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### Improving Provider Compliance With Adult Inflammatory Bowel Disease Patient Care Guidelines In The Ambulatory Setting Through The Use Of Electronic Health Records

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IMPROVING PROVIDER COMPLIANCE WITH ADULT INFLAMMATORY BOWEL DISEASE  
PATIENT CARE GUIDELINES IN THE AMBULATORY SETTING THROUGH THE USE OF  
ELECTRONIC HEALTH RECORDS

Submitted to the Faculty of the  
Yale School of Nursing

In Partial Fulfillment  
Of the Requirements for the Degree  
Doctor of Nursing Practice

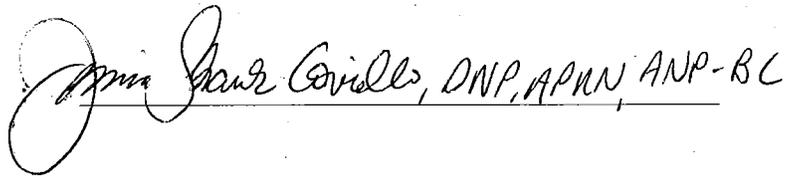
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May 2017

This capstone is accepted in partial fulfillment of the requirements for the degree  
Doctor of Nursing Practice.

Jessica Shank Coviello, DNP, APRN, ANP-BC

Signature

Handwritten signature of Jessica Shank Coviello, DNP, APRN, ANP-BC, written in cursive over a horizontal line.

Date:

3/22/17

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Signed: Nana Bernasko

March 21, 2017

## **Abstract**

Electronic Health Record (EHR) systems have the ability to improve the quality of patient care, patient safety and provide benefits to providers and clinic practices. These systems can transform quality measurement and quality improvement methods, facilitate workflow, and track patients over time to ensure that they receive guideline-recommended, and evidence-based, care. Simply having an EHR system, however, may not be enough to improve the quality and safety of healthcare, especially if the system is not designed to include features specific to the treatment population. In terms of the complex care necessary to treat adult patients with inflammatory bowel disease (IBD), using well-designed, evidence-based clinical decision tools or checklists within the workflow of the EHR system can improve provider compliance with IBD clinical practice guidelines. This initiative will result in adherence to population-based quality measures and will improve quality of care. A comprehensive literature review of the evidence on EHR and the implementation of clinical guidelines was conducted. Critical content to include in the IBD checklist for EHR integration is also recommended.

Keywords: Inflammatory bowel diseases; Crohn's disease; ulcerative colitis; performance measures electronic health records; quality; quality of care; ambulatory care

## Introduction

The American Gastroenterological Association (AGA) recently developed accountability measures that are now part of the Medicare and Medicaid Services pay-for-performance program. The Crohn's & Colitis Foundation of America (CCFA) developed similar recommended processes and outcomes of measurement for adult patients with IBD (Melmed & Siegel, 2013). These measures were developed in an effort to close the gap in the variations of delivery of care, to allow for the standardized measurement of outcomes, and to provide the highest care possible. Examples of these clinical performance measures include documentation that bone loss assessment was recommended for patients at risk for corticosteroid-related injury, documentation of screening for latent tuberculosis and Hepatitis B virus before initiating anti-Tumor Necrosis Factor (anti-TNF) therapy, documentation that corticosteroid sparing therapy was recommended for patients unable to taper off corticosteroids, and documentation that influenza, hepatitis B, and pneumococcal immunizations were recommended (AGA, 2011).

These IBD process measures have not been integrated into the Electronic Health Records (EHRs) system in most ambulatory clinical practices and provider compliance is currently based solely on recall, as there are no alerts, checklists, or reminders in the EHR. There are no reliable tracking methods or ways to measure performance or extract quality measurement data. The care for the IBD patient is complex. As such, using well-designed, evidence-based, EHR-integrated clinical decision support templates or checklists can improve provider compliance with evidence-based guidelines that instruct the treatment of these patients. The purpose of this article is to conduct a comprehensive literature review of the evidence on EHR and the implementation of clinical guidelines. In addition to the review, critical

content to include in the IBD checklist for EHR integration in the ambulatory setting is also recommended.

