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Developing an Evidence-Based Interprofessional Algorithm to Apply Noninvasive Ventilation in Acute Exacerbation of COPD

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Abstract

BACKGROUND: When administered as first-line intervention to patients admitted with acute hypercapnic respiratory failure secondary to COPD exacerbation in conjunction with guideline-recommended therapies, noninvasive ventilation (NIV) has been shown to reduce mortality and endotracheal intubation. Opportunities to increase uptake of NIV continue to exist despite inclusion of this therapy in clinical guidelines. Prior studies suggest that efforts to increase NIV use in acute exacerbation of COPD (AECOPD) need to account for the complex and interprofessional nature of NIV delivery and the need for interprofessional team coordination.

RESEARCH QUESTION: We sought to develop an evidence-based interprofessional algorithm to apply NIV in AECOPD to improve the appropriate utilization of NIV in AECOPD.

STUDY DESIGN AND METHODS: In this prospective qualitative descriptive study, subject matter expert physicians, nurses, and respiratory therapists practicing in a variety of clinical settings caring for patients with AECOPD were recruited for semistructured interviews. The

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Consolidated Criteria for Reporting Qualitative Research checklist was followed for interview development. Interview themes applicable to interprofessional collaborative practice were identified using deductive thematic analysis. An NIV algorithm based on recent society guidelines was constructed. Interprofessional team tasks appropriate for each phase of the NIV process were integrated into the algorithm.

RESULTS: We present an interprofessional team-based algorithm for delivery of NIV in AECOPD inclusive of patient selection and initiation, titration, monitoring, and weaning of NIV. The goal is to increase appropriate uptake of NIV in the AECOPD population.

INTERPRETATION: The identified roles and responsibilities of an interprofessional team could be integrated into an interprofessional education program pertaining to use and management of NIV for patients with AECOPD emphasizing collaborative best practice, interprofessional team communication, and support of professional autonomy when appropriate.

Keywords

acute exacerbation of COPD; COPD; interprofessional team; noninvasive ventilation

When administered as first-line intervention to patients admitted with acute hypercapnic respiratory failure secondary to COPD exacerbation in conjunction with guideline-recommended therapies, noninvasive ventilation (NIV) has been shown to reduce mortality and endotracheal intubation. Opportunities to increase uptake of NIV continue to exist despite inclusion of this therapy in clinical guidelines. In this paper, we describe the methodology used to develop an evidence-based algorithm speaking to patient selection and initiation, titration, monitoring, and weaning of NIV in treatment of acute exacerbation of COPD (AECOPD), incorporating tasks promoting the necessary interprofessional collaboration among physicians, nurses, and respiratory therapists caring for these patients. This manuscript serves as a companion to our recently published paper.¹ The latter paper describes the implementation of our interprofessional evidence-based algorithm into clinical practice. The goal of the study is to foster appropriate uptake of NIV in patients with AECOPD. To do so, we use methods which showcase the interprofessionalism required for NIV uptake.

NIV is guideline-recommended therapy for patients hospitalized with acute hypercapnic respiratory failure secondary to AECOPD.^{2,3} Furthermore, randomized controlled trials and meta-analyses show a reduced likelihood of mortality and endotracheal intubation in patients admitted with acute hypercapnic respiratory failure secondary to COPD exacerbation when NIV is instituted as a first-line intervention in conjunction with usual care.⁴⁻⁶ Despite the available evidence, opportunities exist to increase the uptake of this therapy. Prior studies suggest that efforts to increase NIV use in COPD exacerbation need to account for the complex and interprofessional nature of NIV delivery and the need for team coordination.^{7,8} Successful application of NIV and improved patient outcomes is facilitated by involvement of the interprofessional team of physician, nurse, and respiratory therapist interacting effectively and with each team member contributing unique clinical skills in the ED, ICU, or intercare/stepdown unit.⁸

Previously identified barriers to NIV use include perceived patient discomfort, whether the roles of interprofessional team members are truly understood, and whether interprofessional team training sessions occur in a manner which meet team needs (eg, live, in a classroom setting).⁸

Interprofessional collaboration occurs when two or more professions work together to achieve common goals or aims.⁹ Teamwork in health care is defined as a cohesive group with shared identity, clarity, interdependence, integration, and shared responsibility.¹⁰ Ineffective teamwork and team communication in health care settings are associated with increased patient harm and sentinel events.^{11–14} Furthermore, there has been a call for more research in a multidisciplinary/interprofessional rather than a siloed approach to health care delivery, recognizing the risk in health care complexity and trend toward precision medicine.¹⁵

