Research Article

https://doi.org/10.64142/jsmcr.2.4.55

Journal of Surgery and Medical Case Reports

ISSN: 3117-3187

JSMCR-25-55

Peak Expiratory Flow Rate (PEFR) Changes as a Predictive Measure of Respiratory Sequalae in Individuals with Severe Obesity

Karrie Kuecker*

[1]Resolve Diamondback Post-Acute, Phoenix, USA

***Corresponding author:** Karrie Kuecker, Resolve Diamondback Post-Acute, Phoenix, USA, E-mail: kkuecker@emich.edu

Received date: November 17, 2025; **Accepted Date:** November 30, 2025; **Published date:** December 17, 2025

Citation: Kuecker K (2025) Peak Expiratory Flow Rate (PEFR) Changes as a Predictive Measure of Respiratory Sequalae in Individuals with Severe Obesity. J Surg Med Case Rep Vol.2 No.4: 055.

Abstract

The purpose of this research study is to examine if use of Peak Expiratory Flow Rate (PEFR) can be used as a predictive measure of possible respiratory sequalae in individuals living with severe obesity. Totals were taken during each therapy session (3-5 times per week depending on specific patient needs). When a significant decrease of >50 LPM was noted, medical interventions were implemented by their primary Provider and non-pharmacological interventions were implemented in the course of the patrticipant's Speech Therapy treatment sessions. This method resulted in improved PEFR following both pharmacological and non-pharmacological interventions, with 71% (10/14) of the participants not requiring a transfer to acute care for higher levels of care.

Keywords: Severe obesity; Peak expiratory flow rate; Respiratory sequelae; Respiratory monitoring; Early intervention

Introduction

Individuals with severe obesity represent an under-researched and clinically complex patient population. Their care requires individualized approaches due to diverse concomitant conditions and varying health needs, which pose challenges for large-scale, controlled studies. One critical but often overlooked issue in this population is compromised respiratory function. Mafort et al. identified mechanical alterations such as adipose deposition along the chest wall, abdomen and upper airway as well as systemic inflammation as primary contributors to increased work of breathing in individuals with severe obesity [1]. These changes physically restrict the movement of the diaphragm and the contraction of external intercostal muscles, leading to disordered and inefficient respiratory patterns. Reduced Forced Vital Capacity (FVC), Forced Expiratory Volume in one second (FEV_1) and Peak Expiratory Flow Rate (PEFR) are commonly observed in this group, consistent with the presence of restrictive lung disease [2]. Lo Mauro et al. and Severin et al. further corroborate these findings, highlighting how skeletal muscle strain and thoracic cavity restriction especially in supine and prone positions exacerbate respiratory impairment [3,4]. So, et. al. concludes that patients with severe to very severe COPD with greater changes in PEFR had shorter duration until first hospitalization, more frequent hospitalizations despite similar demographic, spirometric and comorbid parameters at baseline compared to the 'controlled' group [5]. Indicating that frequent PEFR monitoring could identify COPD patients predisposed to worse outcomes. Chinnaiyan et al. hypothesizes that the significant reduction in PEFR noted in females living with obesity compared to their normal sized peers is related to the increased work of breathing and respirator insufficiency present in the females living with obesity [2]. These physiological limitations underscore the urgent need for targeted respiratory monitoring and intervention strategies tailored specifically for individuals with severe obesity. Implementing such programs has the potential not only to improve lung function but also to enhance Overall Quality of Life (QOL) and reduce preventable hospitalizations in this high-risk population. Gupta, et. al. state that a PEFR decrease of >20% of personal best total likely indicates an acute exacerbation [6]. As at the Start of Care (SOC) the research subjects were all generating a personal best of 150-300, with 250 being average, a decrease of =/>50 LPMs would indicate a significant change in function and thus likely an exacerbation or onset of respiratory sequalae.

Materials and Methods

This observational pilot study evaluated expiratory flow dynamics in 14 adults with severe obesity (BMI ≥ 40 kg/m^2) to identify patterns suggestive of respiratory sequelae. Participants performed standardized Peak Expiratory Flow Rate (PEFR) maneuvers using a digital flow meter, with values recorded at 1 second intervals up to 3 seconds. Each maneuver was repeated three times, with the highest readings recorded for analysis. Direct comparisons of PEFR values across time intervals were conducted to detect clinically significant

https://doi.org/10.64142/jsmcr.2.4.55

Journal of Surgery and Medical Case Reports

ISSN: 3117-3187

decreases. A decrease of >50 L/min between consecutive intervals was used to identify probable episodes of respiratory sequelae. Based on these findings, a medication and treatment protocol was developed by the primary care provider, emphasizing early intervention and local medical management to reduce rehospitalization risk.

