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LRTI-SYSTEMATIC APPROACHES TO DIAGNOSIS AND EFFECTIVE THERAPEUTIC MANAGEMENT

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ABSTRACT: Introduction: Lower Respiratory Tract pulls in air from the upper respiratory tract, absorbs oxygen and release carbon dioxide in exchange, infection to this is known as LRTI. It includes Bronchitis, Bronchiolitis, Influenza, Pneumonia, COPD and Asthma. Patients were treated with many medications like Bronchodilators, antibiotics and antivirals. **Objectives:** To evaluate treatment assessment of respiratory disease condition in hospital along with monitoring comorbid conditions, diagnosis, risk effecting agents, length of stay, effective treatment. **Methodology:** This prospective observational study conducted in Mallige Hospital, Bengaluru, India for 6 months from January to June in 2024. Total 316 patients were enrolled, data was collected from ICU, MRD, OPD, Wards from Pulmonology department under guidance of physician. **Results:** Out of 316 participants 54% were male and 46% were female within majority age group 61-80 years and 48% were overweight. Higher comorbid conditions are hypertension (198) and diabetes mellitus (134). Chief complaints were coughing (74.6%) and breathlessness (74%). In 98% individual ECG was advised. In spirometry analysis 66% subjects had 60% FEV1 and FVC value, 50% had less than that. 49.60% were diagnosed with asthma and COPD. Patients were majorly treated with Mucolytics (92.70%) and corticosteroids (83.80%), with treatment management showing the p –value (p=0.002). **Conclusion:** The current study reveals the LRTI approaches to diagnose and effective therapeutic management in tertiary care hospital has shown positive outcome.

INTRODUCTION: In 2005 the European Respiratory Society (ERS), in collaboration with The European Society for Clinical Microbiology and Infectious Diseases (ESCMID), published guidelines on the management of lower respiratory tract infections (LRTIs) in adults [1].

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Lower respiratory tract infection (LRTI) is a broad terminology which includes Asthma, Acute exacerbations of Chronic Obstructive Pulmonary Disease (COPD), Influenza, Pneumonia, Asthma and COPD overlap syndrome.

These infections are caused by microscopic organisms known as bacteria or viruses, which are usually the most common cause for infection [2]. They are carried in tiny droplets and transmitted through coughing, sneezing and indirect contact with surfaces. People who are infected the body will produce antibodies to fight against virus[3]. Beta-lactam antibiotics, Macrolides and

Fluroquinolones are routinely prescribed medicines for the management of LRTIs [4]. LRTI affects approximately 200 million individuals annually, resulting in 3 million hospitalizations, 1.4 million deaths worldwide [5]. Estimated annual healthcare expenditures exceeding $100 billion in the United States. Significant economic and social burdens on individuals, families, and communities [6]. LRTI management poses significant clinical challenges, including Diagnostic uncertainty due to nonspecific symptoms and limited diagnostic accuracy, increasing antimicrobial resistance rates compromising empirical antibiotic therapy can affect the rational of therapy [7].

Health disparities disproportionately affecting vulnerable populations. Understanding the pathophysiology and microbiology of LRTI is crucial for developing effective diagnostic and therapeutic strategies [8]. Current therapeutic approaches for LRTI include: Antimicrobial therapy (antibiotics, antivirals), Supportive care (oxygen therapy, mechanical ventilation), Pharmacological interventions (bronchodilators, corticosteroids). Despite advances in diagnosis and treatment, LRTI management remains suboptimal, with inappropriate antibiotic use contributing to antimicrobial resistance, Diagnostic delays compromising patient outcomes, Limited consideration of patient-specific factors in therapeutic decisions [9, 10].

LOS is a critical metric in healthcare, reflecting the duration of hospitalization for patients with LRTI. Prolonged LOS is associated with increased healthcare costs, risk of hospital-acquired infections, and decreased patient satisfaction was also studied in this study [11, 12]. This study mainly aims to Develop and validate a systematic approach to LRTI diagnosis, incorporating clinical decision in diagnosis and therapeutic management effectively. Evaluate the effectiveness of evidence-based therapeutic strategies. Investigate the impact of patient-specific factors by enhancing the quality of health and healthcare services [13, 14].