Intuitively, it makes sense that interprofessional teams bring more abilities, knowledge, skills, and resources to a clinical problem, but simply putting a team together is not enough. Teams composed of multiple disciplines or professions produce higher-level innovations when the team demonstrates a collaborative process marked not only by task orientation but also frequent interaction, participation from all involved in a safe space, and buy-in to a shared common vision.¹⁶ Effective teams have specific attributes including clarity of roles, goals, and responsibilities; inclusion; psychological safety; and self-reflection.¹⁷ A seminal study reported that physicians, respiratory therapists, and nurses must work together when selecting patients with AECOPD for NIV to achieve optimal clinical outcomes and decrease unnecessary intubation.¹⁸ The importance of promoting interprofessional team communication among physicians, nurses, and respiratory therapists caring for patients with AECOPD on NIV has been explored from the subject matter expert (SME) nurse perspective.¹⁹ Frequent patient assessment, novice nurses' need for clinical support, team communication, and nursing education were themes identified from SME nurses caring for patients with AECOPD on NIV. Cognitive task analysis has been used to identify interprofessional team-based tasks important in the application of NIV in AECOPD.²⁰ Cognitive task analysis focuses on identifying key steps and decision points that contribute to development of best practice strategies at the point of care. Shared cognitive tasks pertaining to application of NIV in patients with COPD include completing a thorough patient assessment, formulating a care plan, and continuously monitoring patient status.

Study Design and Methods

We present the method used to develop an interprofessional team-based model for delivery of NIV in COPD exacerbation with the approach described herein inclusive of the necessary and essential interprofessional collaboration among physicians, nurses, and respiratory therapists through patient selection and initiation, titration, monitoring, and weaning of NIV. Although published reviews speaking to the management of NIV in acute respiratory failure mention the need for an experienced health care team,⁶ by specifying roles unique to clinical care team members, we present the first known evidence-based algorithm steeped in the realities of interprofessional care to guide patient selection, titration, monitoring, and

weaning of NIV in treatment of AECOPD. In this way, we aim to improve the uptake of NIV as part of the treatment for COPD exacerbation.

Study Design and Setting

This prospective observational study was conducted as part of a National Institutes of Health RO1 award to improve the uptake of NIV through interprofessional education.⁷ This study took place in a tertiary academic teaching hospital in the Northeastern region of the United States that takes care of approximately 450 patients with COPD per year. It was part of a larger study that recruited SME physicians, nurses, and respiratory therapists for the purpose of increasing the effective use of NIV to treat acute exacerbation of COPD.⁷ The University of Massachusetts Baystate Health institutional review board deemed the study appropriate for waiver of consent (Board No. BH-19-137).

Identifying Components of NIV Tasks

The algorithm development team included key stakeholders in the fields of hospital medicine, pulmonary medicine, pulmonary nursing, and respiratory therapy, versed in the subject of NIV. Multiple team meetings were held to identify and discuss key elements of patient selection and initiation, titration, monitoring, and weaning of NIV. As a starting point, the algorithm development team used an unpublished algorithm provided by one author (N. S. H.) speaking to the application of NIV for acute respiratory failure. The algorithm for application of NIV for AECOPD underwent at least 12 iterations before being finalized.

Multiple guidelines were consulted including current society guidelines,² American Thoracic Society documents,²¹ Cochrane Library reviews,⁵ quality guidelines,²² and selected review articles.⁶ Review articles pertaining to specific clinical situations (eg, palliative care,²³ high-intensity NIV²⁴) were included. Papers focusing on use of high-flow nasal cannula in acute respiratory failure^{2,3,25} and patient-ventilator interactions^{26–30} were reviewed. Additional references pertaining to NIV in acute hypercarbic respiratory failure secondary to AECOPD can be found in our companion paper.¹

Identifying Roles of Physician, Nurse, and Respiratory Therapist

Recruitment: SME³¹ physicians, nurses, and respiratory therapists were recruited from the ED, intercare/stepdown units, and rapid response team to gather information about their experience related to caring for patients experiencing COPD exacerbation incorporating NIV as part of the treatment plan. Additional detail for recruitment can be found in a prior publication from the study group.²⁰ Directors and managers of these respective groups were asked to provide names of SME or peer role models with superior knowledge of NIV in AECOPD. Identified SMEs were invited for an interview by a recruitment email including a copy of the study information sheet sent by members of the research team. It was decided a priori to interview a minimum of five participants per role.³² Characteristics of SME interviewees are summarized in Table 1. Crispen and Hoffman,³¹ using findings from expert systems and cognitive task analysis, concluded that knowledge elicitation or task decomposition can be conducted with three individuals who qualify as genuine experts.

