

A Kid-Friendly Approach to *Incentive Spirometry*

Anish Gupta, Priyanka Mishra, Bhavna Gupta, Kamna Kakkar¹

Department of Anesthesiology, All India Institute of Medical Science, Rishikesh, Uttarakhand, ¹Department of Anesthesiology, PGIMS, Rohtak, Haryana, India

ABSTRACT

Incentive spirometer (IS) is a popular choice for chest physiotherapy. It is used to optimize preoperative respiratory status and prevent postoperative pulmonary complications. However, the use of conventional forms of IS pose a challenging task in children due to the lack of cooperation, compliance, and submaximal effort on the part of pediatric patients. To tackle this problem, we describe an innovative and fascinating technique of spirometry. It employs a toy as a better acceptable incentive spirometry device in pediatric population. This toy has a mouthpiece and a long inflatable plastic strip at the other end. As the child blows into the mouthpiece, a captivating sound from the toy keeps buzzing progressively till the air is being blown during exhalation and is accompanied with inflation of the strip in an elongated fashion. Hence, this device incorporates the two best enjoyed incentives for children, namely, visual and audio to ensure patient compliance and participation.

Keywords: Incentive spirometry, kids, toy

Address for correspondence: Dr. Bhavna Gupta, Department of Anesthesiology, All India Institute of Medical Science, Rishikesh, Uttarakhand, India.
E-mail: bhavna.kakkar@gmail.com

Submitted: 30-Sep-2018 **Revised:** 24-Nov-2018 **Accepted:** 07-Jan-2019 **Published:** 19-Apr-2021

A spirometer is a device to measure volume of air inspired and expired by the lungs. It measures ventilation and forms the main part of equipment employed for pulmonary function tests (PFTs). Incentive spirometer (IS) has been a popular choice for chest physiotherapy. It encourages patients to take deep breaths guided through visual feedback and allows for opening of collapsed airways resulting into an increase in inspiratory volumes, transpulmonary pressure (TPP), and inspiratory muscle performance. IS is a small hand held device that contains a mouthpiece through which suction is created by the patient and 2 or 3 columns with moveable pistons that change position with inspiration.^[1] The deeper the breath, the higher the piston rises, with incorporated visual indicators of performance (inspiratory effort) in order to aid the therapist in coaching the patient toward an optimal performance. Similarly, the patients use this

visual feedback to monitor their own efforts. IS has been employed to optimize preoperative respiratory status and prevent postoperative pulmonary complications. This technique of chest physiotherapy could, however, prove to be a little tedious and unacceptable when it comes to dealing with children.^[2] This further results into lack of cooperation, compliance, and submaximal effort on the part of pediatric patients.

We, hereby, want to describe an innovative and fascinating technique of spirometry. It employs a *toy* as an efficient and more acceptable incentive spirometry device in pediatric population. This toy has a mouthpiece and a long inflatable plastic strip at the other end [Figure 1]. When the child takes a deep breath and blows into the mouth piece, the inflation of the strip in an elongated fashion occurs that is accompanied with a captivating sound. Deeper the breath, the more is the air blown and

Access this article online	
Quick Response Code:	Website: www.annals.in
	DOI: 10.4103/aca.ACA_188_19

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Gupta A, Mishra P, Gupta B, Kakkar K. A Kid-friendly approach to *incentive spirometry*. *Ann Card Anaesth* 2021;24:238-40.

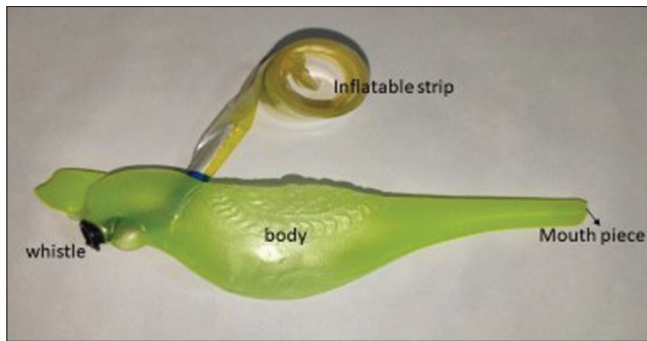


Figure 1: Toy, is shaped like a bird, which has a body, mouth piece, whistle and inflatable strip, as labelled

the higher goes the colorful strip [Figure 2]. The sound from the toy keeps buzzing progressively till the air is being blown during exhalation. This device has on offer the two best enjoyed incentives for children, namely, visual and audio. The effort and the excitement to achieve these visual and audio targets encourage children to try their best and consequently promotes patient compliance and participation. The child breathes in from the device as deeply and slowly as possible, and holds the breath for 2–6 s, same maneuver as in yawning. This procedure when repeated on a regular basis, may prevent or even reverse atelectasis. The procedure should be repeated at least 10–12 times per hour for every hour the child is awake and can be modified as per specific risk of development of perioperative pulmonary complications. Hence, it succeeds in real-time target to optimize pulmonary function while preventing atelectasis, despite not being able to depict exact lung volumes.

We have used this innovation in 50 pediatric patients, in the age group of 2–8 years who underwent cardiothoracic surgeries and none of them developed any postoperative pulmonary complications, giving a positive nudge to the more widespread use of this device. Children in age group between 2 and 8 years of age have difficulty in comprehending the instructions of performing incentive spirometer or taking expiratory maneuvers and easily get distracted.^[2] Therefore, they should get attractive and colorful choices of the toys for performing the procedure, and the team must be very attentive, enthusiastic, and should know the limitation of explaining the procedure to children. Toy is always a great idea for children, and at the same time, it provides an added advantage of incentive spirometry. Children above the age of 8 years are able to use a normal incentive spirometer.

All the patients were excited to use the new toy and adult encouragement or monitoring did not present an issue. Another advantage of this device is that it is very



Figure 2: A cardiac patient holding the toy in postoperative period [left part of the picture shows inspiratory phase and right side shows a vertically inflated green strip on expiration]

economical. In comparison to the various incentive spirometers in market that cost hundreds of rupees, this just costs around twenty rupees, practically negligible among the existing options. We do not reuse this device. We keep one device per person, and they use it as a normal toy and as it does not enter directly into blood, hence it does not need any sterilization, however mouth piece is cleaned like that of any incentive spirometer.

We acknowledge the fact that it has its own limitation in that the lack of gradation of the device deprives us of the judgment regarding target rates and hence a more transparent assessment of improving pulmonary status, although the improvement in pulmonary status can still be assessed by charting of the total length of the inflatable strip and the duration of sound coming from the toy. There is scope for future development of this device that would tackle this limitation by gradation of lung volumes and capacities into it, allowing a better functional assessment of pulmonary function. The other limitation is also that the device works best for exhalation process. However, in children the toy may encourage them take deep breaths indirectly.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Miller MR, Hankinson J, Brusasco V, Burgos F, Casaburi R, Coates A, *et al.* ATS/ERS task force. Standardisation of spirometry. *Eur Respir J* 2005;26:319-38.
2. Beydon N. Pulmonary function testing in young children. *Paediatr Respir Rev* 2009;10:208-13.