical services to patients who do not require hospitalization and are not expected to need to stay in a surgical facility longer than 24 hours (42 C.F.R. §416.2).³ Many of the services performed in these facilities extend beyond procedures traditionally thought of as surgery, including endoscopy, injections to treat chronic pain, and dental care.³ Currently, there are over 5,100 Medicare-certified ASCs in the U.S., which represents a greater than

50% increase since 2001. In 2007 more than six million surgeries were performed in these facilities and paid for by Medicare at a cost of nearly \$3 billion.^{4,5}

Oversight of Medicare-Certified ASCs

Oversight of Medicare-certified ASCs to assure compliance with the Conditions for Coverage (CfCs), which include minimum health and safety standards, falls to the State Survey Agencies (SSAs) or any of the four accrediting organizations (AOs) that have been granted deeming authority by CMS.³ These are the Joint Commission (TJC), Accreditation Association for Ambulatory Health Care (AAAHC), American Association for Accreditation of Ambulatory Surgery Facilities (AAAASF), and American Osteopathic Association (AOA). Ambulatory surgical centers that are accredited by an AO are exempt from routine surveys conducted by SSAs. However, a notable exception to this rule is the surveys conducted by the SSA in response to a complaint. Similarly, a relatively small number of validation surveys are conducted by SSAs to verify the equivalency of the AO's survey process to that of CMS and the SSA. Currently, approximately 20% of Medicare-certified ASCs have relied upon an accrediting organization for their certification.

Data on HAI Risks in ASCs is Lacking

National estimates regarding the number of HAIs originating in ASCs are not available and little is known about infection control practices in these settings. Current data related to SSIs and other HAIs come primarily from hospitals, which have an established infrastructure with staff dedicated to infection control and HAI surveillance. This infrastructure is largely absent in ASCs. Much of what is known about adverse events and HAIs in these settings is based on outbreak investigations conducted by State Health Departments and the Centers for Disease Control and Prevention (CDC). Recent steps to better assess and summarize infection control practices in ASCs occurred in the context of an enhanced inspection pilot activity that was led by CMS and supported by CDC. In 2008, SSAs in each of three states (Maryland, North Carolina, and Oklahoma) incorporated an infection control audit tool, based upon CDC guidelines (e.g., Standard Precautions)⁷, into their routine ASC survey process. Over two-thirds of the facilities surveyed in the pilot had lapses in infection control identified by surveyors and half of the facilities had not undergone a full inspection in more than five years.⁸

A February 2009 report from the Government Accountability Office (GAO) highlighted the lack of information related to health outcomes and process measures in ASCs⁴:

The increasing volume of procedures and evidence of infection control lapses in ASCs create a compelling need for current and nationally representative data on HAIs in ASCs in order to reduce their risk. Because HAIs generally only occur after a patient has left an ASC, data on the occurrence of these infections—outcome data—are difficult to collect. But data on the implementation of CDC-recommended infection control practices—process data—in ASCs can be

collected more easily and can provide critical information on why HAIs are occurring and what can be done to help prevent them.

In the report, GAO further recommended the utilization of existing regulatory infrastructure, such as the inspections performed in the 2008 CMS pilot, to collect data on infection control practices in ASCs to help describe current practices and target infection control prevention strategies.

This report is an update on progress made, remaining gaps, and recommendations for next steps related to reducing the risks of HAI transmission in ASCs. Although similar surgical procedures are performed in physician offices and hospital-based surgery centers, this report focuses on Medicare-certified ASCs of which assessment and enforcement of CMS standards falls primarily to SSAs and AOs.

III. Progress Made

ASC Conditions for Coverage Expanded to Include Infection Control and Prevention

CMS recently revised the ASC CfCs and the interpretive guidelines and survey procedures, which became effective in 2009.³ Previously, the survey methodology, set out in Appendix L of the State Operations Manual, had not been updated since 1982.⁹ In 2008, CMS revised the CfCs for ASCs to specifically address the need for infection control programs, including the following requirements:

- The ASC must maintain an infection control program based upon CDC or other nationally recognized infection control guidelines;
- The infection control program must be under the direction of a designated healthcare professional with training in infection control;
- The infection control program must be integrated into the ASC's Quality Assessment and Performance Improvement Program (QAPI); and,
- The ASC must identify HAIs through activities conducted in accordance with recognized infection control surveillance practices.