Case Scenario: The scenario discussed in SME interviews involved a patient experiencing a severe COPD exacerbation defined by the Global Initiative for Chronic Obstructive Lung Disease guidelines,³³ namely an acute event characterized by a worsening of respiratory symptoms beyond normal day-to-day variations and leading to a change in medication. Global Initiative for Chronic Obstructive Lung Disease guidelines support prompt treatment with bronchodilators, glucocorticoids, antimicrobials and/or antivirals when appropriate, and supplemental oxygen targeting saturation of peripheral oxygen of 88% to 92%. The scenario discussed is as follows: “The patient has severe COPD; is already receiving oxygen, bronchodilators, steroids, and antibiotics if needed; and is in respiratory distress. How do you decide if the patient should be placed on NIV and who do you contact?”

SME Interviews and Guide: Semistructured interviews were conducted by trained members of the research team (including K. L. R.) to identify thought process applied in the care of patients experiencing AECOPD based on the case scenario. Interviewees were asked (1) to describe their step-by-step approach to assessing and deciding further action for the patient in severe respiratory distress (eg, advocating for a trial of NIV vs invasive mechanical ventilation) and how they care for a patient on NIV, (2) to identify cues or patterns overlooked by a novice that could signal worsening respiratory distress and might require escalation of care, and (3) to describe the level of support and collaboration experienced with colleagues from other professions. Interviews were 60 min in duration and occurred via video conference or telephone. In-person interviews were part of the original plan; however, because the study plan spanned the COVID-19 pandemic, interviews had to be conducted via video and telephone in compliance with mandates set by the Centers for Disease Prevention and Control during the pandemic. The Consolidated Criteria for Reporting Qualitative Research checklist (e-Appendix 1) were followed.³⁴ All interviews were recorded, transcribed, returned to interviewees for comment/correction, and deidentified for subsequent analysis.

The interview guide published as part of a prior publication from this study group²⁰ went through several iterations. Initially, questions were developed by members of the study team with expertise in internal medicine and pulmonary medicine (including M. J. S. F.). Subsequently, a member of the study team with expertise in human factors and qualitative approaches (A. M. H.) reviewed a draft of these questions. Finally, the interview guide was piloted with two members of the study team (including M. J. S. F.) and two physicians external to the study team to check for understanding. Questions were modified for clarity, redundant wording was eliminated, and content from several questions was consolidated to improve the flow of questions during the interview.

Data Analysis: Interview transcripts were reviewed alongside the recording for deidentification and accuracy. Interviewees were then sent a copy of the initial results in aggregate and were asked to provide a response, including any corrections. Data saturation was achieved as it became apparent that no novel information was extracted from the interviews from our center.

Two independent trained reviewers (M. J. S. F. and C. D. C.) subsequently analyzed transcripts using deductive thematic analysis,³⁵ which provides a flexible and pragmatic

approach to collecting and analyzing narrative accounts in a rich and detailed way. Deductive thematic analysis adopts a framework approach that is applied preinterview, when the researcher identifies issues to be investigated while maintaining flexibility to allow new themes to be uncovered. Themes were organized along the core components of the perfect medical team framework, which stipulates patient-centeredness, roles and responsibilities, teamwork among the clinical care team, and interdependent tasks as core components for successful clinical teams.³⁶ The six-phase guide by Braun and Clarke³⁵ is as follows: (1) familiarization with data, (2) generation of initial code, (3) search for themes, (4) review of themes, (5) definition and names of themes, and (6) production of the report. The final analysis consisted of using selected extracts from the interviews and relating them back to research questions. Because the overall purpose of the current paper is to provide a more clinically relevant summary of the work, greater depth on this method, including step-by-step processes for data analysis and validation of qualitative data, is provided in the paper on cognitive task analysis for this study group.²⁰

Results

A total of 21 SMEs participated in the interviews: a total of seven physicians including four hospitalists and three ED physicians, nine registered nurses including three ED nurses, three intercare/stepdown floor nurses, and three rapid response team nurses, and five respiratory therapists (Table 1).