MATERIAL AND METHODS: This study is conducted at Mallige hospital. Mallige hospital is a multispecial tytertiary care hospital with over 126 beds conveniently located in the heart of Bengaluru, the capital of Karnataka state of India. Mallige hospital consist of many departments like Nephrology, Cardiology, Radiology, General Medicine, Surgical, Pediatrics, Obstetrics & Gynecology, *etc*. The study conducted was prospective observational study. Study has been carried out for six months. The sample size is found to be 316 with 95% confidence interval and 5% margin error. The tools used were Patient data collection form, Patient informed consent forms, SPSS, MS excel, Graphpadprism 2.O. For this study, the ethical clearance has been obtained from institution.

Data has been collected from abovementioned sources after getting consent from the patient. Data have been collected in a well-structured manner with the help of data collection forms. Data is analyzed by using suitable updated software. Statistical analysis is performed using GraphPad prism 2.O software, the qualitative data is represented in numbers and percentages, and quantitative data will be represented in mean±SD and the association between the variables is assessed using suitable statistical procedure.

RESULT: The data of 316 patients was collected in which 54% were males are high risk frequency of LRTI than female individuals 46% as shown in **Fig. 1**. The most effected age groups out of 316 patients are around 23.5% patients were from age group of 61-80 followed by 22.9% from 51-60. Around 14.3% patients were from 81-90 years age group 7.9% from 41-50, 6.7% patients from 21-30 years 4.4% from 31-40 years and the lowest age group which got affected was 31-40 years around 4.4% patients as shown in **Table 1.** The BMI of the LRTI patients is being demonstrated in the below mentioned pie chart and it is being observed that majority of the patients belong from the overweight category (48%) followed by normal category (37%) and 5% patients under-weight category as shown in **Fig. 2.**

The following were the risk factors and co-morbidity conditions observed among the LRTI patients enrolled in the study. The graph below shows the distribution of these risk factors among the patients. Hypertension was the major risk factor seen in 192(71.9%) patients and the second one was diabetes mellitus which was seen in 134(50.2%) patients mentioned in **Fig. 3**.

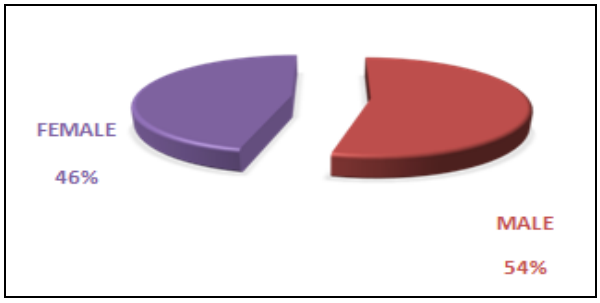

FIG. 1: GENDER DISTRIBUTION

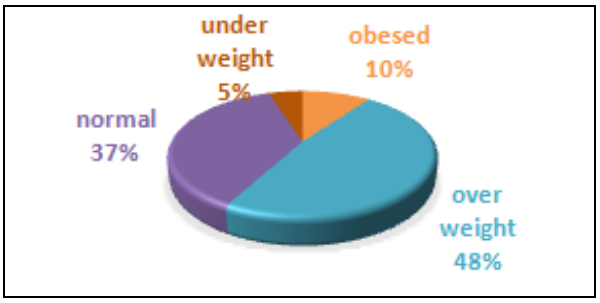

FIG. 2: BMI DISTRIBUTION AMONG PATIENTS

TABLE 1: AGE DISTRIBUTION AMONG PATIENTS

Age distribution	In percentage
10-20	3.2%
21-30	6.7%
31-40	4.4%
41-50	7.9%
51-60	22.9%
61-70	23.5%
71-80	23.5%
81-90	14.3%
91-100	1.3%

