Original Article

Findings during screening colonoscopies in a Middle Eastern cohort

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Abstract

Background/Aims: Colorectal cancer is the most common cancer in males and the third most common cancer in females. We aim to determine the polyp and adenoma prevalence in a cohort of patients who underwent opportunistic screening colonoscopies.

Patients and Methods: A retrospective cohort study was conducted using an endoscopic reporting database of individuals seen at three tertiary care hospitals (two public hospitals and one private) in Riyadh, Saudi Arabia. Consecutive patients who were 45 years of age and older and underwent opportunistic screening colonoscopies between November 2016 and October 2017 were included. We excluded those with a history of colon cancer or colonic resection for any reason, inflammatory bowel disease, gastrointestinal bleeding, or anemia.

Results: Around 1180 patients were included in the study with a mean age of 58.6 years (SD = 7.3), with males representing 53.6% and an overall cecal intubation rate of 92.4%. Masses were found in 1.6% of the study population (50% in the sigmoid or rectosigmoid, 37.5% in the rectum). The polyp detection rate in colonoscopies was 24.8% and the adenoma detection rate was 16.8%. The histology of removed polyps was tubular adenomas in 56.6%, hyperplastic polyps in 32.7%, tubulovillous adenomas in 8.2%, and villous adenomas in 2.5%. The majority of the polyps were in the sigmoid colon (28.3%) and rectum (22.0%), followed by the ascending colon (11.2%) and cecum (10.3%), then the transverse colon and descending colon (9.4% each), and multiple locations in the remainder.

Conclusion: The prevalence of polyps and adenomas in this cohort is less than that reported in the Western populations.

Keywords: Adenoma, colon cancer, colonoscopy, early detection, endoscopy, epidemiology, polyp, prevalence, Saudi Arabia, tumor

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INTRODUCTION

Although colorectal cancer (CRC) screening programs have been shown to be efficacious in decreasing the morbidity and mortality associated with CRC[1-3] due to early detection and prevention, these benefits depend on the underlying prevalence and incidence of CRC in the target population. According to the Saudi Cancer Registry, CRC is the most

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common cancer in males, with an average annual age standardized rate (ASR) of 10.6/100,000 population, and the third most common cancer in females, with an average annual ASR of 8.2/100,000 population.[4] Furthermore, CRC tends to effect the Saudi population at a younger age[5] when compared to other populations.

Multiple guidelines have been published for CRC screening, including in Saudi Arabia,[6] and they vary in the screening method recommended, the frequency of test repetition, as well the ages at which to start and stop screening.[7] This reflects the variability in baseline risks as well as resources available for such programs. Although the Saudi guidelines for CRC screening have been disseminated, they were based on limited data[8] including studies looking at the adenoma risk in the country[9] based on a colonoscopy cohort which only had a small number of screening colonoscopies included. So, it is understandable that these guidelines when implemented would be for opportunistic screening as there is no national screening program till date.

Thus, we believe that a study focusing on those undergoing screening for CRC is needed. This would be of importance in assessing if a national screening program would be worthwhile, as well as to clarify the prevalence of adenomas in this population. In addition, due to variation in the performance of screening tools for CRC,[10] we opted to conduct a study using colonoscopy as the screening modality in a cohort of patients in Riyadh, Saudi Arabia.

The primary objective of the study was to determine the baseline polyp as well as adenoma prevalence in a cohort of patients who underwent opportunistic screening colonoscopies.

PATIENTS AND METHODS

Data collection

This was a retrospective study where we reviewed endoscopic reporting systems of individuals seen at three hospitals in Riyadh, Saudi Arabia: Dallah Hospital, King Fahad Medical City, and King Khalid University Hospital. The first is a private hospital whereas the second is a hospital run by the ministry of health and the third is a university hospital.

We included individuals 45 years of age and older, who had a colonoscopy where the indication was documented as screening between November 2016 and October 2017, through hospital information systems. We excluded those with a history of colon cancer or colonic resection for any reason, inflammatory bowel disease, gastrointestinal bleeding, or anemia.

Electronic endoscopy reports, histology reports, and a manual review of the files were performed. Data collected included: age, sex, body weight and height, history of smoking, quality of bowel preparation, medication history and comorbidities. The location, number, shape, and histology of polyps detected and removed were also documented.

