other stakeholders like community members, Panchayat Raj Institutions (PRI), Non-Government Organizations (NGO) and other public sector departments as a part of this campaign. Activities from within, like public rallies, marathons, *swachhata* walks, human chains, street plays/*nukkad nataks*/folk arts/folk-music, *etc.* will act as potent instruments of social advocacy and community participation. It ensures every stakeholder from outside health facility premises and communities are gradually involved for hygiene and infection control and thereby helping health promotion at the grass-root level. World Health Organization estimates that Swach Bharat Abhiyan in India would potentially have a spectacular impact on improving the sanitation of communities and thereby averting disease burden within five years of its launch [4]. The integration and extension of such activities will be another opportunity for healthcare providers to make an impact on health indicators and disease burden. Subsequently, as all stakeholders adopt these initiatives, there will be a visible and viable behavior change of the public at large.

To, summarize Beyond hospital boundary will act as a novel, innovative game-changer tool for community participation in sanitation, hygiene, and infection control.

GOPAL ASHISH SHARMA AND VIJAY KUMAR BARWAL*
Department of Community Medicine,
Indira Gandhi Medical College,
Shimla, India.
**barwalvk@gmail.com*

REFERENCES

1. Ministry of Health and Family Welfare, Government of India. Kayakalp: An initiative to promote hygiene and sanitation in public health facilities. Press Information Bureau (07-August-2015). Availale from: *http://pib.nic.in/newsite/PrintRelease.aspx?relid=124554*. Accessed February 16, 2020.
2. Tiwari A, Tiwari A. Kayakalp: Impact of swachh bharat abhiyan on cleanliness, infection control and hygiene promotion practices in district hospitals of Chhattisgarh, India. IOSR-JESTFT. 2016;10:55-8.
3. Ministry of Health and Family Welfare, Government of India. Award to public health facilities kayakalp, May 2015. Available from: *https://www.nhp.gov.in/sites/default/files/pdf/award_to_public_health_facilities_kayakalp.pdf*. Accessed February 20, 2020.
4. World health Organization. Health gains from the Swachh Bharat initiative. Available from:*http://origin.searo.who.int/india/mediacentre/events/2018/WHO-lauds-India-commitment-to-accelerated-sanitation-coverage/en/*. Accessed February 25, 2020.

Spirometry in COVID-19 Times – An Emerging Dilemma

Spirometry is useful for the diagnosis, management and monitoring of chronic respiratory conditions in children, especially asthma. As severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) can be transmitted *via* aerosol generation, coughing or sneezing [1], spirometry can pose a risk for transmission of the virus as the procedure requires generation of high minute ventilation and flow, and for the patient to be in close contact with the technician and equipment. We have tried to extrapolate information from adult guidelines on spirometry during the COVID-19 pandemic.

As the pandemic evolves over time, prevalence can be classified to be in the pandemic phase, post-peak phase or post-pandemic phase, with high, low or controlled community prevalence, respectively. This can be determined by the local health authorities. Level 1 safety recommendations are suggested for those places in the pandemic phase, Level 2 in the post-peak phase, and Level 3 in the post-pandemic phase [2].

Indication for spirometry: During the pandemic phase and post-peak phase, clinicians should restrict referrals for spirometry to those patients who require it urgently or when it is essential for their diagnosis [3]. A pediatrician can teleconsult the patient and determine the need for spirometry, to reduce the number of visits of a child to the hospital. One should; however, not perform spirometry on patients with a clinical suspicion of COVID-19, influenza-like illness (ILI) or severe acute respiratory infections (SARI) [4]. In children who test positive for COVID-19 infection, all pulmonary function tests (PFTs) should be deferred for at least 30 days post-infection, as viral shedding can occur even after 10 days.

Guidelines for performing spirometry: The following are the Level 1 safety precautions one must follow while performing a spirometry in children during the pandemic phase. Similar precautions are advised for Level 2 in post-peak phase as it might be difficult to determine pre-test probability of infection in children.