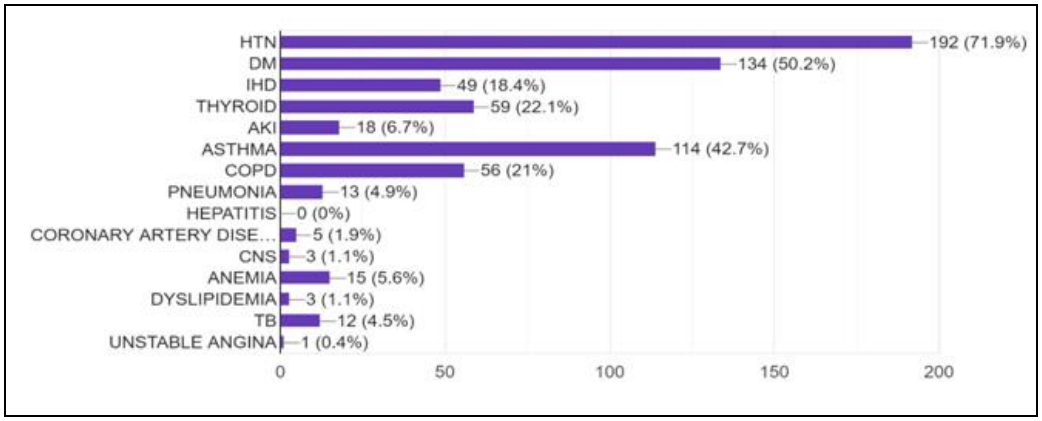

FIG. 3: COMORBIDITY DISTRIBUTION AMONG PATIENTS

The Alcohol and Smoking Distribution of the LRTI patients is depicted by the below mentioned graph and it is being observed that the majority of the lrti patients were from the group of smoker and alcoholic mentioned in **Fig. 4.** The vaccination status of the patients are 316 patients were vaccinated with covid vaccine, 27 patients were vaccinated with influenza vaccine and 20 patients with pneumococcal vaccine mentioned in **Fig. 5**.

The graph in **Fig. 6** below shows the SpO2 value in LRTI patients results as 79 % patients in the study had SPO2 less than 95% and rest 22% patients had SPO2 more than 95%. The Laboratory investigations that were performed on the LRTI patients show around 98% patients were advised for ECG, 97.90% patients for X-Ray, 79% patients were advised for H1n1 and 77.70% for RTPCR is mentioned in **Fig. 7.**

