EDUCATIONAL FORUM

"Oxygen Audit" with a Novel Teaching and Training Tool in COVID Pandemic

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Abstract

In the midst of oxygen shortage across several states in the country, the union territory Chandigarh (India) mapped the oxygen supply chain that brought the lifesaver gas, from oxygen generation manufacturers to the hospitals. Various steps were taken by the administration to identify the key bottlenecks along the way. Oxygen audit and prevention of oxygen wastage in the pandemic with the use of teaching and training education tools was a novel, innovative thought. The purpose of this training was to sensitize the medical staff regarding unintentional oxygen wastage and thus indirectly save oxygen at times of crisis in the pandemic.

It was audited that more than 20–25% oxygen requirement and consumption was decreased in a few days after the sensitization program as extracted from the feedback proforma, number of patients admitted, demand of the number of oxygen cylinders per day, or liquid oxygen required. The hospital staff admitted that the oxygen-saving sensitization programs decreased their consumption and were eye-openers for them. The fixed oxygen quota provided to all the hospitals in the city was efficiently managed by the administration, with oxygen audit as one of the significant measures toward efficiently managing the resources.

Keywords: Oxygen audit, Oxygen crisis, Teaching and training tool.

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Introduction

Despite all achievements in the management of COVID cases in the present pandemic, many communities are still lacking in one key area, that is, reliable oxygen access and availability.[1] The second wave in India appeared more detrimental, and supplies of oxygen took central place. Recent systematic reviews reported an overall estimate of 31% of patients remained asymptomatic and mostly recovered with oxygen supplementation.[2]

Approximately 15% of all patients with COVID-19 required oxygen support, and 5% had critical disease with complications.[3] In lower-middle-income classes, an estimated half a million people required 1 million cylinders of oxygen every day.[3] It created a persistent outcry that instilled thanatophobia in the patients. The decision to use supplemental oxygen was, however, controversial because of large heterogeneity in the reported results and emerging reports of side effects. The Government of India and many states released their own guidelines for rational utilization of oxygen.[4–6] The above situation in COVID times compelled us to do oxygen audit with the help of a novel teaching and training tool. The period of oxygen audit was from 1st April 2021 to 31st May 2021, that is, 2 months.

Teaching and Training Tool

A 30 minutes training session was provided to all medical staff at all nine private hospitals, two government institutions, and eight mini-COVID centers with hand-outs, posters, and banners in our city (Fig. 1). The interaction was bilateral with bedside demonstration with the purpose of saving unintentional wastage of oxygen. The posters were distributed to all hospitals, and their content was taught to all medical and administrative staff working in hospitals. When hospitals were visited, it was observed that oxygen requirement at all centers was huge, and there was no dedicated oxygen audit team in any of the hospitals.

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A total of 20 MT of liquid medical oxygen (LMO) was allocated to all city hospitals, and it was redistributed to all.

Conduct of Training

The training was conducted by a team of senior anesthesiologists at Government Medical College and Hospital (GMCH) and Government Multi Specialty Hospital (GMSH) that cater to more than six states in the northern part of India.

The average number of COVID patients in GMCH wards (on oxygen) was 210 in that period. The non-COVID patients, seven emergency operation theaters, 61 COVID ICU patients, and 62 non-COVID ICU/CCU beds also required oxygen at all times. The patients who were on mechanical ventilation required an increased amount of oxygen requirement as pneumatic ventilators require either compressed air or medical oxygen to run.[7] It was analyzed that more than 15 MT of oxygen was being used in the hospital before the sensitization program at the hospital. After this training to all medical staff and administrative nodal officers, the records showed that more than 2.5 MT (15–12.5 MT, i.e., nearly 21%) requirement

