What outcomes should be evaluated in critically ill patients?

Quais desfechos devem ser avaliados nos pacientes graves?

ABSTRACT

Randomized clinical trials in intensive care prioritize disease-focused outcomes rather than patient-centered outcomes. A paradigm shift considering the evaluation of measures after hospital discharge and measures focused on quality of life and common symptoms, such as pain and dyspnea, could better reflect the wishes of patients and their families. However, barriers related to the systematization of the interpretation of these outcomes, the heterogeneity of measurement instruments and the greater difficulty in performing the studies, to date, seem to hinder this change. In addition, the joint participation of patients, families, researchers, and clinicians in the definition of study outcomes is not yet a reality.

Keywords: Patient outcome assessment; Critical illness; Critical care; Prognosis; Intensive care units

INTRODUCTION

Conceptually, the emergence of intensive care units (ICUs) was based on the premise of saving the lives of critically ill patients, i.e., reducing mortality. This goal was achieved in many clinical situations, such as sepsis(1) and acute respiratory failure.(2) This was due to progress in vital organ monitoring techniques,(3) to the organization and specialization of teams(4-6) and to improvements in symptomatic treatments of multiple organ dysfunction syndrome (MODS).(7)

Although the goal - mortality - remains valuable for intensivists, patient-centered outcomes have gained importance over the years. Among these outcomes are more effective pain control, evaluation of medium- and long-term results in those who survive a critical illness and greater attention to caregivers and family members (new class of patients).(8-10)

Thus, the objective of this study is, through a narrative review, to describe the most important outcomes for critically ill patients, compare those with the outcomes most frequently studied in randomized clinical trials (RCTs) and describe possible barriers that prevent the evaluation of patient-centered outcomes in the intensive care setting.

METHODS

This is a nonsystematic review in which the bibliographic references of the retrieved studies were also searched to identify other relevant studies.

The MEDLINE® literature search was conducted in PubMed® on August 25, 2020, using search terms and synonyms for “patient-centered outcome” and terms related to patient-centered outcomes in critical care.
What outcomes should be evaluated in critically ill patients?

In clinical research, a relevant outcome for patients has been previously defined as a characteristic or variable that reflects how patients feel, function or survive. Clinical studies conducted in diabetic patients have shown that survival, quality of life, and functional, cognitive and neurological performance are the most important outcomes sought by this population. However, when patients are placed in the center of care, the importance of doctors and their opinion decrease in the face of decisions, and they feel capable of making such decisions without the need for further discussion or sharing of expectations. Nevertheless, those most interested in outcomes are those who suffer them: the patients. Physicians and researchers should guide patients on technical issues and on the difficulties in measuring outcomes; however, they must include patients in the discussion and to choose the outcomes to be investigated in RCTs. Only with the participation of more patients in the construction of outcomes would this be possible, placing weight on the “preeminence of the values and preferences of the interested party.” Thus, what outcomes should we measure in critically ill patients?

Long-term outcome measures

The study of ICU mortality will always be a marker of care quality. However, the possible adverse consequences of an ICU stay are much better evaluated after discharge from this unit and, especially, after hospital discharge because critical illness is associated with high...
### Table 1 - Categorization of outcomes in intensive care medicine

|Domains| Examples |
|---|---|
|Important outcomes for the patient| Mortality at any time  
Quality of life  
Functional capacity after ICU discharge  
Cognitive capacity after ICU discharge |
|Clinical outcomes| Organ failure  
Adverse events (e.g., drug-induced skin reaction or hypotension during renal replacement therapy)  
Outcomes associated with medical care (e.g., hospital-acquired pneumonia, catheter-related infections) and delirium  
Clinical events (e.g., venous thromboembolism and myocardial infarction)  
Pain (in the ICU)  
Anxiety (in the ICU)  
Level of consciousness  
Return to spontaneous circulation  
Strength/muscle circumference  
Sleep duration  
NIHSS score for acute phase of CVA  
Clinical response to antibiotics  
Dyspnea (in the ICU)  
Tolerance to noninvasive ventilation |
|Biological, physiological, or radiological outcomes| BNP  
NGAL  
Total lung capacity  
X-ray severity score |
|Outcomes related to the decision of the caregiver| Duration of mechanical ventilation  
Length of ICU or hospital stay  
Exposure to antibiotics  
Reintubation  
Exposure to sedation (dose/time)  
Need for renal replacement therapy  
Need for ventilatory support (invasive or noninvasive)  
ICU readmission rate  
Tracheostomy rate  
Need for blood products  
Need for surgical procedure |
|Outcomes related to care performance| Quality of the care procedure  
Exposure to noise  
Exposure to light |
|Other outcomes| Family satisfaction  
ICU staff satisfaction  
Costs and charges  
Judgment of the patient on their readiness for discharge  
Team workload  
Compliance with service protocols  
Medico-legal conflict |