Improved Inspection Frequency and Methodology

As noted above, historically, surveys of ASCs have been infrequent (the median interval between inspections has been more than five years) and surveyors did not formally assess infection control practices as part of the inspection process. However, in response to a 2008 outbreak of hepatitis C virus infections at a Nevada ASC, national attention quickly focused on ASCs and triggered questions related to their performance and safety and oversight.^{6,8} CDC tools used in outbreak investigation were further adapted to develop a checklist for assessing infection control practices in ASCs. CMS, with support from CDC, endeavored to strengthen and expand the infection control component of the survey to include direct observation of staff practices using the CDC checklist. As a result, there has been a notable increase in overall awareness of the needs for infection control and prevention activities in ASCs,

where SSAs and AOs are primarily responsible for assessment and enforcement of CMS standards. There has also been increased emphasis on the process measures necessary to measure compliance and to examine findings and patterns across surveys. This has been a critical first step toward the goals of valid and reliable surveillance systems and patient-centered outcome measures related to decreasing HAI risks among ASC patients.

In 2009, American Recovery and Reinvestment Act (ARRA) funding supported a 33% increase in the number of non-accredited ASC surveys conducted by SSAs. (Accredited ASCs are not included in the intensified survey schedule since their frequency of inspection is determined and maintained by the respective accrediting organization.) Simultaneously, the survey process was modified by CMS. The tracer methodology, pioneered by TJC in 2004 for its hospital accreditation surveys, was adopted to facilitate a more complete evaluation of an individual patient's experience while under the care of an ASC. By following a patient through his or her ASC admission, the CMS surveyor is able to more accurately determine how well the actual provision of care and services are aligned with CfCs. In addition, the new infection control worksheet (ICWS) that was developed from the CDC checklist and guidelines for use in the 2008 three state pilot activity has been adopted for routine use in conjunction with the CMS standard survey forms. The current version of the ICWS was released in October 2009 for national implementation during all SA surveys.⁹ Voluntary use of the tool was requested from the four AOs that accredit ASCs.

The infection control worksheet is divided into two sections:

Section one, ASC Characteristics – This section captures descriptive information about the type of ASC, its scopes of services, the organization of its infection control program, and any training it provides. The use of nationally recognized standards and/or guidelines, surveillance methods used by the ASC, and qualifications of the healthcare professional responsible for the infection control program are included in section one.

Section two, Infection Control Practices Assessment – This section is based upon nationally recognized evidence-based guidelines from CDC and focuses on specific practices in five areas of infection control that are critical elements for a successful infection control program and assuring safe care. These are: hand hygiene and use of personal protective equipment, injection safety and medication handling, equipment reprocessing (e.g., sterilization and high-level disinfection), environmental cleaning, and handling of point-of-care devices, specifically use of blood glucose monitoring equipment.

The first national database of ASC infection control practices is in development with new data being submitted regularly. Analysis of this data is expected to begin in 2011. Since the implementation of the ICWS, there has been a fourfold increase in the number of condition level infection control deficiencies identified during ASC surveys.

Each facility cited for noncompliance at the condition level is not only required to submit a corrective plan of action, but also receives a follow-up visit to assure that the plan is effective.

Education and Training

Another important achievement has been the increase in both the number and types of resources available to support HAI prevention initiatives in ASCs. In October 2009, after a ten year lapse, CMS hosted a two-and-a-half day training program for ASC surveyors, an event attended by over 200 participants supported by CDC staff and made available through electronic media to staff that were unable to attend in person. The first web-based ASC surveyor training course is in development and is scheduled to undergo beta testing by the end of 2010. Surveyors and SSA staff currently have expanded access to experts in infection control, including Regional Medical Officers, CMS personnel, and CDC officials. In addition, CDC has led development of educational videos (e.g., hand hygiene, safe injection practices) and other materials for training of front-line healthcare personnel.

