Evaluation of an Oxygen Protocol in Long-Term Care

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OBJECTIVE: The purpose of this study was to determine the effect of protocol-directed recommendations for oxygen therapy implemented by respiratory therapists in skilled nursing facilities. We hypothesized that the use of an oxygen protocol would reduce the number of missing and incomplete orders and unnecessary oxygen use in skilled nursing facilities. METHODS: We studied patients who required oxygen therapy in 17 Ohio-based skilled nursing facilities. Respiratory therapists assessed the need for oxygen therapy. Recommendations for oxygen use and orders were made in accordance with an algorithm-based protocol and guidelines established by the Ohio Department of Health. Data were prospectively collected from January 1 through March 31, 2005. RESULTS: Of 346 eligible patients, 261 had complete data and comprised the study sample. The mean ± SD age was 83 ± 11.8 years, and 79% were male. Payer mix included Medicaid (46%), Medicare Part A (36%), private pay (11%), and hospice (7%). Orders for oxygen therapy were incomplete or missing in 18% of the population. A total of 1,175 billed days were saved, which corresponded to a cost savings of $6,768. CONCLUSIONS: Successful implementation of an oxygen protocol can improve compliance with accreditation agency requirements by reducing the number of missing and/or incomplete orders for oxygen therapy. Financial and patient outcomes can also be enhanced by discontinuing unnecessary oxygen use and initiating oxygen therapy when clinically needed. *Key words: respiratory therapist, protocol, oxygen, long-term care, skilled nursing facility.*
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Introduction

A plethora of literature exists supporting the use of protocols with respect to positive professional, patient, and resource utilization outcomes.[1,2] Respiratory care protocols have effectively reduced the medical cost of care, improved the effectiveness of therapy, and minimized the risk of medical errors.[3] Although protocols have shown consistent positive outcomes in critical and general care areas for hospitalized patients,[4–6] documentation supporting their use is limited in alternate care settings. Studies conducted in nonhospital settings are narrow in scope and focus on the outcomes surrounding the precise prescription of oxygen therapy outside the hospital setting.[6] Long-term-care facilities are among the sites where more information is needed about the role of protocol care.

The reduction in government subsidized reimbursement to the long-term-care market makes it imperative to ensure that services rendered match therapeutic need. Protocols for the care of chronic populations do exist in long-term care. Standardized guidelines for the management of asymptomatic bacteriuria, pressure ulcers, and incontinence were implemented with positive patient, process, and financial outcomes.[7–9] There is also utility for implementing protocols for respiratory-related modalities. However, it is not common for skilled nursing facilities to hire respiratory therapists (RTs) as direct care staff. This obstacle makes it difficult to implement and evaluate the use of respiratory care protocols.

This study investigates the use of respiratory care protocols in the long-term-care sector. The purpose of this study was to determine the effect of protocol-directed recommendations for oxygen therapy implemented by RTs in skilled nursing facilities. We hypothesized that the use of an oxygen protocol would reduce the number of missing

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and incomplete orders and oxygen use in skilled nursing facilities.

Methods

A prospective, observational study was conducted to assess the appropriateness and completeness of orders for oxygen therapy in the long-term-care environment. Seventeen Ohio-based skilled nursing facilities participated in the study. The facilities included in this study did not employ RTs to provide direct patient care. Respiratory consultative services by licensed respiratory care practitioners were provided to each of the skilled nursing facilities by the respiratory service company contracted for the provision of respiratory equipment and supplies. No additional charges were incurred for the respiratory care consultative services, which were available to all of the contracted skilled nursing facilities without regard to study participation.

Data were collected on patients with orders for oxygen therapy from January 1 through March 31, 2005. RTs, employed at the aforementioned contracted respiratory service provider, conducted a thorough chart review, patient history, physical assessment, and noninvasive measurement of oxygen saturation performed via pulse oximetry (S_{pO_2}). Patients were excluded from the study if the medical record was not available for review or if the RT was unable to complete a history and physical assessment.