Results

Direct examination and coding of PEFR measurements before and after implementation of the medical management protocol revealed that a >50 L/min decrease in sequential PEFR intervals reliably indicated probable respiratory sequelae in individuals with severe obesity. Among the 14 participants identified with such decreases, 10 (71%) showed improvement in PEFR values, returning to pre-illness levels following the prescribed medication regimen. Notably, all 10 of these individuals avoided re-hospitalization, suggesting the protocol's effectiveness in managing respiratory decline locally **(Figure 1)**.

Participant #	Target PEFR (LPM)	height cm	age	Max LPM (SOC)	11/8/24	11/15/24	11/22/24	11/29/24	12/6/24	12/13/24	12/20/24	12/27	1/3/25	1/10/25	1/17/25	1/24/25	1/31/25	2/7	2/14	2/21	2/28	3/7	3/14	3/21
1	565	168	32	210	280	230	220	230	240	270	270	270	220	270	280	(1/21) 280 (1/23) 180	250	250	280	180	240	200	X	250
2	355	151	58	170	150	(11/11) 300 - (11/14) 240	(11/18) 230 (11/20) 130	(11/26) 180	300	290	(12/16) 190 (12/19) 150	hospital	hospital!	270	280	300	260	X	330	X	X	X	X	X
3	644	183	34	310	310	330	410	370	420	420	430		250	(1/9) 400 (1/10) 450	470	490	455	290	(2/11) 310 (2/12) 350 (2/13) 350 (2/14) 390	(2/18) 420 (2/20) 415 (2/21) 380	(3/3) 430	(3/6) 450	(3/10) 450	(3/20) 430 (3/24) 450
4	624	180	25	210	220	170	240	210	285	270	210	210 (to ach)	hospital!	280	(1/13) 280 (1/17) 300	(1/21) 230 (1/24) 220	180	290	310	210	(2/27) 200 (2/28) 290	(3/3) 230 (3/10) 250	250	
5	366	155	55	260	260	200	230	210	210	190	190	225	X	250	230	210	X	X	250	260	X	X		
6	668		39	230	X	230	320	330	330	295	330	(12/23) 360 (12/26) 375	(1/2) 350 (1/3) 385	430	410		470	(2/12) 390	500	(2/20) 450	380	450+	450+	450+
7	517	173	44	X	180	170	150	240	300	200	225	(12/30) 130 (1/2) 195	(1/6) 250 (1/10) 200	(1/13) 200 (1/17) 175		175	(2/10) 175	(2/11) 200 (2/14) 225	200		200		200	255
8	596	171	54	100	X	X	100	60			70		90	100	80				80	100	100	80	80	
9	573	185	50	210	X	X	X	(11/25) 210	X	320	230	280	300	310	320	280			340	290	300	270	250	250
10	623	192	66	140	X	X	X	140	X	(12/11) 220	hospice??													
11	383	157	51	180	X	X	X	180	200	(12/9) 110 (12/13) 160	205		210	240	(1/14) 310 (1/17) 260	(1/20) 270 (1/24) 230		(2/10) 270	200	280	X	X	X	
12	630	173	24	265			(11/19) 240	170 (12/3)		210	265	200	190	130	hospital	hospital	deceased :(							
13	621	180	41	270	X	X	X	X	X	270	(12/16) 200 (12/20) 355	330	340	285	160	285	285	X	220	d/c to home				

Figure 1: PEFR Measures of 13 participants with severe obesity and frequent respiratory sequalae.

Intervention protocols

Interventions included both pharmacological (managed by the participants' managing primary provider) and non-pharmacological (managed by the participants' speech-language pathologist). These are detailed as follows:

Non-pharmacological

The treatment protocol includes: Respiratory Muscle Strength Training (RMST), Osculating Positive Expiratory Pressure (OPEP) device use (also called a Flutter valve), Incentive Spirometer (IS), diaphragmatic breathing exercises, Oropharyngeal Exercises (OPEs) for the throat and upper airway management. High-Frequency Chest Wall Oscillation (HFCWO) vest/Afflovest, if appropriate/indicated by Pulmonology provider [7].