The impetus for improvement and collaboration has extended beyond HHS as well. Professional organizations, such as the Association for Professionals in Infection Control and Epidemiology (APIC) and the Association of periOperative Registered Nurses (AORN), have developed education programs and conference content designed to address HAI prevention needs within ASCs. Private providers of continuing education have followed the lead of the associations and are beginning to promote their own web-based programs. Joint efforts between HHS Operating Divisions, professional associations, and consumer advocates have resulted in closer scrutiny of key infection related issues such as injection safety, blood glucose monitoring, and sterilization and disinfection practices.

Interagency Collaboration

Across HHS, information exchange, consultation, and collaboration between the Operating Divisions, including CMS, CDC, the Agency for Healthcare Research and Quality (AHRQ), the Indian Health Service (IHS), and the Food and Drug Administration (FDA), in the area of HAI prevention among ASC patients has increased substantially since the release of the HHS Action Plan in January 2009. In 2009, CMS and CDC entered into an interagency agreement to enhance CMS expertise and capacity to provide oversight of infection control activities within Medicare-certified institutional providers and suppliers of healthcare services, with an initial focus on ASCs. CDC provided funding for CMS to create a new position for an infection preventionist to assist with this work. AHRQ has also identified ambulatory care as a high-priority area for HAI prevention and surveillance research, as demonstrated by recent funding initiatives.¹⁰

IV. Remaining Needs and Prevention Opportunities

Unmet needs pertaining to HAI prevention in ASCs fall into three main categories:

1. The need for proactive HAI Prevention at the clinic level;
2. The need to sustain and expand improvements in oversight and monitoring; and,
3. The need to develop meaningful HAI surveillance and reporting procedures.

Need for Proactive HAI Prevention at the Clinic Level

While significant progress has been made toward improving oversight in ASCs, ultimately, accountability for HAI prevention and safe care rests with the ASC itself. The new infection control requirements set forth by CMS in the updated CfCs will help assure that ASCs develop infection control policies based upon nationally-recognized guidelines and that those policies are under the direction of someone with training in infection control. However those updates, alone, will not be sufficient. ASCs need to proactively embrace a culture of safety and make allocation of resources and education of staff for HAI risk reduction a priority, without the threat of an impending survey or citation from CMS. Understanding where and in what ways risks and hazards associated with infections are embedded in the process and structure of care within ASCs is vital to the development of safe practices for HAI prevention. Once the risks and hazards are understood and modeled, using such techniques as Socio-Technical Probabilistic Risk Assessment (ST-PRA), new safe practices can be developed using a risk-informed design approach. One such practice has already been developed and tested in the inpatient setting. The Comprehensive Unit-Based Safety Program (CUSP), which was developed for use in hospital settings, provides one possible model that can be modified and applied to the ASC setting.¹¹

Based on the number of infection control citations that have been issued by state surveyors since the new survey process and ICWS were implemented, clearly there are educational needs that are not being met. The survey process is not designed to address these education gaps. Additional educational resources and training opportunities are needed to assist facilities with development of infection control policies and plans of correction when lapses are identified as well as ongoing training of staff. Further, ASCs may benefit from regular access to a certified infection preventionist who could provide more tailored education of staff and meet specific needs of the facility as opposed to those addressed through general educational sessions on infection control.

Need to Sustain and Expand Improvements in Oversight and Monitoring

Despite recent improvements to the survey process including increased attention to infection control and a commitment by CMS to inspect one-third of all CMS-certified ASCs nationwide by the end of the fiscal year, surveys are still infrequent and only represent information from a single snapshot in time. Additionally, the sustainability of this enhanced survey process in ASCs, currently funded through ARRA, is uncertain.