Data Collection: Presence and Completeness of the Physician's Oxygen Therapy Order

Prior to determining if the patient met criteria for the protocol, data from the physician order section of the medical record were collected with respect to the presence and completeness of an oxygen order. In accordance with guidelines established by the Ohio Department of Health, a complete physician order was required for all patients receiving oxygen therapy. Complete orders for continuous oxygen therapy must contain the delivery device, fraction of inspired oxygen (F_{IO_2}) or flow rate, and frequency of use. Requirements for complete as-needed oxygen orders include specifying a reason for use, in addition to meeting all of the criteria, mentioned above, pertaining to orders for continuous oxygen therapy. Examples of specific reasons for as-needed oxygen use included, but were not limited to, chest pain and shortness of breath.

A respiratory assessment form (Appendix) was used to document current orders, demographic, pertinent laboratory, and radiological information, as well as physical assessment findings. Recommendations to obtain or amend a physician order, to ensure compliance with standards established by accreditation agencies, were documented in the Suggested Plan of Action section of the form. Recommendations for order clarifications were made after the patient was assessed. This allowed suggestions for protocol-driven flow rate and/or F_{IO_2} changes to be included with the order clarification suggestions. Each recommendation the RT made for an order change was written very specifically, in a step by step format. For example, if an order for oxygen via nasal cannula did not specify the flow rate, the RT would write the recommendation as follows: "Current order for oxygen therapy incomplete. The flow rate on the oxygen concentrator is set at 1 L/min. The patient is resting comfortably. The S_{pO_2} is 92% on 1 L/min of oxygen via nasal cannula, continuously. Vital signs are stable and listed above. (1) Suggest clarifying the oxygen order as follows: discontinue current order for oxygen therapy via nasal cannula. (2) Suggest ordering oxygen therapy as follows: oxygen at 1 L/min via nasal cannula, continuously."

Data Collection: Protocol Implementation

Suggestions for oxygen titration were based on a sign and symptom, algorithm-based care plan (Fig. 1). A recommendation to reduce the delivered flow or F_{IO_2} was made if the patient was clinically stable and did not display clinical signs of hypoxemia or indications for oxygen therapy. Indications for oxygen therapy included shortness of breath, tachycardia, diaphoresis, and confusion. The protocol allowed for some flexibility in the titration criteria for individuals with documented evidence of pre-existing chronic hypoxemia. S_{pO_2} criteria could be modified in those instances, at the discretion of the attending physician.

Once the plan of care was devised and documented, the RT reviewed the proposed plan with a designated representative at the respective nursing home. This designated individual was selected by facility preference. In some instances the representative was a bedside nurse. In others it was a charge nurse, nursing supervisor, or director of nursing. The facility representative was responsible for communicating the recommendations for care and obtaining complete orders for oxygen therapy from the resident's attending physician. If the physician was on site, the RT worked with the facility representative to communicate care recommendations. Because the RT was not an employee of the skilled nursing facility, all verbal and/or telephone physician orders needed to be transcribed by the facility representative.

The RTs used a tracking sheet to record the number of evaluations conducted, and recommendations for changes in the patient's plan of care. The date, patient name, room number, oxygen orders, diagnosis, physician, and recommendations for care were recorded. The form was reviewed at the next scheduled facility visit and updated to indicate whether the physician accepted or rejected the protocol-