Whenever a colonoscopy was not completed, the reason for not completing the procedure was documented. We used the definition given by the American Medical Association's Current Procedural Terminology coding system for incomplete colonoscopies which states that "when performing an endoscopy on a patient who is scheduled and prepared for a total colonoscopy, if the physician is unable to advance the colonoscope beyond the splenic flexure, due to unforeseen circumstances."

No personal identification information or other personal identifiers were recorded to ensure patient confidentiality. This study was approved by the Institute Review Board of King Khalid University Hospital.

Statistical analysis

Descriptive statistics were computed for continuous variables, including: minimum and maximum values, means, standard deviations (SDs), as well as 95% confidence intervals (CIs) and frequencies for categorical variables when appropriate. If hypothesis testing was used, Pearson's Chi-squared test, *t*-test, and, where appropriate, Fisher's exact tests were used.[11] A one-way analysis of variance to test for differences among groups when comparing more than one group was performed when appropriate.

When calculating the adenoma detection rate (ADR), we included all colonoscopies where at least one adenoma was found in the numerator.

A sample size calculation was performed based on an adenoma prevalence of 12.5% in those undergoing a screening colonoscopy with a power of 80% and type I error of 5%; a sample size of 1000 patients was required.

R Studio[12] was used for analysis using the R statistical language.[13] A statistical significance threshold of $P = 0.05$ was adopted. No attempt at imputation was made for missing data.

RESULTS

Demographics and historical data

The study population included 1180 patients who had undergone a screening colonoscopy. The mean age was 58.6 years (SD = 7.3) [Figure 1], and males represented 53.6%. The most common comorbidities were diabetes (42.9%), hypertension (40.9%), and dyslipidemia (27.1%). The mean body mass index was 30.35 (SD = 6.0) whereas 13.9% were smokers [Table 1]. Aspirin was used by 38.2%, nonsteroidal anti-inflammatory drugs by 8.2%, calcium by 16%, multivitamins by 15.5%, and anticoagulants by 3.9% [Table 1].

Bowel preparation quality, completion rate, and complications

The bowel preparation quality was good in the majority of cases (86.3%), bad in 13.3%, and suboptimal in 0.4%. The cecal intubation rate was 92.4%, whereas the terminal ileum was intubated in 29.9%. When considering those who had a good bowel preparation quality only, the cecal intubation rate was 94.8%. The reasons for an incomplete colonoscopy were poor bowel preparation quality (46.9%), technical difficulty (35.9%), obstruction (10.9%), and patient discomfort (6.2%) [Table 1]. The bowel preparation quality was neither effected by age [good (58.6 years) vs. suboptimal (57.0 years) vs. bad (59.2 years), $P < 0.60$] nor BMI [good (30.2) vs. suboptimal (26.0) vs. bad (31.3); $P = 0.06$] [Figure 2a and b].

The reported complications in the cohort in this study included intraprocedure bleeding postpolypectomy in 0.2%, whereas perforation was reported in 0.1% of the cohort.

Masses, polyps, and adenomas detected

Masses (i.e., tumors) were found in 1.6% of the study population (50% in the sigmoid or rectosigmoid, while 37.5% in the rectum).

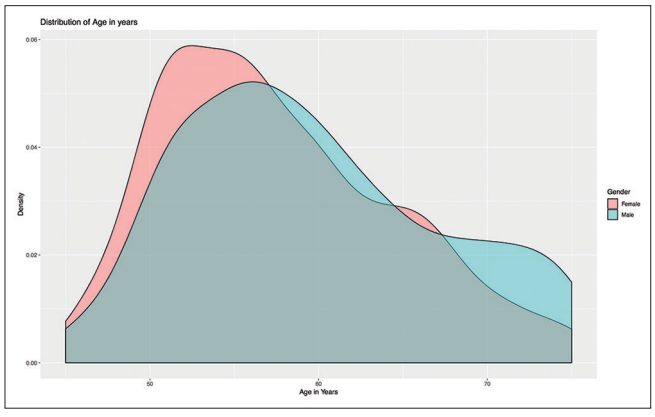

Figure 1: The age distribution of those who had a screening colonoscopy

The polyp detection rate in colonoscopies was 24.8% [Figure 3] and the ADR was 16.8%. The histology of the removed polyps is described in Figure 4. The majority of polyps were in the sigmoid colon (28.3%) and rectum (22.0%), followed by the ascending colon (11.2%) and cecum (10.3%), then the transverse colon and descending colon (9.4% each), and multiple locations in the remainder. The morphology of the polyps found was most commonly sessile (64.4%), followed by pedunculated polyps (23.3%), or flat (12.3%).