Need to Develop Meaningful HAI Surveillance and Reporting Procedures

The progress previously described related to updates in the CfCs and improvements in the survey process focus primarily on process measures. While process measures are critically important to assuring safe care and these updates by CMS were much needed, surveillance of patient outcomes following procedures in ASCs and other outpatient settings remains challenging. The advantages and disadvantages of some of the currently available options for HAI surveillance in ASCs are summarized in Table 1. Currently, there is no national data source describing HAIs that originate in ASCs. Thus, there is no standardized mechanism in ASCs to tie compliance with process measures to improved outcomes or reductions in HAIs.

Post-discharge surveillance remains an area where additional guidance is needed. Currently, there is a great deal of heterogeneity and a lack of standardization of post-discharge HAI surveillance data in ASCs. This exists for a number of reasons. First, given the diversity of procedures performed in ASCs, many of which extend beyond what is traditionally considered surgery, guidance is lacking as to which procedures should be prioritized for surveillance activities. Moreover, there are no standardized surveillance definitions for many of the higher volume procedures performed in ASCs.

There is no “one size fits all” HAI surveillance solution for ASCs. For example, many ASCs only perform endoscopy, for which SSI definitions are not applicable. Other ASCs specialize in orthopedic and/or general surgical procedures; existing SSI definitions exist for some of these procedures, but research is needed to understand how definitions and surveillance protocols that have been developed for use in hospital settings can be translated for the ASC environment. State Health Departments and CDC continue to investigate outbreaks at ASCs and track infections across the spectrum of healthcare settings, including sentinel surveillance for viral hepatitis. CDC’s National Healthcare Safety Network (NHSN), which is currently used in all 50 states to collect SSI data, is primarily targeted toward procedures performed in acute care hospitals. Colorado recently began to require all ASCs performing hernia procedures, hip replacements, and knee replacements to report to NHSN.¹² Two other states have plans to initiate ASC SSI reporting requirements in 2010-2011. Evaluation of these state’s experiences will be needed to determine how the system might be tailored to better fit the needs of outpatient settings.

An additional challenge to effective routine HAI surveillance for ASCs pertains to the difficulty in tracking patients after they are discharged. They present to the ASC for the procedure itself, but typically do not return to the ASC for routine post-operative care or if there are complications with the procedures. Instead, they may present to an area hospital or their personal physician for evaluation and treatment. These visits are not necessarily reported back to the ASC. However, the sensitivity of these methods has been traditionally low with significant variability in terms of how long after surgery this follow-up occurs and an often poor response rate from both patients and providers.

Several efforts are currently underway that are aimed at overcoming the lack of standardized or validated methods to identify SSIs resulting from procedures performed at ASCs, but which are diagnosed in hospitals or other healthcare settings. AHRQ is funding work that will use all-payer administrative data from AHRQ’s

Healthcare Cost and Utilization Project (HCUP) to develop quality indicator specifications for HAIs originating in surgical care settings. This work is being conducted in collaboration with CMS. In a related AHRQ-funded project, these specifications will be tailored for use in identifying SSIs that originate in the ASC setting. This effort will involve: enhancements to HCUP data to facilitate linkage of patients across time and setting in the HCUP database; development of a pilot national ambulatory surgery database; and estimation of HAI prevalence and incidence in ambulatory surgery settings. CDC is funding a Prevention Epicenters Program study that is examining SSIs following ambulatory surgery. One group of investigators is using automated data from a managed care organization to focus on the CMS Hospital Outpatient Quality Data Reporting Program (HOP QDRP) and additional high volume procedures. The second group is using the HCUP state ambulatory surgery databases to focus on spine procedures. The project's goal is to provide a descriptive epidemiology of select ambulatory procedures resulting in SSIs that require a subsequent ambulatory procedure or an acute care hospitalization for treatment within 60 days of the index procedure and to assess the usefulness of coding and ambulatory pharmacy dispensing data in identifying SSIs.

V. Next Steps: “Collaborations for Shared Solutions”

The remaining needs surrounding HAI prevention in ASCs, as outlined in the previous section, serve as an opportunity for HHS to set forth a proposed series of next steps, priority areas, and actions, as follows.