Major SME Interview Themes

Teamwork Among Clinical Team Members Comes First: The importance of interprofessional team interaction and communication when managing patients on NIV was expressed by SME interviewees. Working as a team means more than gathering in the same workspace. Collaboration and communication with other team members is important from the initial patient assessment through development and execution of a plan of care. Representative quotes speaking to the importance of team are subsequently included.

Emergency room physician 1 stated the following:

So, I like to be collaborative . . . for two reasons. One is that sometimes someone comes up with a really good idea, which never crossed my mind, and I am always surprised how frequently that happens. The other reason is that frequently I am not available to assess the patient so I would like to have a conversation with everybody as to what I think is going on and what I am concerned about so they can act as my proxy.

Floor registered nurse 1 stated the following:

For me . . . the team approach is best because you get the information right then and there. The pulmonologist is the best resource for these patients. Respiratory and RRT [rapid response team] nurses are a great resource as well. We have residents that are on our unit and the attendings, so, I like to have everyone here. I try to get them to come as soon as you see a problem . . . it works better.

Respiratory therapist 5 stated the following:

I believe we should all be present for the initial evaluation and physical assessment of the patient . . . and come to a plan between nursing and physician and therapist. We all talk about what the patient looks like now and what we expect the patient to look like in a relatively short period of time and come up with a plan of whether to keep on NIV or intubate the patient . . . if the patient is not doing well, I like to be called back along with the physician and we might make a different plan from there.

Include the Patient in the Team: Given the emphasis on shared decision-making, patient engagement, and patient buy-in, an important member of the team is the patient. Interviewees expressed that patients, families, and caregivers should be routinely brought into the discussion during the patient selection and initiation process as part of the process to improve uptake and compliance with NIV.

Respiratory therapist 3 stated:

We need the patient's compliance . . . if we just start doing what we need to do without letting the patient in on the plan, then there is more resistance, that is a time lapse that we could have dropped if we just included the patient with what we were doing . . . we communicate with the doctor during our time with the patient . . . so the doctor can see the benefit of including the patient.

Roles and Responsibilities: Both shared and unique responsibilities of interprofessional team members were identified throughout the process of NIV initiation, titration, monitoring, and weaning. Selected physician, nurse, and respiratory therapist responsibilities (Fig 1, Table 2) were extracted from SME interviews pertaining to patient assessment, setup of NIV including alarms and settings, recognizing signs of deterioration, recognizing signs of respiratory improvement, escalation of care, and patient education.

Putting It All Together: Integration of Interprofessional Team Roles With Steps of NIV Delivery: the Final Product

The resources used to build the foundation for our evidence-based NIV guideline speaking to patient selection and initiation, titration, monitoring, and weaning of NIV in treatment of AECOPD were identified. Major themes from SME interviews were incorporated into the algorithm as tasks identified for physicians, nurses, and respiratory therapists. The final NIV interprofessional team algorithm informs all members of the interprofessional team with practical information during the steps of NIV patient selection and initiation, titration, monitoring, and weaning in AECOPD.

Discussion

An Opportunity for Education

Knowledge of evidence-based best practice and cooperation between different caregiver groups may not necessarily translate to improved bedside clinical care. This issue was addressed by identifying the roles of the physician, nurse, and respiratory therapist from SME interviews, then integrating this information into the NIV algorithm. We then took this

knowledge one step further and delivered a training program to identified physician, nurse, and respiratory therapy champions from various hospital systems as part of a larger National Institutes of Health grant with the aim of increasing uptake of NIV as part of treatment for AECOPD. Although a detailed description of this education program is out of the scope of this paper, real-time development of a plan of care at the bedside as part of a collaborative discussion between physicians, nurses, and respiratory therapists was thought to be the most effective way to manage a patient on NIV. Each member of the interprofessional team contributes a different palette of clinical skills to the management of patients with AECOPD. Therefore, this education was not simply task oriented but also incorporates features of collaborative best practice (Fig 2), incorporates interprofessional team communication, and supports autonomous function of each profession when appropriate.

Limitations

The SME interview data used to build the interprofessional team roles and responsibilities of the algorithm reflect the subjective views of the interviewees from a single medical center. Because scope of practice varies regionally and institutionally, further study is needed to better understand the roles of physicians, nurses, and respiratory therapists and their educational needs pertaining to NIV use in AECOPD across a variety of institutions where scope of practice may vary.