There was no difference in age of those who were found to have polyps (59.1 years), masses (61.7 years), those with a normal colonoscopy (58.2 years), or other findings (59.5 years) ($P = 0.2$) [Figure 5]. Males had a higher probability of having polyps compared to females (29.3% vs. 19.4%, $P < 0.01$) as well as those taking anticoagulants had a higher incidence of polyps (36.8% vs. 24.4%, $P = 0.02$) and those with polyps tended to have a lower BMI (29.3 kg/m^2 for those with polyps vs. normal findings 30.8 kg/m^2 vs masses 30.2 kg/m^2 vs other findings 29.7 kg/m^2, $P = 0.05$), whereas those taking calcium had a lower prevalence of polyps (16.0% vs. 26.5%, $P < 0.01$). Other miscellaneous findings (e.g., diverticula, nodular mucosa,

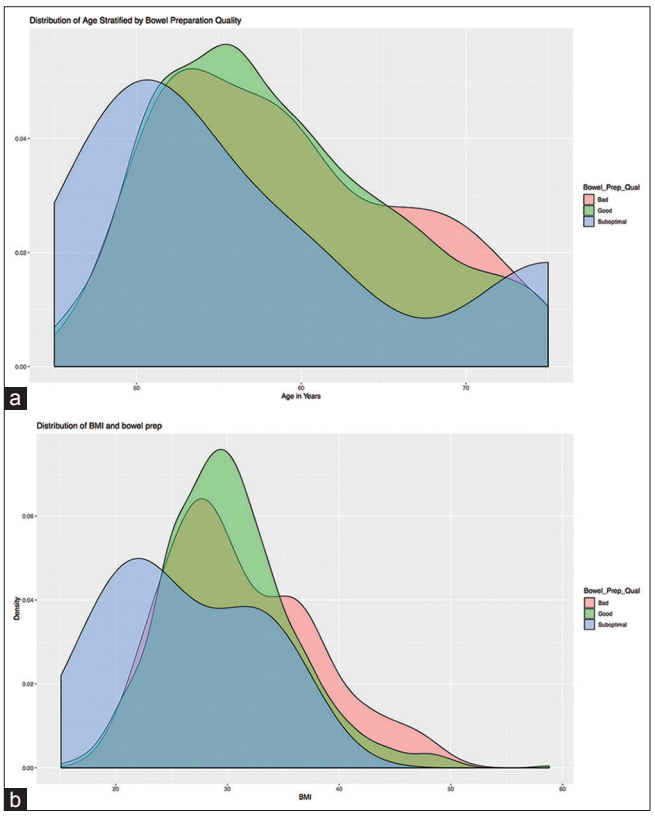

Figure 2: (a) Age distribution of the study population stratified by bowel preparation quality and (b) body mass index distribution of the study population stratified by bowel preparation quality

Table 1: Basic characteristics as well as colonoscopic findings for the complete cohort

Variable	Percentage or mean (*n*=1180)
Sex	
Males	53.6%
Females	46.4%
Age	58.6 (SD=7.3)
Comorbidities	
Diabetes	42.9%
Hypertension	40.9%
Dyslipidemia	27.1%
Ischemic heart disease	8.4%
Chronic renal failure	0.7%
Smoker	13.9%
Body mass index (mean)	30.35 (SD=6.0)
Medications	
Aspirin	38.2%
NSAIDs	8.2%
Calcium	16%
Multivitamins	15.5%
Anticoagulants	3.9%
Bowel preparation quality	
Good	86.3%
Suboptimal	0.4%
Bad	13.3%
Intraprocedure complications	
Bleeding	0.2%
Perforation	0.1%
Complete examination	92.4%
Incomplete examination	7.6%
Reason for incomplete exam	
Difficult procedure	35.9%
Obstruction	10.9%
Patient discomfort	6.2%
Poor bowel preparation	46.9%
Hospital	
Dallah	59.3%
King Fahad Medical City	23.1%
King Khalid University Hospital	17.7%

and hemorrhoids) during screening colonoscopy were more common in those with dyslipidemia (11.6% vs. 4%, $P < 0.01$). The finding of masses was also higher in those with ischemic heart disease (6.2% vs. 1.2%, $P < 0.01$) and chronic renal failure (14.3% vs. 1.5%, $P = 0.05$). None of the other variables was statistically different between the groups [Table 2].