1. Improve and Consider Expanding Process Measures

The CMS Surgical Care Improvement Project (SCIP) is a national quality partnership of stakeholders committed to improving surgical care by reducing surgical complications. SCIP measures have primarily targeted improvement measures in hospital settings. However, given that many of the same procedures are being performed in ASCs, similar standards should be applied.

Currently, there are six National Quality Forum-endorsed measures adopted by the ASC Quality Collaboration including: patient burn; prophylactic intravenous antibiotic timing; patient fall in the ASC; wrong site, side, patient, procedure, or implant; hospital transfer/admission; and appropriate surgical site hair removal.¹³ Additional measures that address HAI prevention are needed. In addition to the need for measures specific to SSI prevention, endoscope reprocessing is a specific area that would likely benefit from quality measure development. Further evaluation and stakeholder input is needed in this area.

2. Expand Current Knowledge of Surveillance to Include ASC-Specific Measures and Associated Strategies for Outcomes Measurement

Further research is needed to help inform how HAI surveillance can most effectively be conducted in ASCs and, as importantly, which procedures are the highest priority for tracking of infectious complications. There are several activities needed to explore surveillance options in ASCs, some of which are currently underway:

- Establish robust estimates of the numbers and types of procedures that are currently being conducted in support of identifying prevention needs, surveillance priorities, and benchmarks for higher volume, higher risk procedures;
- Continue and expand research into SSI and other HAI surveillance methodologies for ASCs, with an emphasis on electronic data mining across hospital and outpatient settings and clinical validation procedures;
- Include ASCs in local, state, and national efforts to promote adoption of electronic health records and explore other information technology options to support enhanced, consistent HAI-related process/outcome data collection and reporting; and,
- Identify options for improving State Health Department capacity for outbreak detection and reporting, including development of systems to identify clusters of ASC patients requiring hospital admission for HAI-related complications and establishing protocols and other requirements for reporting and investigation of potential bloodborne pathogen transmission among ASC patients.

3. Identify Needs and Opportunities for HAI Reduction through Improvements in the Process of Care within ASCs

Reviews of infection control deficiencies identified through inspections and other assessments or consultations have the potential to identify needs and opportunities to reduce the risk of infection within ASCs. For example, CDC and other stakeholders have promoted access to the services of infection prevention specialists to perform on-site assessments aimed at optimizing infection control procedures. Similarly, AHRQ is currently funding a risk assessment approach to SSI prevention in the ASC setting using ST-PRA to prepare models of risks and hazards associated with HAIs. From these risk models, new safe practices can be developed through a risk-informed design process. Coupling these efforts with healthcare safety and human factors specialists from the engineering field may lead to innovative and scalable process of care, device, or facility design improvements.

4. Disseminate Evidence-Based Guidelines and Training for Infection Control in Ambulatory Settings

The ASC ICWS and CfCs are in many respects founded on Standard Precautions, yet understanding and uptake of these guidelines and underlying principles in ASCs appears to be lacking. CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC) is in the process of producing a summary guide

tailored to ambulatory care settings that summarize infection control recommendations for all ambulatory care settings including ambulatory surgical centers. This document aims to educate healthcare providers and communicate expectations for infection control and prevention in a convenient and practical format.

Several states are also planning regional training opportunities to meet the educational needs of healthcare professionals working in ASCs. HHS Region II, representing more than 450 ASCs in New York, New Jersey, and Puerto Rico, will be using supplemental HAI funding from the Office of the Assistant Secretary for Health (OASH) in the HHS Office of the Secretary (OS) to conduct infection control training targeted to providers in ASCs and will engage various professional organizations to promote enrollment in these activities. HHS funding will also support further development and packaging of these materials for wider distribution and an evaluation of their usability with direction from CDC and other HHS partners. In addition, CDC and the Safe Injection Practices Coalition are leading the “One and Only Campaign” to promote safe injection practices and basic infection control with a focus on ambulatory care settings; CDC-funded pilot activities are currently underway in two states.

