

# BMJ Open Quality Improving bone mineral density screening in patients with inflammatory bowel disease: a quality improvement report

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## ABSTRACT

The prevalence of osteopenia and osteoporosis in patients with inflammatory bowel disease (IBD) is estimated between 17% and 41%, partly due to repeat courses of glucocorticoids which enhance the risk for bone disease. Multiple gastroenterological and endocrine societies have established guidelines for bone mineral density (BMD) screening in patients with IBD, with estimates suggesting providers vary in their adherence. We aimed to improve the rate of BMD screening in patients with IBD in a large academic outpatient practice. Using the Plan-Do-Study-Act (PDSA) model, we first conducted a retrospective review and determined that only 10.8% of patients with IBD in our practice were adequately undergoing BMD screening. Over the course of five PDSA cycles, we conducted three interventions focusing on education and provider reminders. Through an informative lecture, a flyer and an electronic medical record-based prompt, we were able to increase our rate of BMD screening to 81.8%. Current rates of BMD screening in patients with IBD are not adequate. We demonstrate a simple quality improvement initiative that successfully improved our adherence to standards of practice.

## PROBLEM

Patients with inflammatory bowel disease (IBD) often view their gastroenterologists as their primary care providers. With this expectation, gastroenterologists must be equipped to address the medical needs of this special patient population. As a large academic institution in the heart of Appalachia, West Virginia University's JW Ruby Memorial Hospital serves as a major referral centre for the state of West Virginia and surrounding states. Approximately 60 patients with IBD are seen on average each month in the Digestive Diseases Clinic. Through departmental discussions, it was determined that bone mineral density (BMD) screening was often overlooked in patients with IBD followed in the Digestive Diseases Clinic.

Patients with IBD are often treated with chronic or periodic glucocorticoids. Glucocorticoid use has detrimental effects on

BMD, and thus screening recommendations for patients with IBD differ from the general population. After addressing factors that play a role in this gap of care, our goal was to increase the rate of BMD screening in this vulnerable population. The project was conducted by the Section of Digestive Diseases in conjunction with the Department of Medicine at West Virginia University.

## BACKGROUND

Patients with IBD are at greater risk for decreased BMD compared with the general population.<sup>1</sup> The prevalence of osteopenia and osteoporosis in patients with IBD is estimated between 17% and 41%.<sup>2</sup> Additionally, patients with IBD with decreased BMD have a higher rate of fractures than those without IBD.<sup>3</sup> While some evidence suggests that patients with IBD inherently have a greater risk for bone mineral disease, the pathogenesis is likely multifactorial. Increased production of inflammatory cytokines, malabsorption of vitamin D and calcium, and frequent glucocorticoid use are all known to play a role.<sup>4</sup> Of these risk factors, the use of oral glucocorticoids has been shown to be predictive of increased fracture risk.<sup>5</sup>

For patients with IBD, recommendations for BMD screening vary, but screening with dual-energy X-ray absorptiometry (DEXA) in patients with significant oral glucocorticoid use remains a common theme among all societies. The American College of Gastroenterology, the American Gastroenterological Association, the National Osteoporosis Foundation and the British Society of Gastroenterology guidelines (table 1) recommend DEXA to quantify BMD and predict fracture risk.<sup>6–11</sup>

There are limited data regarding the rates of BMD screening in patients with IBD. A Swiss IBD cohort documented screening rates from 11% to 62% among six different



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**Table 1** Society guidelines for bone mineral density screening in patients with IBD by steroid usage

ACG 2017 <sup>6</sup>	AGA 2003 <sup>7</sup>	NOF 2014 <sup>8</sup>	BSG 2012 <sup>9</sup>
≥7.5 mg/day of prednisone or equivalent for >3 consecutive months	History of glucocorticoid use >3 months	≥5 mg/day of prednisone or equivalent for ≥3 months	≥7.5 mg/day of prednisolone or equivalent for >3 months

ACG, American College of Gastroenterology; AGA, American Gastroenterological Association; BSG, British Society of Gastroenterology; IBD, inflammatory bowel disease; NOF, National Osteoporosis Foundation.

centres.<sup>12</sup> Despite including large academic and private centres with gastroenterologists specialised in IBD care, such a large disparity in screening rates suggests a poor awareness of bone mineral disease in patients with IBD.

While there have been numerous efforts to promote BMD screening in the elderly and other at-risk populations, to the best of our knowledge, no significant efforts have been made in regard to patients with IBD. Studies have shown simple interventions including education, pamphlets and electronic physician-directed prompts to be effective in improving rates of screening for bone mineral disease in the general population.<sup>13,14</sup> Our project aimed to improve BMD screening in high-risk patients with IBD using the Plan-Do-Study-Act (PDSA) method.