Other findings during the colonoscopies were the presence of diverticula, nodular mucosa, and hemorrhoids.

DISCUSSION

Globally, the burden of CRC is on the rise with an incidence of 1,360,602 cases and 693,933 deaths annually and an ASR of 17.2/100,000.[13] In 2015, CRC was estimated to cause 17 million disability-adjusted life-years of which 96% were years lived with disability and 4% years of life lost.[14] Despite the global increase in CRC, there are geographical variations, and the World Health Organization, eastern Mediterranean region (e.g., Gulf countries, Yemen, Egypt, etc.) has a much lower incidence with an ASR of 7.4/100,000.[13] This is also reflected in the Saudi Cancer Registry where CRC has an ASR of 10.6 for males and

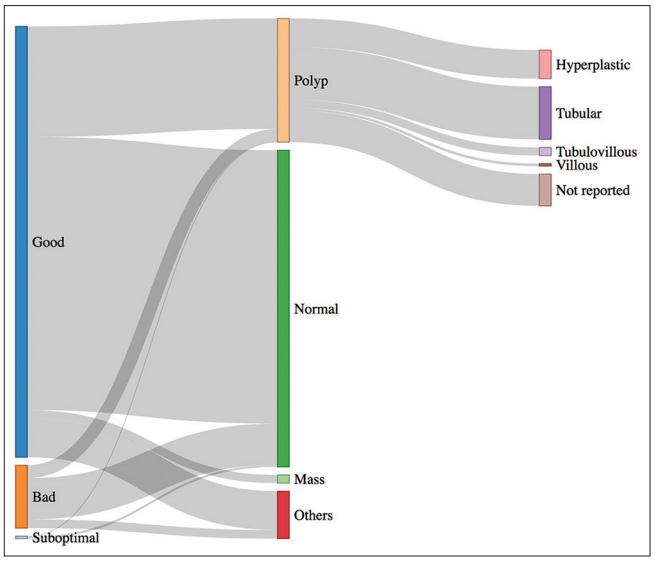

Figure 3: Sanke diagram of the findings of screening colonoscopies stratified by bowel preparation quality

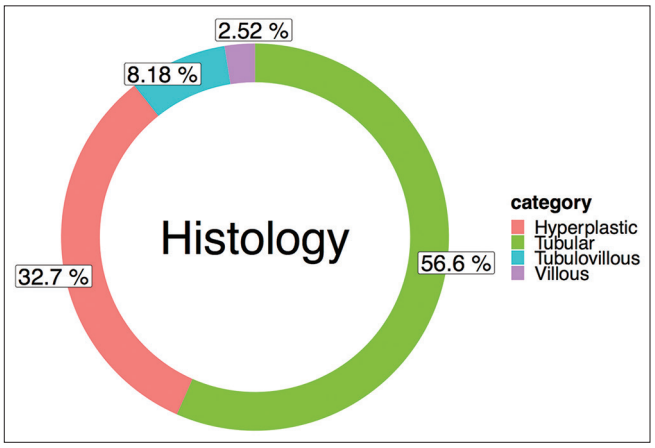

Figure 4: This histology of polyps removed during screening colonoscopy

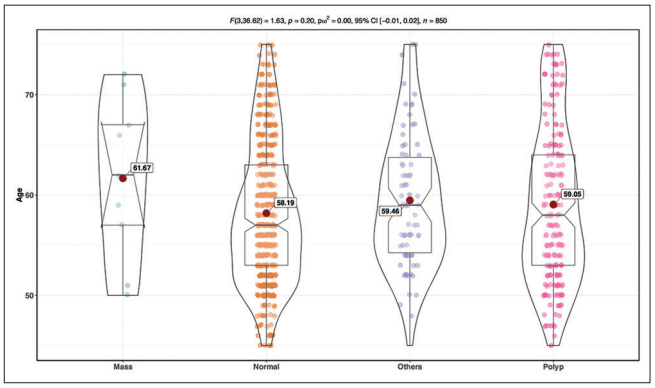

Figure 5: Age distribution based on findings during screening colonoscopy

Table 2: Demographic and historical details of patients based on the findings on screening colonoscopy