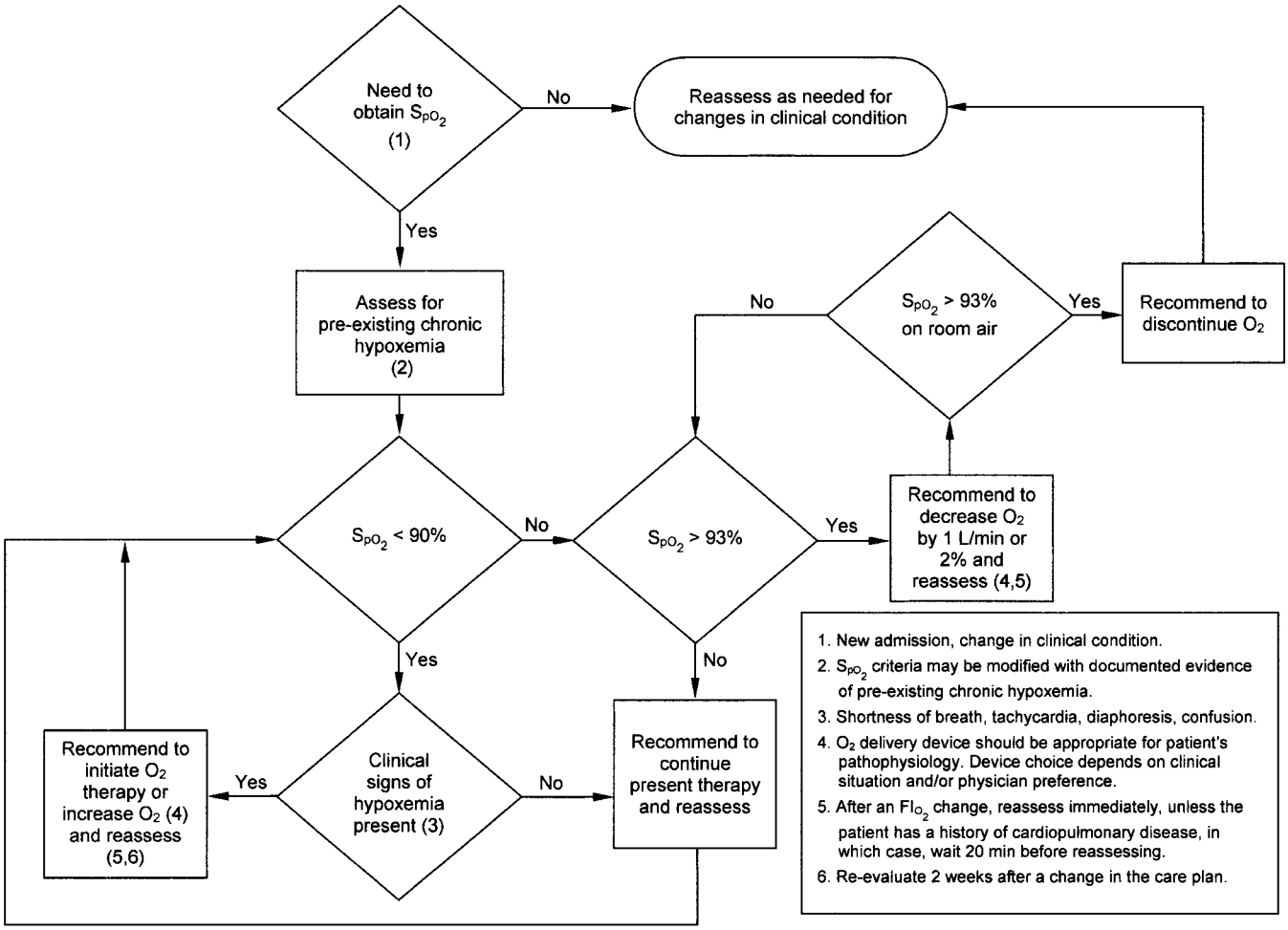

Fig. 1. Algorithm depicting the respiratory consultant protocol for the initiation and titration of oxygen therapy.

directed recommendations. Facility visits were scheduled approximately every 2 weeks. The RTs would indicate in the Results section of the tracking sheet whether the recommendation was accepted. If further follow-up was needed on a particular recommendation, the RT would summarize the findings under the Action Taken portion of the form. For example, if a recommendation to obtain an order for oxygen therapy was specified and the physician had not reviewed the recommendation, any written or verbal follow-up with the facility designee regarding this issue would be summarized in this section of the tracking sheet. The RT could also include a brief explanation for additional follow-up.