5. Engage Stakeholders to Facilitate Collaboration and Promote a Culture of Safety

In September 2010, the Department will host a meeting of stakeholders including federal partners, professional organizations, and consumer groups to discuss this module and help further prioritize next steps for HAI prevention in ASCs. Further, in October 2010, CDC in conjunction with OS/OASH will host a HAI Recovery Act Grantee Meeting bringing together HAI Coordinators from all 50 states to define next steps related to state HAI activities funded through ARRA. As part of this meeting, work being conducted related to HAI elimination in ASCs will be presented and representatives from communicable disease, regulatory, and quality improvement organizations will come together to discuss how these groups can better collaborate to promote uptake of best practices and assist in the development of stronger infection control infrastructure in ASCs. Additional areas that have been identified as priorities for stakeholder collaboration and engagement include:

- Work with AOs to: identify best practices to promote HAI prevention initiatives; measure benefits of accreditation in terms of HAI risk reduction; and assure timely and appropriate communication with SSAs, State Health Department officials, and CMS regarding ICWS and related inspection findings.
- Work with CMS Quality Improvement Organizations (QIOs), State HAI Programs, State Hospital Associations, AOs, and other stakeholders to develop and promote a patient-centered Culture of Safety in the ASC setting.

- Use the AHRQ Medical Office Survey on Patient Safety Culture to obtain baseline cultural assessments and work with stakeholders to adapt the survey specifically to ASCs.
- Promote development and uptake of engineering controls to prevent transmission of HAIs in the ASC environment.
- Work with CDC and the public health system to specifically address ASCs within the State Action Plans to Prevent HAIs; and,
- Identify strategies to involve consumers and others on an ongoing basis.

6. Obtain Consensus on Measurable 5-Year Goals

- E.g., 100% adherence to selected process measures contained within the current infection control worksheet;
- E.g., Adherence to SCIP/NQF infection process measures (perioperative antibiotics, hair removal, postoperative glucose control, normothermia); and,
- E.g., Identify selected common ASC surgical procedures for which SSI definitions and methods should be developed and develop a multi-year plan and phased approach to support routine surveillance.

7. Extend HAI Prevention Actions Developed for ASCs to Other Outpatient Surgery Venues

This module centers on defining current issues and making recommendations on how to ensure safe care in ASCs. However, ASCs only represent a subset of the outpatient facilities performing surgical procedures. Physician-run, office-based surgical practices perform procedures that are identical or similar to those conducted in ASCs, but many of these facilities are not subject to any regulatory oversight and are not being evaluated through any type of inspection process. While little is known about infection control and HAI rates in ASCs, even less is known about what is occurring in these types of facilities. Future efforts directed toward ASCs, particularly related to educational outreach, need to be mindful of this group.

TABLE 1. Summary of Literature Review of Surgical Site Infection Surveillance Practices Conducted in Non-Acute Care Settings*

Method	Potential Advantages	Potential Disadvantages
Routine wound examination by trained professional	High sensitivity and specificity	Labor intensive, prospective only
Outpatient chart review by trained professionals	High sensitivity and specificity	Labor intensive
Surgeon Reporting		
Self Initiated	High specificity, resource efficient	Poor sensitivity
Mail Survey	Acceptable specificity, relatively resource efficient	Suboptimal sensitivity
Patient reporting		
Mail Survey	Relatively resource efficient	Unreliable sensitivity and specificity
Telephone Survey	Good public relations	Labor intensive, unreliable sensitivity and specificity
Microbiological data	Relatively resource efficient, may “flag” potential SSIs	Unreliable sensitivity and specificity.
Claims data algorithm incorporating discharge diagnosis codes, procedure codes, pharmacological Rx date*	Electronically available, increased sensitivity and positive predictive value	Changes in coding practices with changes in pay for performance practices, applicable in a limited, managed care type setting where patients follow up in the same system that they received operative treatment; poor sensitivity
Clinic notes text searching **	Can be individualized to discipline	No widely accepted benchmark for f/u rates, definitions would need to be standardized by discipline, rate of f/u influenced by multiple factors, attrition bias (f/u response not representative of the original population)

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