Variable	Normal (%)	Polyp (%)	Mass (%)	Other findings (%)	*P*
Total	63.8	24.8	1.6	9.7	Not applicable
Age	58.2	59.1	61.7	59.5	0.2
Sex					
Male	60.4	29.3	1.5	8.8	<0.01
Female	67.9	19.4	1.8	10.8	
Comorbidities					
Diabetes	62.4	24.1	2.2	11.2	0.33
Hypertension	61.7	25.0	2.6	10.7	0.21
Dyslipidemia	66.5	26.0	3.3	4.1	<0.01
Ischemic heart disease	56.8	27.2	6.2	9.9	<0.01
Chronic renal failure	57.1	28.6	0.0	14.3	0.05
Smoker	62.2	26.7	1.1	10.0	0.77
BMI	30.8	29.3	30.2	29.7	0.05
Medications					
Aspirin	64.7	22.2	2.0	11.1	0.38
NSAIDs	57.1	27.4	3.6	11.9	0.33
Calcium	63.9	16.0	3.5	16.7	<0.01
Multivitamins	59.0	26.6	3.6	10.8	0.14
Anticoagulants	42.1	36.8	5.3	15.8	0.02
Family history					
Colon cancer	51.5	45.5	0.0	3.0	0.13
IBD	100	0.0	0.0	0.0	
No family history	66.5	23.8	1.9	7.8	
Bowel preparation quality					
Good	63.4	25.7	1.9	9.0	0.31
Suboptimal	80.0	20.0	0.0	0.0	
Bad	65.9	20.3	0.0	13.8	

NSAIDs: Nonsteroidal anti-inflammatory drugs; IBD: Inflammatory bowel disease

8.2 for females per 100,000 population.[4] Independent of the incidence, the mortality associated with CRC might increase, decrease, or stabilize and might be associated with the overall development of these countries.[15] Such a variation might cause reservations on the effectiveness of adopting guidelines from an area of high incidence and extrapolating the benefit to lower risk countries.[16]

In addition, more recently, follow-up data from a randomized trial using flexible sigmoidoscopy as a screening modality demonstrated that this method of screening did not have much of an effect on mortality in females [hazard ratio (HR) 0.92 (95% CI: 0.79–1.07)].[2] These findings have casted some light on the variability in the performance of screening modalities[10] between populations and that generalization of studies to populations, which were not included in those trials, might not be accurate.[17]

These findings stress the need to have local policies and guidance based on evidence from the region and hence the importance of this study for the region.

Although the study incorporated three hospitals, all of which were confined to a single geographical area (Riyadh area), which might limit the generalizability of the study results, but at the same time, these hospitals do not have predefined catchment areas and populations and serve individuals from various regions in the country (other districts). In addition, more than half of the study population came from a private hospital that could potentially have inherent characteristics that were not captured in the study. A strength of the study is that the population included appears to resemble that of the general population of Saudi Arabia in the prevalence of comorbidities and risk factors; for example, the prevalence of smoking in the study population was 13.9% compared to 14.4% for those between 45 and 54 years of age and 15.6% for those from 55 to 64 years in the general population based on the Saudi Health Information Survey in 2013.[18] Similarly, dyslipidemia was found in 27.1% of the study population that mostly resembles the prevalence in those older than 65 years in Saudi Arabia (28.7%).[18] In addition, diabetes prevalence in the study population was 42.9% compared to 50.4% of the Saudi population aged 65 years and older.[18] In addition, the prevalence of hypertension was 40.9% compared to 51.2% in those between 55 and 64 years in the general population.[18] Nonetheless, there may be some confounders that we could not account for as the study population could have inherent characteristics given that they underwent opportunistic screening for CRC with a colonoscopy that reflects a more health conscientious trait.