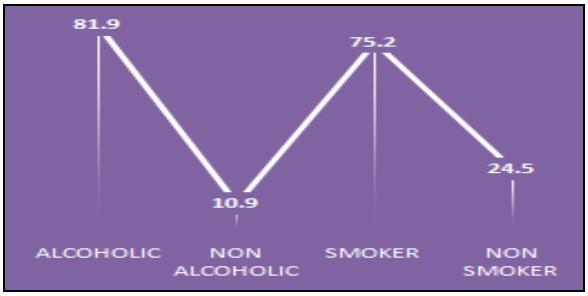

FIG. 4: ALCOHOL AND SMOKING

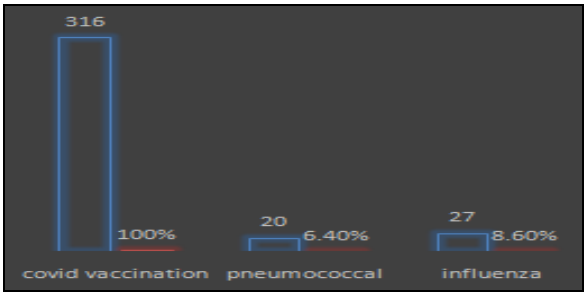

FIG. 5: VACCINATION IN POPULATION

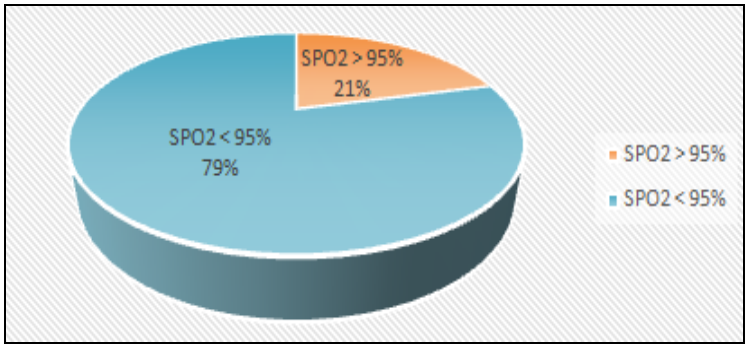

FIG. 6: SPO2 VALUES AMONG PATIENTS

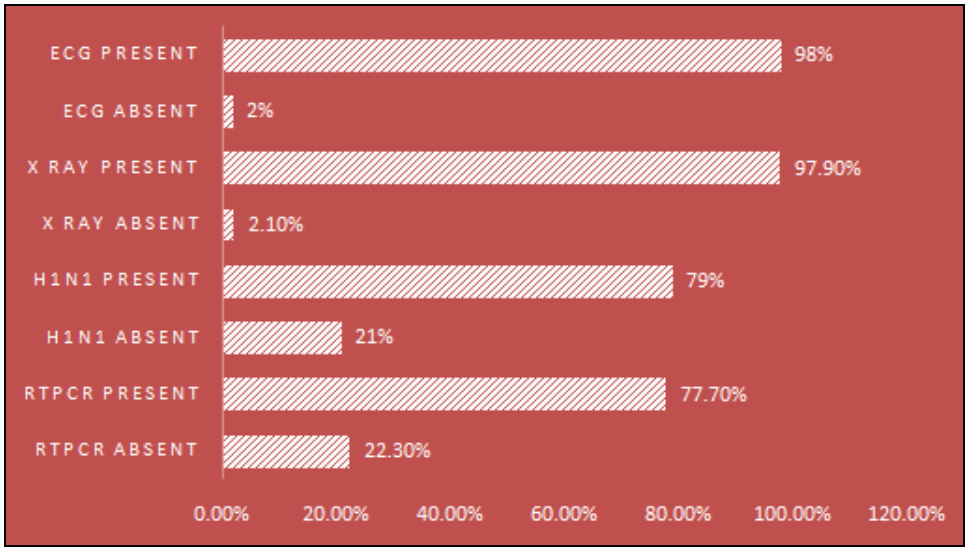

FIG. 7: LABORATORY INVESTIGATIONS AMONG PATIENT DISTRIBUTION

The above-mentioned graph in **Fig. 8** depicts the FVC and FEV1 severity on the patients: 66% of the patients in the study had severe (60%) FEVI and FVC which shows that patients had a severe obstruction. And in about 24% Patients the FVC and FEV1 was mild to moderate (60-79%), in 10% patients FVC and FEV1 was normal (10%). The above-mentioned graph in **Fig. 9** depicts the status of FEV1/FVC in the patients who were taken under the study. According to the study 56% Patients had FEV1/FVC ratio<50%, 35% patient had 50- 69%, and 9% patient had normal >70%.

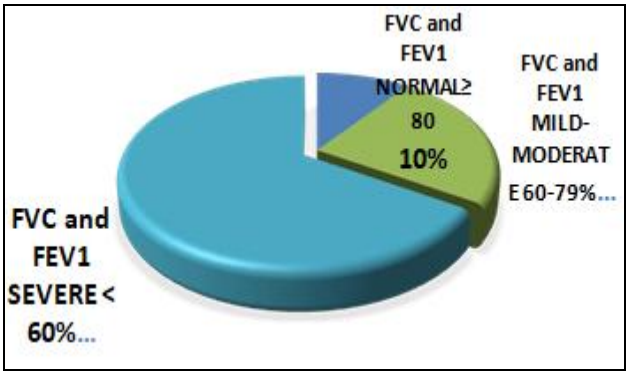

FIG. 8: FVC AND FEV1 VALUES

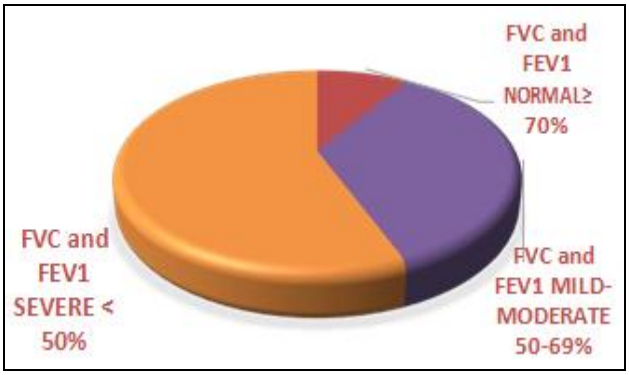

FIG. 9: FVC/FEV1 VALUES

The graph depicts the final Diagnosis. Majority of the patients came to the hospital with LRTI were suffering from Asthma (49.60%) second most were suffering from COPD (30%) rest 8.60% patients were suffering from Asthma-Copdoverlaps, 5.20% from pneumonia, 3.40% from COVID 19 and 3.20% from influenza as mentioned in **Fig. 10**.