Pharmacological

Once a significant decrease in PEFR measure was noted, the managing Provider was contacted and they determined need and appropriateness of pharmacological interventions. These included, but not limited to: Administration of oxygen to maintain levels >90%, titrating up or down as required. A steroid (*e.g.,* prednisone) to address any inflammation, if present. An appropriate antibiotic if infectious origin is suspected, this frequently included an Azithromycin (Z-pack); however, the antibiotic(s) required were dependent upon bloodwork results, participants' medical history and overall pharmacological profile. A bronchodilator (*e.g.* Albuterol or Duoneb) if appropriate and Short-Acting Beta-Agonist (SABA) and/or Long-Acting Beta-Agonist (LABA) medication if appropriate. In addition, a consultation with Pulmonology providers would be requested. The participants in this study all had BMI measures of >50 kg/m^2, with the highest BMI recorded being 134 kg/m^2, they would frequently be assessed for CPAP/BiPAP/iVAPS/AVAPS which could be configured to allow for additional oxygen support *via* 'oxygen bleed' if indicated [8-10].

This protocol was variable and person dependent; as individuals living with severe obesity with a BMI >50

https://doi.org/10.64142/jsmcr.2.4.55

Journal of Surgery and Medical Case Reports

ISSN: 3117-3187

kg/m^2 contain a significant number of concomitant health effects, necessitating the need for flexibility in pharmacological protocols. The participants' medical history, current medical needs related to symptoms of respiratory sequalae experienced by each individual were used to determine the appropriate pharmacological intervention recommended.

It is important to note that the participants are residents of a Long-Term Care (LTC) program located at a Skilled Nursing Facility (SNF), so limitations in interventions, diagnostic testing and availability of treatments maybe affected by several socio-economic and logistical factors. Additional limitations to interventions are the size of the participants (BMI 50-134 kg/m^2) and limitations in mobility and transportation availability.

Conclusions and Implications

Serial PEFR measurements taken at 1 second intervals served as a reliable, non-invasive tool to identify early respiratory sequelae in individuals with severe obesity. A >50 L/minute decrease between readings was predictive of clinical decline, allowing for early intervention.

Following implementation of the provider-developed medication and management protocol, 10 of 14 participants (71%) experienced sustained improvement in PEFR values, returning to or nearing pre-illness levels. Importantly, re-hospitalization was avoided in these cases, suggesting the protocol's effectiveness in managing respiratory deterioration locally.

PEFR monitoring, paired with timely treatment, demonstrates potential as a low-cost, scalable strategy for preventing respiratory complications and reducing hospital admissions in high-risk obese populations.

References

1. Mafort TT, Rufino R, Costa CH, Lopes AJ (2016) Obesity: Systemic and pulmonary complications, biochemical abnormalities and impairment of lung function. Multidiscip Respir Med 11. [Crossref], [Google Scholar], [Indexed]
2. Chinnaiyan S, Ramayyan V (2021) Comparison of Peak Expiratory Flow Rates (PEFR) between obese and non-obese females. J Pre-Clin Clin Res 15: 111-115. [Crossref], [Google Scholar]
3. Mauro AL, Tringali G, Codecasa F, Abbruzzese L, Sartorio A, et al. (2023) Pulmonary and chest wall function in obese adults. Sci Rep 13. [Crossref], [Google Scholar], [Indexed]
4. Severin R, Bond S, Mazzuco A, Silva AB, Arena R, et al. (2019) Obesity and respiratory skeletal muscles. Nutr Skeletal Musc 197-215. [Crossref], [Google Scholar]
5. So JY, Lastra AC, Zhao H, Marchetti N, Criner GJ (2016) Daily peak expiratory flow rate and disease instability in chronic obstructive pulmonary disease. Chronic Obstr Pulm Dis 3: 398-405. [Crossref], [Google Scholar], [Indexed]
6. Gupta S, Verma A (2023) PEFR monitoring can better predict asthma exacerbation as compared to monitoring by symptoms: Prospective cohort study. [Crossref], [Google Scholar]
7. Lin YP, Tung HH, Wang TJ (2017) Comparative study of high frequency chest wall oscillation and traditional chest physical therapy in intensive care unit patients. J Comp Nurs Res Care 2. [Crossref], [Google Scholar]
8. Dubal S (2022) Assessment of peak expiratory flow rate and spirometry in obese and nonobese school children. Int J Life Sci Biotechnol Pharm Res 11: 112-115. [Google Scholar]
9. Melo LC, Silva MAM, Calles ACN (2014) Obesity and lung function: A systematic review. Einstein (São Paulo) 12: 120-125. [Crossref], [Google Scholar], [Indexed]
10. Salome CM, King GG, Berend N (2010) Physiology of obesity and effects on lung function. J Appl Physiol 108: 206-211. [Crossref], [Google Scholar], [Indexed]