Although there was no standardized protocol used for the bowel preparation between the three study sites, they all used polyethylene glycol–electrolyte-based solution

on the day before the colonoscopy. Although the bowel preparation quality was not described based on a validated scale, this was not deemed to be a necessity according to the ASGE and ACG task force where it states that "endoscopists should document the quality of bowel preparation based on ability to identify polyps after retained fluid or stool has been suctioned,"[19] which we believe was attained in this study. Both the rate of adequate bowel preparation quality (>85%) and cecal intubation rates (>90%) are in concordance with the quality indicators for colonoscopy[19] and are better than what we had reported in two prior local studies.[9,20] The reported complications in this cohort were perforation in 1/1000 cases and bleeding in 2/1000 cases, both of these are in acceptable range. The complication rates reported in a systematic review were 4 perforations (95% CI: 2–5) and 8 major bleeds (95% CI: 5–14) per 10,000 procedures.[21] Although a meta-analysis found that the perforation rate was 5/10,000 procedures (95% CI: 4–7), bleeding was 26/10,000 procedures (95% CI: 17–37), and the mortality was 0.29/10,000 procedures (95% CI: 0.11–0.55) colonoscopies.[12]

The prevalence of polyps in our study was 24.8%, whereas adenomas were 16.8%; this is much lower than that reported in North America and Western Europe. The adenoma prevalence in the USA has been reported to be 25–38%[22,23] and was higher in males compared to females, 31% versus 20%, respectively,[23] whereas a study from Germany found that the polyp detection rate was 52.4% while the ADR was 31.7%.[24] This association between polyp detection rate mirrors the incidence of colon cancer in these geographical areas.

In our previous study in an unselected population that underwent colonoscopies for a variety of indications, the polyp detection rate in those who had a complete colonoscopy was 20.8% (95% CI: 19.2–22.5) whereas the adenoma prevalence was 8.1% (95% CI: 7.1–9.1).[9] In that population when the analysis was limited to those undergoing screening colonoscopies, 22.9% had polyps and 8.8% had adenomas.[9] Although the polyp detection rate was similar in both studies, the ADR was almost double in this study. But when the prevalence of adenomas was stratified by age, we found that in the previous study, the prevalence of adenomas in those who had a screening colonoscopy between the ages of 60 and 65 was 12.5% and those above the age of 65 years was 18.4%,[9] which resembles the findings in this study.

It has been shown that age, sex, race, and ethnicity have an effect on the adenoma and advanced adenoma prevalence.[25,26] In this study, males had more polyps (29.3% vs. 19.4%, $P < 0.01$) that is again consistent with the literature. We believe that other positive associations between the use of anticoagulants and a higher prevalence of polyps are due to confounding factors; the use of anticoagulants might be a surrogate of an increased risk of polyps such as the metabolic syndrome rather than a true causative association. We could not ascertain whether the association between the consumption of calcium would result in a true decrease in the adenoma prevalence as we could not discern a temporal relationship; studies have found an association between calcium intake and reduced colorectal adenomas (OR 0.74, 95% CI: 0.58–0.95).[27,28]

About a third of the polyps that were removed and reported in the study were hyperplastic whereas the remainders were adenomas and most commonly tubular adenomas. In a study from USA, the prevalence of hyperplastic polyps was 33.1% (both single and multiple polyps), adenomas were 59.9% (both single and multiple adenomas), whereas villous adenomas were 1.3%[29] which resembles to a degree the findings in our study.

The distribution of polyps and masses that were found in this study were mostly left sided.

Some limitations that should be noted are that being a retrospective study, there are numerous limitations that are inherent to such studies including the fact that opportunistic screening is more available to patients who have access to hospitals rather than normal individuals in the community where interactions with health-care professionals are infrequent. In addition, opportunistic screening is subject to the physician offering individuals CRC screening which is a form of selection bias. Nonetheless, this study does add to the literature of CRC screening in the Kingdom and should aid policymakers with regards to the initiation of a national screening program.

CONCLUSION

This multicenter study is an important addition to the body of literature that clarifies that the prevalence of polyps and adenomas in those undergoing opportunistic screening colonoscopies is relatively low which is consistent with the low ASR for CRC in the region when compared to areas of the world where the incidence of CRC is high. These findings should be of value to policymakers when factoring any economic cost-effective analyses for national CRC screening programs.

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Conflicts of interest

There are no conflicts of interest.

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