Oxygen use data were collected on each patient who received oxygen therapy. The number of hours the patient used oxygen therapy was obtained from the hour meter on the concentrator. The hours of use (as-needed and continuous) were collected on a weekly basis for each study participant and documented on a facility-specific oxygen delivery form. If the patient required a portable means of oxygen delivery, the liquid oxygen or compressed oxygen use was calculated and then added to the hourly totals obtained from the oxygen concentrator. Total hours of use were divided by a factor of 24 to derive days of use. Data from the forms were entered into spreadsheet software (Excel, Microsoft, Redmond, Washington) and imported into statistics software (SPSS 10.0, SPSS, Chicago, Illinois) for analysis.

Calculation of Saved Billed Days and Cost Savings

The number of saved billed days, within the respective month, for each patient receiving continuous oxygen therapy whose oxygen order was discontinued or changed from continuous to as-needed, was tallied. The number of days the patient was ordered oxygen therapy was standardized to the number of days contained within the given month (31 for January and March, and 28 for February). A monthly calculation for saved days and consequent cost savings was used to comply with the regulations for oxygen billing in skilled nursing facilities set forth by the Ohio Depart-

Table 1. Summary of Recommendations for Changes in the Respiratory Care Plan

Recommendation	Recommendations		Accepted Recommendations	
	$n = 261$	%	n	%
No change to current plan indicated	108	41	NA	NA
Obtain an oxygen order	5	2	5	100
Discontinue oxygen	71	27	66	93
Wean oxygen flow	12	5	8	67
Clarify incomplete oxygen order	41	16	35	85
Change from continuous to as-needed oxygen	11	4	7	64
Initiate oxygen therapy	13	5	12	92

NA = not applicable

ment of Health and Human Services and the Centers for Medicare and Medicaid.

The number of saved days, for patients whose continuous oxygen therapy order was discontinued, was calculated on a monthly basis by the following formula;

Billed days saved from the discontinuation of continuous oxygen orders = (days of ordered therapy − oxygen days used)

The number of days of ordered therapy was equivalent to the number of days in that respective month. The oxygen days used were equal to the actual number of days the patient received continuous oxygen therapy, before the order was discontinued. The number of billed days saved from the discontinuation of continuous oxygen therapy orders was totaled.

The number of billed days saved for oxygen orders changed from continuous to as-needed was calculated by the following formula;

Billed days saved from the conversion of continuous oxygen to as-needed orders = days of ordered therapy − days of continuous oxygen therapy + as-needed days

The number of days of ordered therapy was equivalent to the number of days in the respective month. Days of oxygen therapy were equal to the actual number of days the patient actually received continuous oxygen therapy before the order was changed to as-needed. The as-needed days were equal to the actual hours of oxygen use for patients with as-needed orders, before the order was discontinued.

Patients ordered oxygen on an as-needed basis only were excluded from the calculations for saved billed days and cost savings. This was due to the fact that saved billed days and potential cost savings for these patients would be projected. The cost savings for these patients could not be calculated, because there is no actual value for days of ordered therapy. The number of saved billed days was equal to the sum of all of the days for each of the study subjects for the 3-month study period.

Cost savings were calculated by converting the number of saved days to saved hours and multiplying that factor by a cost of $0.24 per hour. The cost calculation was based on the Ohio Medicaid per diem rate, which equates to $0.24 per hour.

All demographic, oxygen use, cost, and protocol data were stored in spreadsheet software (Excel, Microsoft, Redmond, Washington) and analyzed with statistics software (SPSS 10.0, SPSS, Chicago, Illinois).

Results

A total of 346 patients were evaluated. Eighty-five eligible patients were excluded from the study because either the chart (9 instances) or the patients (76 instances) were unavailable. The study population was predominately male ($n = 206$, 79%). The ages of the patients participating in the study ranged from 30 years to 102 years. The mean ± SD age was 83 ± 11.8 years. Payer mix included Medicaid (46%), Medicare Part A (36%), private pay (11%), and hospice (7%). Diagnosis codes varied and included 10 respiratory-related and 44 nonrespiratory diagnoses. Three of the 5 most frequently occurring diagnoses were pulmonary related, and included unspecified viral pneumonia ($n = 17$), pneumonia organism unspecified ($n = 21$), and chronic obstructive pulmonary disease ($n = 48$). The remaining 2 most frequently occurring diagnoses were cardiac arrhythmia ($n = 74$) and unspecified essential hypertension ($n = 18$).