### **Background**

IBD is a group of chronic complex inflammatory conditions of the gastrointestinal tract that lead to symptoms that can severely diminish a patient's quality of life and are expensive to treat. IBD includes Crohn's disease and ulcerative colitis and is characterized by the abnormal response of the body's immune system. The cause of IBD is unknown, but it is theorized that environmental, genetic, and immunologic factors may be involved (AGA, 2016). The average onset of IBD is frequently seen in people in their late teens and twenties, however it may occur at any age and equally among men and women (AGA, 2016). Whereas Crohn's involves transmural inflammation and can affect anywhere from the mouth to the anus, ulcerative colitis is characterized by diffuse mucosal inflammation and is limited to the colon.

It is estimated that about 1.4 million people in the United States suffer from IBD (Incidence & Prevalence Database, 2015). Symptoms and signs of IBD include diarrhea, abdominal pain, weight loss, anemia, malnutrition and, at times, rectal bleeding. Complications of Crohn's disease can include intestinal obstruction due to strictures, abscesses, and fistulas. Complications of ulcerative colitis can include rupture of the bowel and severe bleeding. Both Crohn's colitis and ulcerative colitis patients have an increased risk of developing colon cancer (Centers for Disease Control and Prevention (CDC), 2014). The risk for colorectal cancer increases with a longer duration of ulcerative colitis, greater anatomic extent of ulcerative colitis, the presence of primary sclerosing cholangitis, family history of colorectal cancer, and a greater severity of the inflammation of the colon (Potack & Itzkowitz, 2008).

## Management of IBD

Treatment of IBD is aimed at achieving and maintaining remission. Medications used in treatment include aminosalicylates, corticosteroids, immunomodulators, antibiotics, and biologics. Despite medical treatment, some patients may require surgery either due to secondary complications or in order to control their disease (CCFA, 2009). Due to the complications of both the disease and medical treatments, clinical guidelines have been established to help streamline care while avoiding catastrophic outcomes for the IBD patient.

The treatment of IBD with anti-TNF therapy is effective, yet possesses a risk of infection due to its immunosuppressive effects (Weizman & Nguyen, 2013). In addition to the increased risk of bacterial and fungal infections, this class of medications has the potential to reactivate latent tuberculosis (TB) infection, as well as hepatitis B virus, both of which could be detrimental to the health of the patient. In order to minimize the risk of these infections, it is essential that patients are screened for TB and hepatitis B prior to the initiation of anti-TNF therapy (Weizman & Nguyen, 2013). Immunomodulators such as thiopurines, have a well-established role in the treatment of IBD. Despite good clinical response rates, severe myelosuppression and hepatotoxicity can occur during treatment with this class of medication. It is critical to test the enzyme, thiopurine methyl transferase (TPMT) responsible for the metabolism of this medication, prior to starting therapy, as variation in the TPMT enzyme activity within the population is common (Sanderson, Ansari, Marinaki & Duley, 2004).

Corticosteroids are one of the oldest therapies used in IBD. They are powerful fast-acting medications often used as rescue therapy for patients during disease exacerbation. These medications are effective but are best suited for short-term therapy, as prolonged use is

associated with significant adverse effects. Due to its non-selective systemic anti-inflammatory properties, side effects can impact several organ systems. Some of these side effects include weight gain, mood swings, adrenal suppression, hyperglycemia, osteoporosis, and psychosis (CCFA, 2009). The treatment goal therefore should be to minimize the frequency and length of use of corticosteroids.

The IBD patient is at an increased risk for developing osteoporosis and osteopenia. Osteoporosis is common in gastroenterological diseases, especially in those associated with malabsorption, or may be secondary to treatment for these diseases (Katz & Weirnerman, 2010). The prevalence of osteoporosis in the IBD patient varies widely from 13% to 50%. Several risk factors for osteoporosis have been identified and include low body mass index, smoking, calcium and vitamin D deficiencies, steroid therapy greater than 3 months or recurring use of steroids, postmenopausal status, systemic inflammation and hypogonadism (Katz & Weirnerman, 2010). Using these risk factors as identifiers, IBD patients should be tested for bone mineral density.

It is also important that vaccinations are up to date in the IBD patient who may be a candidate for immunosuppressive medications. In addition to the recommended age-appropriate routine vaccines, it is recommended that the immunosuppressed IBD patient receive the annual influenza vaccine, the pneumococcus vaccine, and the hepatitis B vaccines. Live vaccines, such as the herpes zoster and the varicella zoster, must be avoided in the IBD patient on immunosuppressive therapy, specifically biologics (Kheraj, Tewani, Ketwaroo & Leffler, 2012).

