

# Clinical, Economic and Ethical Considerations for Integrating AI Software into Routine Colonoscopy

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## Abstract

The Chaim Sheba Medical Center, Tel Hashomer, Israel was one of the first public hospitals in the world to introduce artificial intelligence (AI) into every one of their colonoscopy suites. It invested in seven GI Genius™ Intelligent Endoscopy Modules in order to make the performing of AI colonoscopies routine in the department. This article explains the clinical rationale that drove this decision as well as the ethical considerations which had to be taken into account.

**Keywords:** Gastroenterology • Artificial intelligence • Endoscopy • Colonoscopy • Bowel cancer • Colorectal cancer • Adenoma

## Economic Considerations

The main financial consideration in 2021 was whether we should use our budget to invest in AI or spend it on other pieces of equipment e.g. a new tower, new endoscope or a new processor. As you might expect, investment in technology is always at the core of budgetary discussions within a gastrointestinal department and rather than just buying one or two we bought 7 GI Genius™ modules – which was a substantial investment.

We wanted to proceed with AI as we believe that GI Genius™ will have a significant impact on the number of colorectal cancer (CRC) incidences in our hospital. I'm often asked about our economic motivations but the truth is that, when deliberating, we focused more on CRC and patient outcomes [1].

We perform roughly 8000 colonoscopies per year at Sheba between our 24 endoscopists who try to perform all colonoscopies with minimal adverse events and a high Adenoma Detection Rate (ADR). ADR is the most robust and proven quality measure of colonoscopies and, within a certain range, the higher the ADR the lower the rates of colorectal cancer and CRC related mortality in the future.

Here at Sheba our main long term objective is to decrease CRC cases and there is a growing body of evidence showing that AI has the theoretical potential to do this. In the last meta-analysis (10/2021), which included 10 randomised control studies, it has been found that the use of AI during colonoscopy can lead to a percentage increase in ADR of up to 43%. Although it will take several more years to truly evaluate the success of this technology in a real world setting, the early signs are very positive for the benefit of this system.

Of course, a higher ADR means that more polyps will be detected and literature shows that this is especially the case with small and diminutive polyps. There is an assumption that if you detect more adenomas then the cost of pathology will also increase. However, for diminutive polyps there

is an approach, 'resect and discard', when they are not sent to pathology. Furthermore, being able to identify a diminutive polyp and leave it in situ is another approach. Naturally then, with these two approaches short term costs associated with increased detection of polyps during colonoscopies might not increase as much as you'd expect. However, small polyps will always have to be resected and sent for biopsy so overall we should certainly see an increase in short term costs.

While the short term cost might be higher, overall the increased ADR caused by AI might prove to be cost effective as we assume it will lower the cost of treating interval cancer in the long term. We know that, within a certain range, there is a negative correlation between ADR and CRC incidents and ultimately death, which for us is the most important thing.

In 2020, CRC was the third most common form of cancer globally and the second most common cause of death. The survival rates for CRC are significantly higher when diagnosed early. For example, in Europe, of those diagnosed at early stage, 93% are still alive after 5 years while only 6% are still alive after 5 years if diagnosed late. Furthermore, on average the cost of treating late stage CRC is ten times that of early stage treatment; 13,975 Israeli Shekels (€4000) compared to roughly 139,750 Israeli Shekels (€40,000) [2].

In Israel the threshold for being referred to a gastroenterologist for a colonoscopy is very low. Even patients with very minor symptoms tend to be referred meaning that the chances of detecting any signs of colon cancer are already relatively high and combining this with AI will really help us to detect CRC very early and save lives.

## Practicality of Delivery

One day we didn't have AI, and the next, all colonoscopies were performed with the assistance of GI Genius™. It was incredibly simple.

The GI Genius™ modules themselves are very easy to use and require minimal training. Overnight the module was set up in 7 rooms to be used in tandem with existing towers and available for every colonoscopy. Once plugged in and turned on the machines simply act as a second observer and alerts the colonoscopist to polyps with acoustic and visual markers [3].

## Ethical Considerations

For the hospital, purchasing an AI module like GI Genius™ was an all or nothing decision. This is because if we had simply got one or two it would force us to make impossible decisions as to which patients deserve to have colonoscopies assisted with improved ADR. I cannot differentiate because, in my eyes, all human beings are equal. You cannot say who is going to benefit

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more from it, and therefore it would be unfair to deprive a patient of something that I have, and I believe, will have a positive impact on a patient's health. Consequently, I found the ethical dilemma to be unsolvable.

On the other side of the coin, deciding which clinicians would get to perform their colonoscopies with GI Genius™ Module would also have been a very difficult decision and one which could also have impacted on patient outcomes [4].

So although the decision to invest such a significant amount of money into AI was tormenting at the time, we felt we had to make the use of AI absolutely routine in all our colonoscopy suites so as not to force us into making impossible decisions about which clinicians and/or patients would benefit.

We are in the process of collecting data around the introduction of AI in our colonoscopy suites. We will be measuring the impact AI has had on ADR and

the detection of different categories of polyps when compared to previous data. We hope to publish our findings in 2022.

## References

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