## BASELINE MEASUREMENT

Our group defined high-risk patients with IBD as those aged 18 and older who have received glucocorticoids greater than or equivalent to a dose of 7.5 mg of prednisone daily for a cumulative period of greater than 3 months, consistent with the majority of societal guidelines. In previously screened patients, they were only considered deficient if their DEXA scan was greater than 3 years old, and they had received another course of steroids in the interim. While no consensus regarding screening intervals exists, repeat testing should be obtained in patients with risk factors and repeated exposures to glucocorticoids are recommended.<sup>9,15</sup>

A retrospective chart review of all patients with IBD seen from February through April 2018 was performed to assess how well our providers (advance care practitioners, gastroenterology fellows and gastroenterology attendings) were performing BMD screening in patients with IBD. During this period, 65 patients at high risk met criteria for BMD screening and were seen in clinic. Only 7 (10.8%) patients had a DEXA scan ordered at the end of their visit.

Our goal was to improve on these baseline values by focusing on provider-based initiatives. The primary outcome is the percentage of applicable patients with IBD receiving an order for a DEXA scan during their encounter. Following each intervention, we planned to remeasure our screening rate to evaluate for changes. To help further interpret our practices, we measured additional variables such as age and tobacco use history to determine their role in our decision to order DEXA scans.

## DESIGN

After reviewing the initial findings, a multidisciplinary quality improvement team consisting of advanced care practitioners, residents, fellows and attendings was established. Through a series of discussions, improvement in two areas of focus were felt could make an immediate impact. The first area, provider education, would reaffirm the guidelines regarding BMD screening. The second area, provider memory, would address remembering BMD screening during patient encounters, ideally during the healthcare maintenance portion of the visit.

To address education, a formal lecture regarding BMD screening in patients with IBD was conducted during a previously scheduled weekly conference date. In order to ensure that providers remembered to include BMD screening during IBD patient encounters, a flyer summarising BMD screening recommendations was created. It was pinned to the bulletin board (located in a highly visible area in the provider workroom) dedicated to current quality improvement initiatives, clinical trials and research studies. Finally, to ensure that our findings were sustainable, we created an electronic medical record (EMR)-based reminder prompting providers to consider BMD screening with a DEXA scan during encounters for patients with a diagnosis of IBD and history of steroid use with the assistance of our hospital's EMR team.

## STRATEGY

After creating our plan, we set a goal of increasing our BMD screening rate to 60%, a realistic level of sustainable improvement. In order to achieve this result, we determined that three PDSA cycles, each cycle lasting 1 month, were the most likely to be beneficial.

**PDSA cycle 1:** Our first cycle, the simplest, addressed provider education. One meeting dedicated to bone mineral disease and its relationship with IBD was performed during our normally scheduled, weekly, departmental meeting in which all of the staff members attend. Providers were given information on the varying degrees of bone mineral diseases, the effects of glucocorticoids on bone health and guidelines on BMD screening in patients with IBD. In the month following our lecture, we saw a modest improvement in BMD screening to 30%. Despite this improvement, further efforts were needed.

**PDSA cycle 2:** Cycle 2 consisted of placing a flyer in the provider workroom reminding them of the indications for BMD screening in patients with IBD. Following this intervention, our BMD screening rate improved to

61.1%. Feedback from our team about the flyer was positive; it provided them with a simple reminder to proactively address BMD screening.

**PDSA cycle 3:** In this cycle the reminder flyer was removed. Despite this 'negative' intervention, the BMD screening rate remained stable at 61.1% as faculty remained cognisant of BMD screening.

**PDSA cycle 4:** While we met our initial goal with the first interventions, it was thought that we could improve our rates even further by creating an EMR-based intervention. Upon opening a visit with an applicable patient, providers were prompted to consider BMD screening with a DEXA before moving forward with the encounter. Following this intervention, our BMD screening rate improved to 66.7%. This was felt to be the most effective intervention.

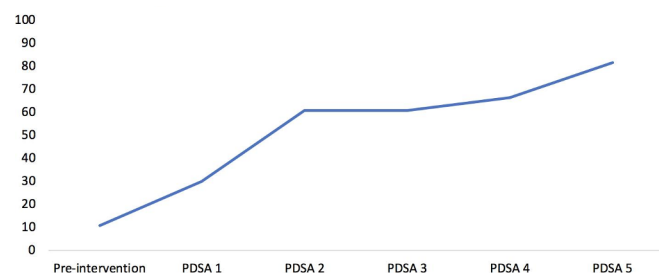
**PDSA cycle 5:** In our final cycle, our goal was to evaluate for improvement and sustainability, and thus no changes were made. The EMR-based prompt was now an integral part of visits with applicable patients with IBD. In the month following this cycle, our BMD screening rate significantly improved to 81.8%, far exceeding our original goal.