According to the CDC (2014), based on data from 2004, IBD accounts for 1.3 million provider visits and 92,000 hospitalizations annually. In 2008, the direct treatment costs for patients with IBD were estimated to be greater than \$6.3 billion and indirect costs were estimated to cost an additional \$5.5 billion. Given the costs, morbidity, and resource utilization, the goal is to provide high-quality, evidence-based care for patients with IBD, and improve their quality of life by reducing complications associated with the disease. These quality measures have the potential to improve patient safety, improve treatment, and decrease complications (AGA, 2011).

### **Quality Measures**

Numerous studies across medical disciplines have shown gaps in the recommended evidence-based guidelines and the actual care that is delivered (Institute of Medicine (IOM), 2006). Interventions, such as implementation of quality measure sets, are important tools being used in various disciplines to address these gaps in care (Shah & Hou, 2014). Quality measures have become an essential part of the United States' healthcare system. These measures are sets of quantifiable processes and outcomes developed through evidence-based practice and expert opinion to reflect high-quality care (Shah & Hou, 2014). They are used to assess the effectiveness of quality improvements initiatives, monitor quality of care, and serve as the foundation for reimbursement programs (IOM, 2006). Quality measures tailored to specific medical conditions can further improve outcomes for patients through the consistent delivery of evidence-based care and decreasing the variability of how care is delivered. These interventions will ultimately lead to a high standard of care, reduced costs and a healthier population (Berwick, Nolan & Whittington, 2008).

An example of a successful integration of quality measures in a chronic disease is the Cystic Fibrosis (CF) Foundation's Quality Care Initiative. The CF Foundation Patient Registry is a data tool that tracks the impact of care standards on the health of patients with Cystic Fibrosis who receive care at CF Foundation-accredited care centers. Since the launch of the Quality Care Initiative, there has been improved adherence to clinical guidelines, improved health outcomes for patients with Cystic Fibrosis and a substantial increase in survival rates (Mogayzel, Dunitz, Marrow & Hazle, 2014). The CF Foundation's Patient Registry has set international standards for gathering patient data and has served as a model for other nonprofit health organizations, as well as CF patient advocacy groups in other countries (Cystic Fibrosis Foundation, 2015). Through the use of technology, such as integrated templates, checklists in electronic health record systems can aid in the improvement of quality of care by increasing provider compliance with evidence-based guidelines, and facilitating and organizing data collection through continuous quality improvement initiatives in patients with chronic diseases.

### **Information technology and healthcare**

The Health Information Technology for Economic and Clinical Health (HITECH) Act is part of the American Recovery and Reinvestment Act of 2009. The HITECH Act mandates that doctors and hospitals must be using a certified Electronic Health Record (EHR) system by 2015 (HealthIT.gov, 2014). EHRs have the ability to improve the quality of patient care, improve patient safety, and provide benefits to providers and clinic practices (Wang et al., 2003). These systems can transform quality measurement and quality improvement methods, facilitate workflow, and track patients over time to ensure that they receive guideline-recommended and evidence-based care (Zhou et al., 2009). Simply having an EHR, however, may not be sufficient

to improve the quality and safety of healthcare, especially if the system is not designed to include quality measures specific to the treatment population. As reiterated by Poon et al. (2010), “to maximize health care quality, developers, implementers and certifiers of EHRs should focus on increasing the adoption of robust EHR systems and increasing the use of specific features rather than simply aiming to deploy an EHR regardless of functionality” (p. 203).

### **Literature Review**

Many experts believe there are remarkable benefits to integrating information technology into healthcare. Several studies have been conducted to evaluate the impact of EHRs on quality of care in different chronic medical conditions. For instance, diabetes care improved significantly in response to a multifaceted intervention study employing the EHR-derived registry in an integrated delivery system conducted by Weber, Bloom, Pierdon and Wood (2007). Substantial increases were seen in all measures of diabetes care over the course of the study year. Pneumococcal and influenza vaccinations improved from 56.5% to 80.8% ( $p < .0001$ ) and 55.1% to 71.0% ( $p < .0001$ ), respectively (Weber et al., 2007).