Recommendations for changes in the patient's plan of care were made in slightly more than half of the study population ($n = 153$, 59%) (Table 1). Reductions in flow rates or F_{IO_2} were made in 5% of those evaluated. The RTs recommended that oxygen therapy be discontinued in

Table 2. Summary of Savings to the Participating Skilled Nursing Facilities

Month	Days Saved by Discontinuing Continuous Oxygen Therapy Order	Days Saved by Changing Continuous to As-Needed Oxygen Therapy	Dollars Saved by Discontinuing Continuous Oxygen Therapy Order	Dollars Saved by Changing Continuous to As-Needed Oxygen Therapy
January	398	46	$2,292.48	$264.96
February	210	61	$1,209.60	$351.36
March	294	166	$1,693.44	$956.16
Total	902	273	$5,195.52	$1,572.48

20.5% of the study population. On application of the protocol, recommendations to initiate oxygen therapy occurred in 5% of the population ($n = 13$). Oxygen was administered for a total of 720 hours (30 d) in this group and had an associated cost of $172.80. The remaining 13.2% ($n = 46$) of the recommendations were suggested to ensure compliance with guidelines for complete oxygen therapy orders. Very few patients received oxygen therapy without a written physician order ($n = 5$, 2%).

A cumulative savings of 1,175 billed days resulted from discontinuing oxygen therapy (Table 2). A total of 902 saved billed days were realized when orders for continuous oxygen therapy were discontinued per protocol. An additional 273 billed days were saved when continuous orders were changed to as-needed, whereby no oxygen use was recorded.

Applying the Medicaid per diem rate to the number of days that continuous oxygen therapy was not billed for resulted in a quarterly cost savings of $5,195.52. A quarterly savings of $1,572.48 for nonbilled days resulted when oxygen therapy was changed from continuous to as-needed (see Table 2). Accounting for the cost of initiating oxygen therapy per protocol, a total cost savings of $6,768.00 was realized.

Discussion

The economic impact of health-care reform caused a shift in the provision of care along the spectrum from the acute-care setting to long-term care or home care.[10] This shift along the continuum of care resulted in the transfer of more acutely ill patients from the hospital to alternate care sites.[11] The need for increased services and higher levels of care in this long-term-care setting, particularly in skilled nursing facilities, must be addressed to ensure appropriate matching of services to the individual's need. Specifically, with regard to the provision of oxygen therapy, the economic and clinical merit of respiratory care protocols in the acute-care setting is well documented.[12,13] The changes in the health-care delivery system drive a need for protocol-based respiratory care along the continuum of care. Therefore, it is not unimaginable that similar results can be obtained from implementation of respiratory care protocols, particularly oxygen protocols, in the long-term-care setting.

The challenge to implementing respiratory care protocols in alternate care venues, such as skilled nursing facilities, is that few facilities directly employ RTs. Many skilled nursing facilities do not provide complex respiratory services and are unable to financially support the employment of RTs. In these cases, protocol implementation may be hindered if RTs are not on staff to provide individualized, thorough patient assessments and allocate respiratory care based on therapeutic need.

This prospective study is unique in that the researchers recognized the aforementioned barrier to protocol implementation in their research design. Protocol application was performed in a nontraditional manner. The RTs applying the protocol were employed by the vendor supplying the respective facilities with respiratory-related durable medical equipment and supplies. This method of protocol application offered a unique way to derive financial and quality-of-care outcomes at alternate care sites. However, this altered the typical process associated with the implementation of respiratory care protocols. Since the RT was not directly employed by the facility, an additional step was needed to ensure compliance with state guidelines for medical order transcription. The RT was unable to transcribe an order or independently make the necessary adjustments to the flow rate, F_{IO_2}, or use of oxygen therapy. Therefore, a recommendation for the algorithm-based change was written. The recommendation was discussed with a facility designee, who then took responsibility for contacting the physician, obtaining the order, and carrying out the suggested plan. This extra step required good communication and interdisciplinary teamwork.