Interpretation

We describe a method for developing an evidence-based algorithm for delivery of NIV in AECOPD inclusive of the necessary interprofessional collaboration among physicians, nurses, and respiratory therapists at a tertiary medical center. The effect of interprofessional team collaborative practice in consistently promoting patient safety and positive outcomes pertaining to the use of NIV in AECOPD remains an area for further study.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Role of sponsors:

The content of this study is solely the responsibility of the authors and does not necessarily represent the official views of the Department of Veterans Affairs, U.S. Government, or any of its affiliated entities.

ABBREVIATIONS:

AECOPD	acute exacerbation of COPD
NIV	noninvasive ventilation

SME

subject matter expert

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Take-home Points

Study Question:

We sought to develop an evidence-based interprofessional algorithm to apply noninvasive ventilation (NIV) in acute exacerbation of COPD (AECOPD) to improve the appropriate utilization of NIV in AECOPD.

Results:

We present an interprofessional team-based algorithm for delivery of NIV in AECOPD inclusive of patient selection and initiation, titration, monitoring, and weaning of NIV. The goal is to increase appropriate uptake of NIV in the AECOPD population.

Interpretation:

The identified roles and responsibilities of an interprofessional team could be integrated into an interprofessional education program pertaining to use and management of NIV for patients with AECOPD emphasizing collaborative best practice, interprofessional team communication, and support of professional autonomy when appropriate.

RESPONSIBILITIES of INTERPROFESSIONAL (IP) TEAM MEMBERS DELIVERING CARE to PATIENT WITH AECOPD on NIV		
PHYSICIAN	NURSE	RESPIRATORY THERAPIST
<ul style="list-style-type: none"> • Lead selection for NIV • Order NIV and settings • Order level of care and escalate if necessary • Determine components of assessment (ABG, exam) • Identify therapeutic goals • Clarify titration orders • Determine frequency of re-assessments by IP team • Clarify frequency of updates • Ensure de-escalation plan is clear as patient stabilizes • Lead team goals of care discussion 	<ul style="list-style-type: none"> • Complete neurologic assessment including mental status • Identify NIV contraindications • Monitor for nausea & vomiting • Ensure patient can follow commands, cooperate with staff, and use call bell • Medicate for pain, anxiety and nausea prophylaxis in collaboration with physician • Notify physician and RT with concerns about oxygenation or respiratory status • Increase presence at bedside during NIV administration 	<ul style="list-style-type: none"> • Complete respiratory assessment including ABG • Obtain NIV equipment • Ensure NIV connected to central alarm system • Obtain mask, fit and adjust • Initiate, titrate, and monitor NIV via physician order or protocol • Assess mask comfort, tolerance, leak, subjective response, breathing effort, synchrony, gas exchange • Repeat ABG as per IP team discussion • Escalate level of care as per IP team discussion

Figure 1 –. Responsibilities of IP team members delivering care to patients with acute exacerbation of COPD on NIV. ABG = arterial blood gas; IP = interprofessional; NIV = noninvasive ventilation; RT = respiratory therapist.