The graph below shows the majority of the bronchodilators and other medications that has been used for the LRTI patients. It was observed

that the most common bronchodilator that was used is mucolytics on 92.70% patients followed by corticosteroids on 83.80% patients. The most commonly used mucolytic is N-Acetylcysteine. Systemic corticosteroids 83.80% more specifically used corticosteroid is budesonide. Antiviral was also used on 43.30% of patients to treat and prevent viral infection as mentioned in **Fig. 11**. The graph represents the Length of stay of each LRTI patients who are included in the study. 70% of patients stayed from 0 to 5 days. 25% of patients stayed for 5 to 10 days and 5% of patients has stayed for 10to 15days as mentioned in **Fig. 12.**

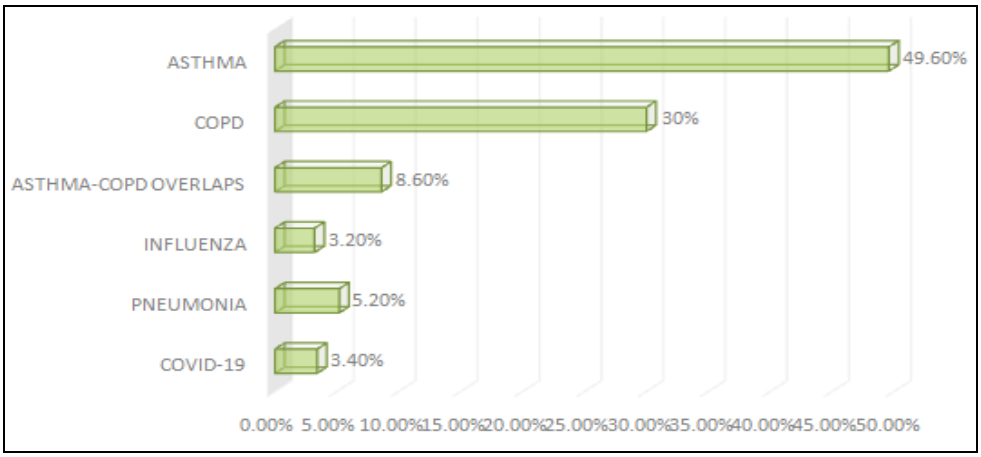

FIG. 10: FINAL DIAGNOSIS AMONG DISTRIBUTED PATIENTS

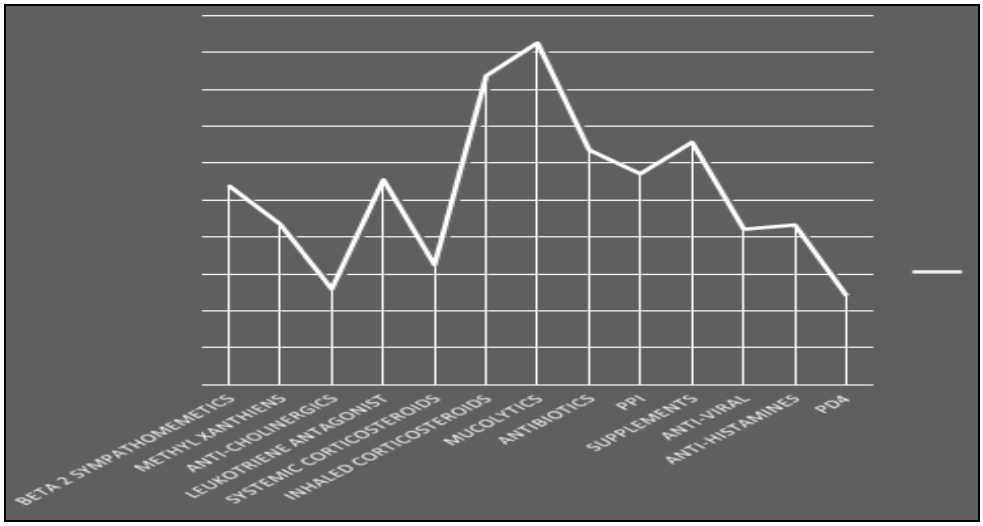

FIG. 11: MEDICATION FOR LRTI AMONG PATIENTS

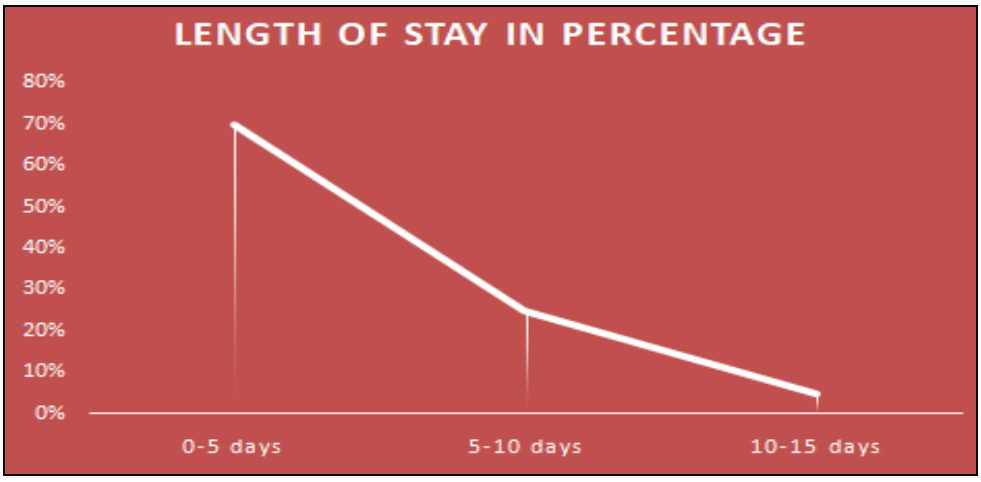

FIG. 12: LENGTH OF STAY AMONG PATIENTS

DISCUSSION: Lower Respiratory Tract Infection (LRTI) are the kind of infections which affects the airways (below the larynx), trachea and alveolar sacs. This study was done to evaluate the diagnosis and management of LRTI at a tertiary care hospital. This study was done on total 316 patients according to the inclusion and exclusion criteria from both ICU and Medical record department out of 316 patients 46% were female and 54% were male, hence the occurrence of LRTI more in male. Although the occurrence of Asthma and Influenza is more in females and occurrence of COPD, ACOS, Pneumonia and Covid is significantly more in male. The study was conducted in age group of 10-100 years.

It observed that maximum patients (23.5%) were from the age group 61-80 years and 48% of patients were overweight. Both the factors play a major role in LRTI as because due to advance age and weight the body immune system decreases and it can because of Hypertension and diabetes mellitus. It was observed that the majority