A majority of patients, nearly 56%, had advanced chronic stable hypoxemia or unstable disease conditions and did not require a change in their oxygen therapy plan of care. The protocol used in this study incorporated a loop for repeated evaluation of patients who required continued oxygen use. The algorithm also integrated a mechanism for repeated assessments to ensure that the most appropriate level of oxygen support was delivered. Interestingly, oxygen therapy was initiated on 13 patients without oxygen therapy orders. These patients were receiving other forms of respiratory care, such as medicated aerosol therapy, and were evaluated by the RT on request of the facility's nursing staff. The indications for initiation of ox-

ygen therapy were met and recommendations for therapy were accepted for all 13 patients by the attending physician. The initiation of oxygen therapy may have prevented a patient transfer to the emergency room or a hospitalization. The additional cost of oxygen therapy in this subset of the study population was negligible and totaled only $172.80. However, the ability to accurately collect outcome data related to the initiation of oxygen therapy was a limitation of this study. The effect the initiation of oxygen therapy per protocol had on morbidity and mortality of the population in the alternate care setting is of notable interest and worthy of further investigation.

Incomplete or missing orders for oxygen therapy were a frequent occurrence in this study. Although we did not specifically gather this data, anecdotal experience suggests that order-entry errors may be attributed to communication problems and lack of knowledge about what constitutes a complete oxygen order. Miscommunication between the discharging facility and the admitting skilled nursing staff, incorrect transcription of hospital discharge orders, and transcription errors made by the admitting nurse may account for order errors and omissions. It is easy for transcription errors to occur if the staff, from the referral source or admitting facility, is not familiar with the regulatory guidelines established for complete oxygen orders. The creation of a template for oxygen orders may address this problem and provide a mechanism to guide the correct transcription of oxygen orders. An example of an order template would be: "Oxygen by _____ (insert type of oxygen delivery device) at __ L/min, delivered _____ (insert either *continuous*, *as-needed*, or *during sleep*). as-needed use for _____ (insert guidelines or rationale for as-needed use)."

The recommendation of as-needed oxygen orders often served as a buffer to reduce the apprehension or anxiety experienced by the patient or direct care staff in association with discontinuation of oxygen therapy. It was much easier to overcome the fear of discontinuing therapy when an as-needed order was approved and the oxygen delivery system was left in the patient's room if needed. The staff was more apt to support and obtain an order to discontinue oxygen when there was actual proof that the oxygen delivery system and device were readily available and not used. There were instances when oxygen therapy was needed only at specified times, such as with meals, during physical activity, and for chest pain. In these instances, as-needed orders allowed for the appropriate matching of therapy to patient need and avoided the use and expense of continuous oxygen therapy when the indication for use was not met. From a cost standpoint, the savings associated with the use of as-needed orders was nearly one fourth (23.2%) of the total savings.

This study had many limitations, such as the inability to establish a control group to compare and statistically analyze the effect the protocol had on cost, morbidity, and mortality. The use of a control group would have also allowed for a more accurate calculation of cost savings realized by protocol implementation. The assumption taken in this study was the duration of a month's time period, which is a typical billing cycle. In reality, the cost savings reported in this study are conservative. In all probability, the cost savings reported may be underestimated, since patients could have potentially been receiving and incurring charges for oxygen therapy beyond the time frame limitations imposed by this study. Additionally, the cost-savings associated with this study was a best estimate. Standards governing the pricing durable medical suppliers may employ are lacking, with respect to the provision of oxygen-related products and services. The costs for oxygen-related durable medical equipment varies by supplier. The only common denominator is that suppliers may not exceed the Medicaid per diem rate. To derive the best estimate of cost savings, the Medicaid per diem rate of $0.24 per hour was applied uniformly to the study population, without regard to payer status.