In another study, conducted in a tertiary care teaching hospital, a clinical-decision-support-system that uses an electronic checklist was developed to improve provider compliance with evidence-based guidelines in patients with heart failure or acute myocardial infarction (Riggio, Sorokin, Moxey, Mather, Gould & Kane, 2009). The authors compared compliance during the 15-month pre-intervention and post-intervention periods. Substantial improvements were seen from the pre-intervention period to the post-intervention periods in the delivery of discharge instructions; 37.2% to 93.0% ( $p < .001$ ). Statistically significant

improvements were also seen in other quality measures, including compliance with prescriptions of specific medications for heart failure and acute myocardial infarction (Riggio et al., 2009).

Persell et al. (2011) implemented and evaluated a multifaceted quality improvement intervention using EHR tools to improve quality measurements for 16 chronic disease and preventative services measures. The intervention combined established improvement methods into an integrated system that included point-of-care reminders and provided clinician feedback. In the year after the intervention, performance improved for 14 of the 16 measures. For 9 of 16 measures, the primary outcome improved more rapidly during the intervention year than during the previous year (Persell et al., 2011).

In a systematic review of more than 250 studies, Chaudhry et al. (2006) concluded that health information technology (HIT) increased adherence to guideline-based care, enhanced disease surveillance and monitoring, and decreased medication errors. The compelling effect of health information technology on quality of care, in this review, was its role in increasing provider compliance with guidelines. Integrated electronic reminders and decision support functions were components of all adherence studies. Another positive conclusion drawn from the study was the ability of HIT to improve quality of care through large-scale clinical monitoring, and collection and analysis of data (Chaudhry et al. 2006).

Jamal, McKenzie and Clark (2009) systematically reviewed evidence, published between 1998 and 2008, on the impact of HIT on the quality of healthcare, focusing on clinicians' adherence to various evidence-based guidelines. Some of the studies reviewed assessed systems designed to assist with drug ordering, some examined the effect of HIT on enhancing

preventative health care delivery, and other studies covered a diverse range of care types. Of the 17 studies reviewed that assessed the impact of HIT on provider performance, 14 showed a positive improvement in their compliance with evidence-based guidelines. The majority of the HIT covered in the review had integrated features that included clinician reminders, clinical decision-support systems, computerized provider order-entry systems, risks of adverse drug reactions, and the ability to generate specific queries (Jamal, McKenzie & Clark, 2009).

A cohort study on a pediatric unit in an academic institution was conducted to evaluate the effect of the use of an EHR-enhanced checklist and a unit-wide dashboard on compliance with an evidence-based catheter care bundle. The results showed overall improvements in compliance with measures. Central line-associated bloodstream infection (CLABSI) rates decreased from 2.6 CLABSIs per 1000 line-days before intervention to 0.7 CLABSIs per 1000 line-days after intervention (Pageler et al., 2014). Compliance with dressing changes increased from 87%- 90%, and compliance with cap changes increased from 87% to 93% ( $p < .001$ ) after the intervention. Another increase in compliance was seen with port needle changes; from 69% pre-intervention to 95% post-intervention (Pageler et al., 2014).

In a literature review by Dorr et al. (2007), 109 articles were analyzed to understand components of information systems important in supporting team-based care of chronic illness. The majority of the published studies showed the positive impacts of specific health information technology components on chronic illness care. 67% of reviewed experiments had positive outcomes, and 94% of uncontrolled, observational studies reported positive results. Factors closely correlated with positive experimental results were association with

computerized prompts, electronic medical records, focused decision support, and population management, which included reports and feedback. (Dorr et al., 2007).

In a randomized controlled trial, Player et al. (2010) examined an electronic medical record-based intervention to improve quality of care for gastro-esophageal reflux disease (GERD) and atypical presentations of GERD in primary care offices. Thirteen offices with 53 providers were randomized to the intervention of electronic medical record-based prompts and education, and 14 offices with 66 providers were randomized to the control group. There were over 67,000 patients in the study. Among patients who did not have GERD at baseline, new diagnoses of GERD significantly increased in the intervention group (3.1%) versus the control group (2.3%) ( $P < 0.01$ ). For patients with atypical symptoms, those in the intervention group had both higher odds of being diagnosed with GERD and being treated for GERD (8.8%) than those in the control group (6.4%) (Player, et al., 2010).