of patient had comorbidities. Hypertension 192 patients (71.9%) Diabetes Mellitus 134 patients (50.2%) Presence of Asthma and Thyroid and COPD was also a considerable risk factor. This Study has also shown a significant association between smokers and alcoholics with the disease compared to non-smokers and non-alcoholics as because smoking deliberately exerts deleterious effects on respiratory tract and lungs parenchyma.

The majority of chief complaints which were observed in 316 patients, were 235 patients had cough and 233 patients had breathlessness other major chief complaints were sputum, wheezing, chest pain, fever with chills etc. LRTI 70% of patients stayed for 0-5 days in hospital. Upon analyzing it was found that mucolytics was frequently used specifically N-acetylcysteine 600mg, followed by systemic corticosteroids. Specifically, Budesonide Nebulizer (0.5mg) and antiviral Oseltamivir phosphate 75mg was used to treat and prevent viral attack. This study highlights the complexities of LRTI management and the need for improved diagnostic, therapeutic, and preventive strategies. By addressing these challenges, healthcare providers, policymakers, and researchers can work together to reduce the burden of LRTI and improve patient outcomes globally.

CONCLUSION: This study concludes by showing the positive results in approaching diagnosis and great advances in therapeutic management as LRTI is most common in the community sector. The non-specific symptoms delay the diagnosis yet managed properly when the outcome is excellent. Thus, the aim is to conduct this study is to create awareness in the hospital sector about patient health and well-being. The findings of this study provide a foundation for future research and quality improvement initiatives. As the LRTI management continues to evolve, it is essential to remain vigilant in addressing emerging challenges and opportunities.

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CONFLICTS OF INTEREST: Nil

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