ICU - intensive care unit; NIHSS - National Institute of Health Stroke Scale; CVA - stroke; BNP - brain-type natriuretic peptide; NGAL - lipocalin associated with neutrophil gelatinase.
What outcomes should be evaluated in critically ill patients? Gaudry et al. showed that of the 73 RCTs included in a systematic review evaluating outcomes in critically ill patients, only 17.8% followed the patients for more than 30 days after ICU admission. In addition, the choice of long-term outcomes could hinder the performance and evaluation of clinical studies with critically ill patient populations (Table 2). The higher risk of loss to follow-up may increase selection bias. The high heterogeneity of the instruments used to evaluate patient-centered outcomes in the context of ICU discharge may hinder the adequate summarization and reproducibility of the evidence. For example, in 425 publications examining ICU survivors after hospital discharge, 250 different measurement instruments were identified. Quality of life was the most frequently reported outcome (in 65% of the articles). Physical activity limitations, an outcome that is also highly relevant for patients, appeared in only 6% of the articles. Although this high heterogeneity reflects the growing nature of this research field, it negatively reflects the lack of standardization of measurement instruments, which limits comparisons among studies and hinders the performance of meta-analyses. Finally, many interview instruments have not yet been validated for their application via telephone, a fundamental requirement for the long-term follow-up of patients.

**Evaluation of mortality associated with quality of life**

In the hierarchical distribution of outcomes, mortality always has a prominent role. However, is survival as important for patients as it is for doctors? In studies evaluating the post-ICU life of patients

**Table 2 - Challenges for the greater use of long-term and patient-centered outcomes in intensive care**

| Implementation challenges | Comment |
|---------------------------|---------|
| Loss of follow-up         | Long follow-up periods may result in large losses to follow-up (due to death or sequelae). |
| Selection bias            | More severe patients may become inaccessible over time due to death or severe sequelae, resulting in a population different from that representative of the post-ICU reality. |
| Memory bias               | Long-term follow-up may favor the occurrence of memory bias regarding relevant outcomes, especially if the interval between follow-ups is long. |
| Confusion bias            | Long-term outcomes can be determined by events subsequent to those studied. |
| Patient-centered outcomes | The limited inclusion of patients and relatives in the determination of relevant outcomes there is a gap in the importance of outcomes between patients (and their families) and researchers/health professionals. |
| Lack of consensus on the health domains evaluated | The lack of consensus among researchers regarding a minimum set of health domains evaluated contributes to the lack of uniformity of publications and a delay in the evolution of knowledge on the subject. |
| High heterogeneity of assessment instruments | The lack of uniformity of measurement instruments can make it difficult to summarize the evidence in meta-analyses, for example. |
with acute respiratory distress syndrome (ARDS), survival was the outcome best evaluated by researchers and physicians; yet, it was the second least important outcome ranked by patients. This inconsistency could be explained by the study sample, composed only of ICU survivors (obviously not evaluating the deceased); by the propensity of researchers to increase the importance of survival due to their awareness of the importance of accounting for death when evaluating functional outcomes after hospital discharge; and by the common practice of evaluating mortality as the primary outcome in intensive care studies.