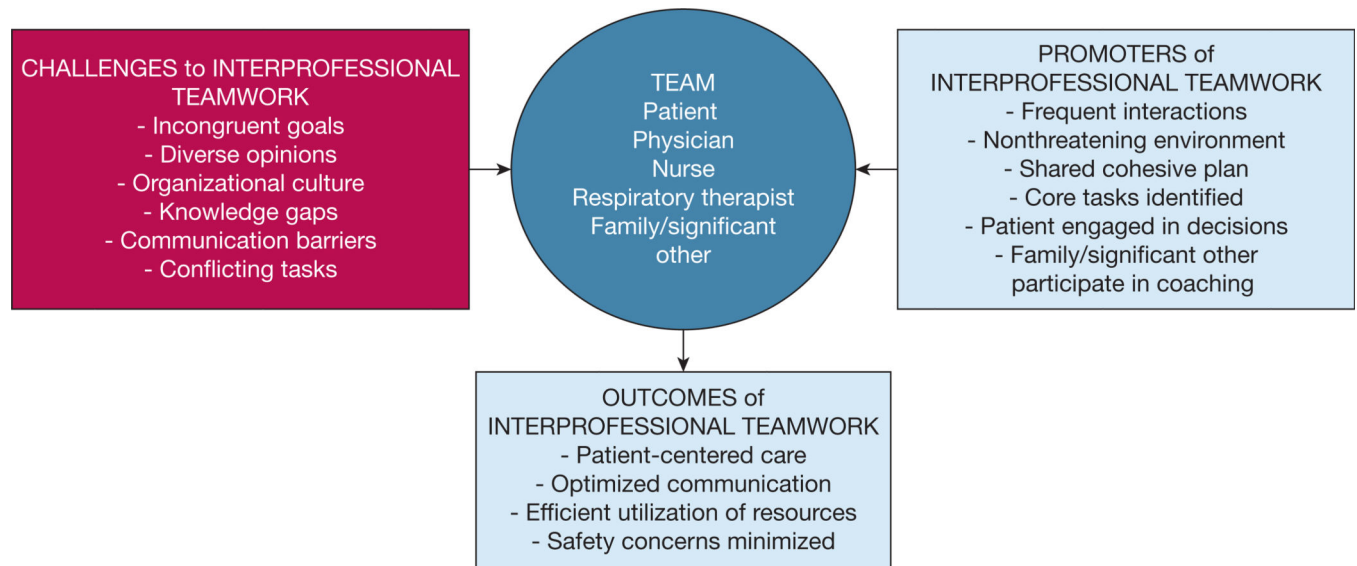


Figure 2 –. Factors that challenge and promote interprofessional teamwork and positive outcomes. At the center of the diagram is the team. Listed are challenges to and factors that promote interprofessional teamwork and expected outcomes of interprofessional teamwork. (Data from Stoller¹⁷).

TABLE 1]
Characteristics of Subject Matter Expert Interviewees

Profession (No. Interviewed)	Years in Current Position	Years of Service
ED physician (3)	11 (7–36)	15 (7–36)
Hospitalist (4)	13.5 (10.5–14.5)	14 (10.5–15.5)
ED nurse (3)	13 (7–19)	14 (10–19)
Floor nurse (3)	17 (2–25)	22 (2–32)
Rapid response nurse (3)	3 (3–9)	22 (20–35)
Respiratory therapist (5)	11 (8–14)	21 (14–24)

Values are reported as No. and median (25th-75th percentile), unless otherwise indicated.

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TABLE 2]

Themes and Supporting Quotations Identified From Subject Matter Expert Interviews