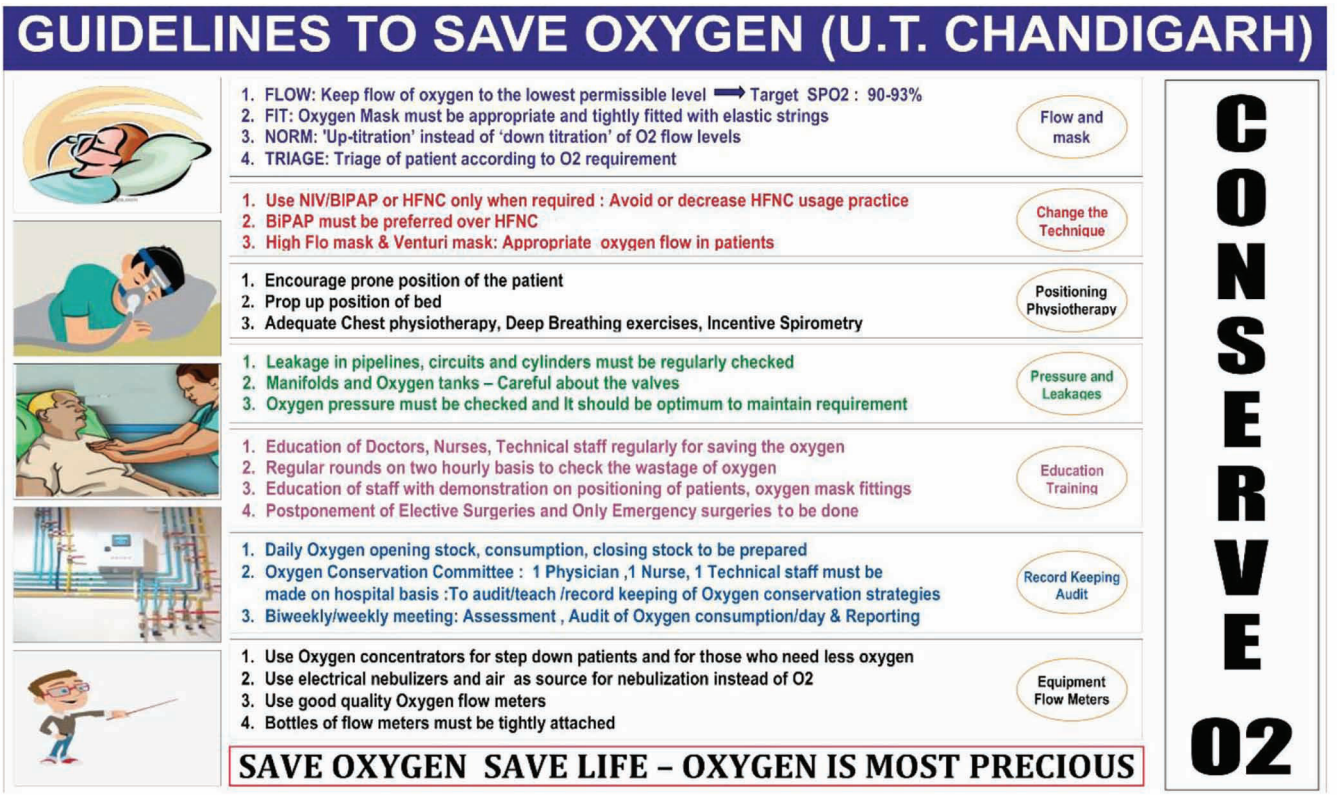

Fig. 1: Guidelines tool used for education of medical staff in UT, Chandigarh, India

was decreased in GMCH. No doubt, the number of patients in COVID areas also decreased from an average of 309 to 223 per day (nearly 27%), but patients in non-COVID areas started increasing. This knowledge had a deep impact on most of the medical staff and sensitized them that saved approximately 21% oxygen in crisis time.

Similarly, in GMSH, the average number of COVID patients (on oxygen) was 203 patients per day before the sensitization program, with a mean consumption of oxygen around 3.3 MT averaging 14.2 LPM per patient. Post-training, the requirement of oxygen decreased to 2.83 MT of LMO per day, that is, 12.1 LPM per patient. There was a 23% decrease in 6 days, although the number of patients on oxygen decreased by 18% only.

Regarding private hospitals, feedback from all private hospitals depicted a 20–25% decrease in oxygen usage and requirement. Although 13–15% of bed occupancy was also decreased during this period yet saving 23% oxygen was remarkable. All staff and administration appreciated the training program and efforts, and it was an eye-opener for all.

The teaching and training included academic part, knowledge sharing with interactive practical skills. The teaching module stressed upon up-titration of oxygen, keeping the patient's oxygen saturation between 92 and 94%. Prone positioning was reemphasized as it improves ventilation, keeps alveolar units open, and makes breathing easy.[8] The potential mechanism of benefit of prone positioning in non-intubated patients is unlikely to be related solely to improved oxygenation. Homogenous lung aeration with prone positioning could result in reduced respiratory effort and lead to a lower incidence of intubation.[8,9]

Similarly, propped-up position was also suggested when the patient is supine. This position provides the benefit of lowering diaphragm and lung mechanics.[10] The importance of frequent chest physiotherapy, deep breathing exercises, and incentive spirometry was reemphasized. All were demonstrated on how to open the oxygen cylinders and use oxygen concentrators or nebulizers. The checks of leaks in pipelines and oxygen bottle flow meters were also stressed upon. The change of water in the glass humidifiers with the washing of humidifier water bottles was taught to prevent any kind of infection.

The feedback from all the hospitals was obtained post-training. The 6 days pretraining days and 6 days post-training days were studied in detail with hospital data. The number of admitted patients, bed occupancy of the hospital, daily oxygen consumption, and the number of operation theaters running daily with oxygen requirements every day were noted. All the staff appreciated and participated in this training enthusiastically.

The feedback and telephonic interviews were conducted, and data were analyzed. Benefits from this exercise are visible as many protocols are prepared and followed now. Oxygen audit committee is made in all the hospitals. Protocols for checking leaks in pipelines and oxygen equipment have been imposed in all hospitals. Time-to-time, refresher courses of this training capsule are conducted on a regular basis.

Finally, to conclude, oxygen audit with training tool of education in the present COVID pandemic is an effective novel tool for managing the oxygen crisis. Limited oxygen supplies and oxygen requirements can be rebalanced by the training and teaching tool. The sensitization of medical staff can be used

regularly both in COVID and non-COVID times to save oxygen and thus causes prevention of unintentional wastage of oxygen.

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