- *Screening:* The clinician or technician performing the test, the child and the caregiver, should all be screened prior to entering the PFT room. A proposed triage questionnaire is available in the European Respiratory Society statement [2]. Patients who screen positive should not undergo spirometry.
- *Infrastructure:* Under ideal conditions, negative pressure rooms or HEPA filtration systems with UV germicidal lamps are recommended. However, this may not be available in most centres. Hence, at least a separate enclosed room with adequate ventilation should be designated for performing spirometry [2]. Waiting areas should be re-organized to ensure patients are not in contact with those who are febrile. Thorough cleaning and ventilation of both the room and equipment needs to be performed between each test [5]. The number of air exchanges between procedures need to be

determined by each facility to ensure removal of 99.0-99.9% of airborne microorganisms calculated as per CDC guidelines [6]. Only one caregiver, who must wear a face mask and follow hand hygiene procedures, should be allowed into the room [5].

- *Staff*: The person performing the spirometry in the pandemic and post-peak phases should wear full personal protective equipment (PPE) which includes a fit tested N95 mask, eye goggles or face shield, apron and disposable gloves [7]. Strict hand hygiene protocols must be followed by both the operator and the patient.
- *Equipment*: Equipment should be cleaned and disinfected by wiping down all surfaces that the patient comes in contact within a 2-metre radius, using a hospital grade antiviral disinfectant such as 70% isopropyl alcohol (IPA). Recalibration of the equipment after decontamination is suggested [2]. Single use bacterial and viral in-line filters of high specification are required to be used. The ideal filter is one with minimum proven efficiency for high expiratory flow of 600 to 700 L/min [8]. Replace all consumables to single use or disposable ones, wherever possible.

Appointments need to be staggered with a gap of 45-60 minutes, taking into consideration the time required for donning and doffing of PPE by the clinician/technician between each patient, post-test cleaning of the room and equipment, and recalibration of the spirometer [5].

All these safety recommendations for performing spirometry must be maintained till the local public health authorities can confirm that the community spread is controlled and the district is in the post-pandemic phase. More specific guidelines for performing lung function tests in children will need to be formulated by global organizations as the pandemic evolves.

KR BHARATH KUMAR REDDY[1*], GV BASAVARAJA[2] AND BARNALI G BHATTACHARYA[3]

*From Department of [1]Paediatric Pulmonology and Sleep, Shishuka Children's Hospital, Bangalore, Karnataka; [2]Department of Pediatric Intensive Care, Indira Gandhi Institute of Child Health, Bangalore, Karnataka; and [3]Children's Clinic, Pune, Maharashtra; India. *drbharathreddykr@gmail.com*

REFERENCES

1. Anderson EL, Turnham P, Griffin JR, Clarke CC. Consideration of the aerosol transmission for COVID-19 and Public Health. Risk Anal. 2020;40:902-07.
2. European Respiratory Society. Recommendation from ERS Group 9.1 (Respiratory function technologists/ scientists): Lung function testing during COVID 19 pandemic and beyond. Available from: *https://ers.app.box.com/s/zs1uu88wy51monr0ewd990itoz4tsn2h*. Accessed July 18, 2020.
3. American Thoracic Society. Pulmonary Function Laboratories: Advice regarding COVID-19. 2020. Available from: *https://www.thoracic.org/professionals/clinical-resources/disease-related-resources/pulmonary-function-laboratories.php*. Accessed July 18, 2020.
4. Global Initiative for Asthma. Global Strategy for Asthma Management and Prevention, Updated 2020. Available from:*https://ginasthma.org/wp-content/uploads/2020/04/GINA-2020-full-report_-final-_wms.pdf.* Accessed July 18, 2020.
5. Canadian Thoracic Society. Resumption of pulmonary function testing during the post-peak phase of the COVID-19 pandemic: A position statement from the Canadian Thoracic Society and the Canadian Society of Respiratory therapists. Available from: *https://cts-sct.ca/wp-content/uploads/2020/07/CTS_CSRT_COVID_PFT_Final-July12_2020.pdf*. Accessed July 17, 2020.
6. Centers for Disease Control and Prevention (CDC). Guidelines for Environmental Infection Control in Health-Care Facilities: Recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC), Update 2019. Available from: *https://www.cdc.gov/infectioncontrol/pdf/guidelines/environmental-guidelines-P.pdf*. Accessed July 26, 2020.
7. American Academy of Allergy Asthma and Immunology. Spirometry during COVID-19. Available from: *https://www.aaaai.org/ask-the-expert/spirometry*. Accessed July 17, 2020.
8. Unstead M, Stearn MD, Cramer D, Chadwick MV, Wilson R. An audit into the efficacy of single use bacterial/ viral filters for the prevention of equipment contamination during lung function assessment. Respir Med. 2006;100:946-50.