Theme	Quotation
Initiation of NIV	
Patient assessment Setup NIV	EDP 1: "Respiratory therapists listen to the lungs themselves . . . know the past medical history . . . when they say what setting do you want, I ask them what settings they think . . . they do this 100 times a day and I do not. I start with 10/5 and either 50% or 100% FIO ₂ . Anything that decreases my cognitive load is great since I could be caring for 20 patients all sick . . . dealing with patient flow issues . . . and teaching."
Setup NIV Team communication	EDP 3: "I know the RTs all very well . . . I do not necessarily watch what they are doing unless there is a problem . . . sometimes I do not even tell them what NIV settings I want . . . settings just magically appear and the patient looks better. I am a big fan of closed loop communication . . . so if I leave the room and say hey, I am going to put this patient on a trial of noninvasive . . . if in 10 minutes they are still having this work of breathing then here is what we are going to do . . . I try to give a concrete plan if I am stepping out so everyone knows the same thing."
Patient assessment	RRTRN 1: "We will get called if the nurse is concerned but does not recognize what is happening or the patient is belly breathing or agitated . . . We usually listen to the nurse on the phone about their concerns while we are on the way over so we can target our assessment when we get there. Once I go in the room, it is the first quick look thing . . . is the patient conscious? Are we recommending invasive or noninvasive . . . how bad is their work of breathing? What is their mental status? If it is somebody who is still awake and in respiratory distress, but not obtunded or apneic, then we have a little more time to figure out what is going on and if noninvasive would be good for them."
Collaboration	RT 3: "Use the algorithm just as a guide . . . usually clinical skills are what we go by along with the nurse's skill set."
Team communication	EDP 3: "Respiratory triangle of work of breathing, oxygenation level, mental status . . . if any one of those things is out of whack in a patient with COPD that is when I go to noninvasive . . . if they are altered . . . I do not think I can put them on noninvasive ventilation . . . if a little bit sleepy then I will give noninvasive a try and stand at the bedside and watch them because that is a high-risk patient . . . I rarely get an arterial blood gas [ABG] in my patients with COPD . . . it is more how they are looking, what is work of breathing, oxygen saturation and mental status so ABG does not do much for me."
	HP 1: "Are we distinguishing between CPAP and noninvasive ventilation . . . need ABG because if COPD and hypercarbia, try noninvasive ventilation; if COPD and hypoxia, try hi-flow. An experienced hospitalist might not follow guidelines every time ABG indicates intubation. Working with RT and nurses, hospitalist might experience that if ABG requested in a patient with known COPD, RT may push back and ask why ABG is needed if you know this patient has COPD. RT wants to start noninvasive ventilation and see if patient responds by assessing mental status."
Titration of NIV	
Patient assessment Recognize deterioration	EDP 2: "Nurses are pretty good at being able to say I think this guy needs more support . . . they will call RT before they call us or at the same time . . . they recognize the patient is not doing well on NIV, looks uncomfortable, sweaty, not answering questions quite as well on NIV. So, they are not making decisions but they are doing a good job recognizing what is going on."
Patient assessment	RT 1: "We don't have a black and white protocol . . . titration depends on oxygen saturations and ABG results . . . adjust tidal volume and EPAP according to patient assessment."
Assessment of patient as a team	RT 5: "It's not only about machine and setting, but we think as a team how you make this decision based on what you see . . . listen to breath sounds, moving any air, monitoring pulse oximetry, responding to bronchodilators, accessory muscle work, really struggling, cannot talk in full sentences, instituting another form of therapy."
Escalation of care when appropriate	HP 1: "RT availability to perform that extra task may be an important issue. Availability of higher level of nursing such as a rapid response nurse to assist with patient in distress rather than relying on bedside nurse is a consideration in staying with NIV."
Monitoring of NIV	
Patient assessment	EDP 3: "You're putting them on NIV and staying at bedside . . . for 10–15 minutes . . . hopefully start to look good and then maybe you check back again in another 15 minutes . . . maybe come back in 5 minutes . . . this depends on the quality of your nurses as well."
Team communication	RT 4: "Communication with other team members . . . during initiation, titration, and monitoring is important. I always talk with the nurses . . . explain to the nurses and doctors the reasoning why I am putting the patient on NIV, what mode and why the settings. I talk to the doctor in person . . . and I will page them after like an hour if I must go up on the setting and I will say, hey, I must go up on the setting for this patient . . . I always try and find the nurse and discuss the plan."

Theme	Quotation
Respiratory signs of improvement	FRN 3: "Even without any medications, being on NIV should be eliciting some kind of change in them quickly. Usually, I think the biggest sign is if the patient is relaxing into it. Because when you cannot breathe and you want air in your lungs, and then we put a tight mask on your face because we do not want an air leak; if they are able to relax and say yes, this is helping me; because if it is going to work, it is going to start working quickly."
Recognizing physical signs of deterioration	RT 5: "New respiratory therapists tend to look at . . . how well the patient is oxygenating, but the true test is to assess work of breathing and removal of CO ₂ . . . by obtaining an arterial blood gas; but the clinician should be able to quickly determine whether the patient is going to tire . . . just by their work of breathing. So accessory muscle use, retracting, tripodding, any of those would be an indicator."
Patient education	EDRN 2: "I usually just tell the patient that, in their situation, why they have the mask on and how it is important that they keep the mask on. I usually try to tell them that the reason they can talk right now is because you have improved to a point where you can because you are taking in all this air and in a better mental status."
Weaning of NIV	
Collaboration	RT 5: "So, within that time period of a half an hour, when we reconvene . . . look at the patient as the physician, the nurse, and the therapist, we should be able to formulate a better plan going long term for the patient, whether it is to continue NIV, discontinue NIV, or proceed to intubation."
Team communication	RT 2: "If NIV doesn't work immediately within half an hour to 45 minutes, we will go to intubation . . . so I ask what the plan of care is . . . a mutual understanding between physician and RT, what's the best course of action to minimize time, minimize effort, save on every aspect of our care, and have an efficient way of providing the care for the patient that will give us a good result in the end . . . Exchange information and plan of care with the nurse . . . we are in the same room talking to each other . . . so, I have this tendency to communicate effectively with nurses and physicians because that gives me piece of mind . . . I stay on top of my game with my patients this way."

EDP = ED physician; EDRN = ED nurse; EPAP = Expiratory positive airway pressure; FRN = intercare/stepdown floor nurse; HP = hospitalist; NIV = noninvasive ventilation; RRTRN = rapid response team nurse; RT = respiratory therapist.