Not all studies however, have shown a positive impact of EHRs on quality of care. In a cross-sectional study conducted by Zhou et al. (2009), the authors found no association between the duration of using an EHR and the quality of care. The study linked a statewide survey of physicians' adoption and use of EHRs and claims data on physicians' quality of care, as indicated by their performance (Zhou et al., 2009). The quality measures were grouped into six clinical categories: asthma care, behavioral and mental health, cancer screening, diabetes care, well-child and adolescent visit, and women's health. For all six clinical conditions that were evaluated, there was no difference in performance between EHR users and non-users (Zhou et al., 2009). Of note, power was limited in this study.

Linder, Ma, Bates, Middleton and Stafford (2007), in a retrospective cross-sectional analysis, also found no association between EHRs and better ambulatory care. The study analyzed visits from the 2003 and 2004 National Ambulatory Medical Care Survey and examined the use of EHRs in the United States and its association with 17 ambulatory quality indicators. For 14 of the 17 quality indicators, there was no substantial difference in performance between visits with EHRs and those without EHRs. Only two quality indicators, avoiding benzodiazepine use for patients with depression and avoiding routine urinalysis during general medical examinations, showed significant improvement with the use of EHRs. One quality indicator, prescribing statins to patients with hypercholesterolemia, had a worse outcome with EHR use. The authors further explain that this outcome may have been attributed to the fact that most of the EHRs that were evaluated did not have integrated clinical decision support, and that they may have had very basic features that did not focus on quality improvement (Linder et al., 2007).

In summary, a majority of the literature reviewed demonstrated a positive impact of EHRs on provider compliance with evidence-based practice guidelines and quality of care. Importantly, these positive results were mostly associated with EHRs that were multifaceted and included specific checklists or registries that were explicit to a target population. Simply using an EHR does not equate to providing higher quality of care or improving provider compliance, as illustrated in the study by Linder et al. (2007). In order to achieve these goals in patients with chronic illnesses such as inflammatory bowel diseases, EHRs must have registries or simply-designed clinical decision support tools integrated into the system. As reiterated by Siegel, Allen and Melmed (2013), the key to success lies in the ability to develop mechanisms

within the EHR, such as pop-ups, alerts and instantaneous reminders, to provide point-of-care feedback during patient visits.

### **Computerized clinical reminders and alerts**

Electronic health record alerts and reminders are increasingly used as a means of increasing quality and cost-effectiveness of care, as well as to decrease medical errors (Krall & Sittig, 2002). These prompts remind clinicians to complete due health care tasks. Clinical reminders can promote adherence with evidence-based clinical guidelines, but they may also cause false alarms, alert fatigue and increased workload, which may cause clinicians to ignore them altogether (Vashitz, Meyer, Parmet, Libermann & Gilutz, 2010).

In a focus study of 16 clinicians, conducted by Krall and Sittig (2002), users of EHR reminders and alerts discussed several ways to improve compliance with these features. These suggestions included minimizing keystrokes, mouse clicks, scrolling, window changes and complexity. The participants said the most fundamental usability requirement is that alerts and reminders must be efficient and not waste time. They also suggested alert completions should be facilitated with pre-populated alternatives and allow for exceptions entry. Another important suggestion was to present alerts and reminders within the workflow, at the point of decision, or at user discretion (Krall & Sittig, 2002).

In an observational study conducted by Saleem et al. (2005), barriers and facilitators to the use of computerized clinical reminders were explored. Three observers recorded the interactions of 35 nurses and 55 physicians and advanced practice providers with clinical reminders in outpatient primary care clinics in four Veterans Administration medical centers. Barriers included lack of flexibility with the clinical reminders, poor interface usability, and using

the reminders while not with the patient, which can impair data collection and/or the implementation of recommended actions. Facilitators to the use of clinical reminders included limiting the number of reminders to avoid reminder fatigue, integrating reminders into workflow, and the ability to document system problems and receive prompt administrator feedback (Saleem et al., 2005). To engage providers and improve compliance with guidelines, computerized reminders and alerts should be integrated into the workflow, be flexible, simple to use, and not time-consuming.