## RESULTS

We chose the rate at which providers were ordering BMD screening in the indicated patients with IBD as our primary outcome measure. Our measurements were made through chart review of patient encounters in the month following each PDSA cycle. Following our three interventions, we were able to significantly improve on our baseline measurement from 10.8% to 81.8% (figure 1).

By focusing on education and posting a simple reminder flyer in our first two cycles we were able to achieve our original screening rate goal. During this period, however, we did note some obstacles to screening. There were two patients who met the indication and were offered BMD screening but declined, citing a lack of health insurance and a concern for the cost of the DEXA scan. For this reason, we excluded both of these patients from our measurements.

Following the removal of the flyer, the rate of BMD screening remained stable at 61.1%. Despite this, we believed that with time, screening rates would likely trend downward and thus we implemented our EMR-based



**Figure 1** Percentage of patients with inflammatory bowel disease (IBD) with an indicated dual-energy X-ray absorptiometry (DEXA) scan ordered by Plan-Do-Study-Act (PDSA) cycle.

prompt. Following this intervention our screening rate once again trended upward. One issue to be noted with this intervention was its implementation. Our previous interventions required no outside assistance and were all able to be conducted within our own department. In order to create an EMR-based prompt, we needed the assistance of our hospital's EMR team which required additional planning and coordination. While we were successfully able to implement the prompt, the improvement initially was not much greater than what we noted from our second intervention. However, in the month following the EMR-based prompt's implementation, we saw the screening rate rise significantly to 81.8% in PDSA cycle 5.

## LESSONS AND LIMITATIONS

The goal of our project was to achieve a sustainable improvement in the rate of BMD screening in our indicated IBD population. While provider education showed an improvement from our baseline, we learnt that this alone was not enough to achieve a successful result. Only after posting a flyer in our provider workroom were we successfully able to achieve our goal. In order to maintain progress once the flyer was removed, we created a long-term solution in the form of an EMR-based reminder. By incorporating an intervention directly into our patient encounter we were able to have a longer lasting effect.

A major learning point is that while most of our providers knew the recommendations for screening for BMD, it was often forgotten in the midst of a complicated patient encounter. Yet when provided with a reminder, be it in the form of a flyer or an EMR-based prompt, there was a substantial improvement in provider ordered screening. While the flyer was able to achieve a successful result, the EMR-based prompt was the most well-regarded intervention among our staff and obtained the most significant result.

The major strength of our project was that the methods we used to achieve our goal are easily reproducible if a facility has an EMR capability. Troubleshooting and implementing an electronic intervention should be in conjunction with your hospital's EMR staff. Working closely with our EMR staff to create a final version of the prompt that included appropriately indicated patients proved to be successful. Anticipate delays and revisions, and involve the EMR team early on in the project.

Regarding the limitations of our study, our efforts focused primarily on improving BMD screening through the provider, and not the patient. While we instructed our providers to educate the patient on the importance of BMD screening, none of our interventions were actually initiated through the patients themselves. In hindsight, empowering the IBD population through an intervention focusing on their education may have resulted in a notable improvement. Additionally, our data collection process was retrospective and relied on what was documented within our EMR. Patients whose steroid use was

not correctly documented may have resulted in them being interpreted as not meeting criteria for screening, and thus subsequently excluded.

The use of on-screen point-of-care reminders has been demonstrated to have a small, but significant effect in improving provider adherence to various areas of care.<sup>16</sup> We found a large effect for our project. The interventions we used are applicable to BMD screening, and have the potential to be used in other aspects of healthcare maintenance. With the versatility of EMRs, there remains great potential to tailor reminders of healthcare maintenance to the specific needs of patients.

## CONCLUSION

In summary, our team recognised that BMD screening for patients with IBD was not adequately addressed at our institution. Poor bone mineral health and osteoporosis can predispose patients to fractures and is associated with high healthcare utilisation costs and increased morbidity. Upon identifying the areas responsible for the gaps in care, and addressing them through simple interventions (provider education, reminder flyer and an EMR-based prompt), we were able to improve our BMD screening rate in patients with IBD from 10.8% to 81.8%. By intervening early, and ensuring patients with IBD are appropriately being screened, we hope that our initiative improves the care and outcomes of our patients with IBD.

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