It may seem atypical for a vendor to be concerned with improving the financial outcomes of their customers. Vendors may be unlikely support for this type of protocol application, because of the additional expense of hiring RTs to implement protocol-driven care and the potential revenue loss through the discontinuation of goods sold (oxygen in this case) to the customer base. However, this "out of the box" thinking may reap benefits that reach beyond the positive patient and financial outcomes established in the literature. The ability to document the improved quality of direct care and financial outcomes is a powerful marketing tool that can be used by skilled nursing facilities. Feedback to referral sources (long-term acute care facilities, hospitals) may positively impact census by increasing the number and/or severity of illness of patients transferred to that nursing home. Quality and financial outcomes data may also enhance the negotiation of the contracted rate for patients with managed-care health coverage. The vendor, of course, would benefit from improvements in nursing-home census, particularly if those admitted were in need of respiratory-related products and services. The ability to provide respiratory consultative services, implement protocols, and report outcomes could be a powerful marketing tool vendors could use to increase their market share. In considering implementation of a protocol, potential loss of revenue should not be a concern; therapy not indicated (or needed) should not be billed. However, further investigations are needed to substantiate these potential benefits.

This study established the need for oxygen therapy protocol-based care in the alternate care site venue. The findings demonstrated that positive financial and patient outcomes can be derived from the application of protocol-based care in the

long-term-care environment. The process of implementing this oxygen protocol in skilled nursing facilities was a bit unconventional and somewhat cumbersome. Nevertheless, a paradigm shift was realized, indicating that the use of protocol-based respiratory care is feasible in environments that may not be designed to support their use.

Conclusions

The use of respiratory care protocols for oxygen therapy can be successfully implemented in a nontraditional manner in the long-term-care setting. Successful patient and financial outcomes can be derived from the use of protocol-based care in this sector. A quarterly cost savings of $6,768.00 was realized, even when RTs were not directly employed by the skilled nursing facility. There are many critical elements for implementation of protocol-based oxygen therapy in this venue. Educating the RT on the algorithm for care and protocol evaluation is essential. It is also important to educate the facility staff on the regulations governing complete oxygen orders. Order templates may be beneficial in improving compliance with voluntary and state-mandated accrediting bodies, by prompting staff to transcribe orders correctly. Communication and cooperation for the coordination of care between the RT and the facility's direct-care staff is also an essential element for successful implementation of protocol-based care.

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APPENDIX

Respiratory Assessment

Evaluation Status: □ New Admission □ Re-evaluation □ Monthly □ Status Change Record # _____

Patient: _____ **Date:** _____

D.O.B _____ **Room #** _____ **Facility:** _____

Diagnosis: _____ **Physician:** _____

Physical Assessment

RR: _____ □ Regular □ Labored □ Deep □ Shallow

□ Dyspnea on exertion □ Use of accessory muscles □ Periods of Apnea _____

Pulse Oximetry Results: _____% **Heart Rate:** _____ □ Room Air
□ Supplemental Oxygen _____

Breaths Sounds: □ Clear _____ □ Decreased _____
□ Rales/Crackles _____ □ Wheezes _____
□ Rhonchi _____ □ Other _____

Cough: □ Strong, non-productive □ Strong, productive
□ Weak, non-productive □ Weak, productive
□ No spontaneous cough □ Requires suctioning

Sputum: Color: _____ Amount: _____ Consistency: _____

Activity Level: □ Ambulatory □ Ambulates with assistance □ Non-ambulatory

Lab and Radiology Results

Chest x-ray: Date: _____ Results: _____
Arterial blood gases: Date: _____ Results: _____
Blood counts: Date: _____ WBC: _____ Hb: _____ Other: _____
Sputum culture: Date: _____ Results: _____

Current Respiratory Orders: _____

_____

Suggested Plan of Action: _____

_____

_____

Comments: _____

Therapeutic Objectives: □ Bronchodilation □ Improve or promote cough
□ Mobilization of secretions □ Improve arterial oxygenation
□ Prevent or treat atelectasis □ Improve alveolar ventilation

Respiratory Therapist _____