### **IBD Checklist**

Using the recommendations of the AGA and the CCFA, the following practices of care was included in the checklist to be integrated in the EHR: Immunizations, documentation that corticosteroid-sparing therapy was recommended for patients unable to taper off corticosteroids, therapy-related testing, bone health screening, smoking cessation, and colon cancer prevention. For immunizations, the influenza vaccine is recommended annually for patients during the flu season, avoiding the live vaccine in immunosuppressed patients (AGA, 2011). In addition to the flu vaccine, vaccination against pneumococcal pneumonia should be considered (AGA, 2011). It is essential that all age-appropriate vaccinations are up to date. Hepatitis B screening is recommended prior to initiating anti-TNF therapy (Weizman & Nguyen, 2013). Hepatitis B surface antibody, Hepatitis B core antibody, and Hepatitis B surface antigen must be checked in this screening, keeping in mind that this virus can be reactivated with this class of medical therapy. If the patient is not immune, consider vaccination against Hepatitis B with the non-live vaccines (Weizman & Nguyen, 2013). Due to the risk of reactivating this bacterial infection on anti-TNF therapy, tuberculosis screening must be completed either using

Quantiferon-TB Gold assay, or PPD skin testing, prior to initiating treatment (AGA, 2011). As myelosuppression and hepatotoxicity can occur in patients on thiopurines, TPMT enzyme activity must be checked prior to initiating treatment.

For bone health, bone density screening must be completed for patients who have a history of chronic steroid use, women who are post-menopausal, and patients with other pertinent risk factors (Katz & Weirnerman, 2010). The frequency of this scan depends on several conditions, including the results of the initial scan, malnutrition and re-exposure to steroids, and can be annually or less frequent. Although corticosteroids are fast and effective treatments in IBD, long-term and frequent use of this medication can cause adverse effects. Providers must recommend corticosteroid-sparing therapy, such as biologics and/or thiopurines, to patients unable to successfully wean off corticosteroids.

Patients with IBD have an increased risk of colorectal cancer. Colon cancer screening must be completed in these patients. The recommended screening is every one-to-three-year surveillance colonoscopies to assess for dysplasia 8-10 years after diagnosis or if there is a history of dysplasia. IBD patients who have concomitant primary sclerosing cholangitis (PSC) require annual surveillance colonoscopies (Farraye, Odze, Eaden & Itzkowitz, 2010). Smoking cessation should be discussed at every visit with patients who smoke (AGA, 2011).

The content of the IBD checklist was further validated independently by a panel of five IBD experts. These experts included four gastroenterologists and a gastroenterology advance practice provider who have done extensive work and research in the care of the adult IBD patient. A rating guide was developed for evaluation of the content of the checklist, based on the consistency, with the recommended guidelines. For instance, the practice guideline for

bone health screening was rated on if it is completely consistent, somewhat consistent, somewhat inconsistent or completely inconsistent, with the established guidelines. There was a 100% consensus from the experts on the consistency of the content of the checklist with established guidelines. The final checklist was then submitted to the information technology department of the ambulatory clinic for integration into the workflow of the EHR, as a pull-down flowsheet.

The checklist has been in production for a few months now and queries will be run at the six-month mark, and every six months thereafter. The purpose of the evaluation is to determine if the checklist has been successful in improving compliance with the IBD guidelines. Examples of metrics that will be evaluated include the percentage of patients vaccinated during the flu season, and the percentage of patients who had their hepatitis B and tuberculosis status checked prior to initiating antiTNF therapy. Using an electronic survey, providers in the clinic will be asked to evaluate the ease of use of the checklist and will also be able to provide feedback on how to improve it if deemed necessary. As new guidelines emerge, the checklist will be updated to reflect these changes.

### **Conclusion**

A simple, well-designed IBD clinical decision support template or checklist integrated into existing EHRs can improve provider compliance with clinical practice guidelines. In addition to improving provider compliance, this tool can improve the quality of care and allow population-based quality measures to be followed in adult patients with IBD in the ambulatory setting. This population data will further help to identify gaps in the quality of care and help in the development of processes to improve them. While the care of the adult IBD patient is

complicated, this tool will alleviate the need to recall standards of care by integrating these practices within the workflow in the EHR. With the healthcare system in the United States evolving towards a performance-based model, it is imperative that providers develop and critically evaluate processes to help deliver the highest care possible to patients.

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