Unfortunately, surviving critical illness is associated with a wide variety of long-term physical and psychological sequelae that may affect functional status and quality of life. Thus, the value of quality of life as a central outcome for ICU survivors is increasing. This is an outcome reported by patients themselves, without external interference from researchers or family members. It values the patient’s perspective and allows the evaluation of the real impact of a disease and the consequences of its treatment from a multidimensional aspect (i.e., extrapolating the simple definition of morbidity or mortality). Such multidimensionality makes it possible to evaluate an individual’s perception in relation to different domains of his or her life, such as physical aspects, day-to-day functioning, social performance and emotional aspects. Thus, a good quality of life could increase patient satisfaction more so than determinations of reduced motor capacity or the ability to perform basic or instrumental activities of daily living.

In this view, alone, the survival of a patient who was critically ill does not allow assessing whether he or she recovered his or her happiness, activities, and ability to interact with the environment. Surviving, therefore, does not necessarily mean having quality of life. The authors suggest that both outcomes should always be evaluated together.

**Combined outcomes of patients, family and/or caregivers**

In clinical research environments and long-term follow-up, family members or caregivers are usually informants of the evolution of ICU survivors. However, is patient information reliable? It seems so. In a study conducted with ARDS survivors, researchers and family members were also interviewed. Of the 19 important outcomes selected by the researchers, approximately 80% also showed agreement between patients and their families. The best ranked outcomes were physical function, pulmonary symptoms, cognitive symptoms, mental health symptoms, pain, fatigue, and the ability to return to work or previous activities. Social roles, activities and relationships, survival and sexual symptoms had the lowest levels of agreement. These data highlight that family members serve as substitute informants of patient-centered outcomes (in case of inability to evaluate the patient), aiming to minimize the loss of data related to possible disabilities or the unavailability of patients to answer questionnaires. Notably, family members of critically ill patients usually get sick along with them. Family members experience a high psychological burden in the first year after patient discharge as they are suddenly and unpreparedly forced to assume decision-making roles in relation to the conduct and treatment of their loved ones. Thus, considering family members and caregivers as a population that should have their outcomes studied seems logical, in addition to the fact that keeping them in clinical follow-up could bring them benefits.

**BARRIERS TO IMPLEMENTING CHANGE**

Change is difficult to accept in any field of science, be it exact or social. The trade of a “paternalistic model” of medical decision-making to a “model of sharing” decisions with patients (in which the “patient is at the center” of medical decision-making) has been changing the scale of importance of the outcomes studied. It seems that now there is less interest in what is a “clinically relevant” effect and more emphasis on what is “important for the patient”.

Some difficulties are expected as this slow change occurs in scientific studies of critically ill patients. First, to date, there is no taxonomy of the outcomes studied in critically ill patients or a defined grouping of the set of outcomes. However, some experiments are already being performed in some medical specialties, such as rheumatology and endocrinology, and in patient education studies. Additionally, in the area of intensive care, initiatives in the areas of ventilatory support and acute respiratory failure have emerged.

Second, the discovery of how different the expectations of patients and physicians are regarding the outcomes proposed in studies is relatively recent, that is, still too early to be common knowledge among the entire medical community.

Third, methods to involve patients in determining patient-centered outcomes are still under development and include conducting qualitative research, as well as the need for patient participation in health-related meetings.
What outcomes should be evaluated in critically ill patients?

Important outcomes (such as survival or quality of life) have different effects on each individual component of the outcome. This fact could greatly complicate the interpretation of this “new” composite outcome proposed for studies.

Finally, the choice of a composite outcome (a disease-centered outcome associated with a patient-centered outcome) to facilitate the execution of a study could be difficult to interpret because the treatment offered often has different effects on each individual components of the outcome. This fact could greatly complicate the interpretation of this “correct” transition to occur as quickly as it should. The choice of an outcome in a scientific study should be built in collaboration, in which the patient, family, researcher and clinician perspectives are evaluated, discussed, and synthesized to obtain a cohesive and representative understanding of the results that would be important for the patients, in addition of being easy to perform and interpret by physicians, relatives and researchers.

**REFERENCES**

1. Stevenson EK, Rubenstein AR, Radin GT, Wiener RS, Walkey AJ. Two decades of mortality trends among patients with severe sepsis: a comparative meta-analysis. Crit Care Med. 2014;42(3):625-31.
2. Zambon M, Vincent JL. Mortality rates for patients with acute lung injury/ARDS have decreased over time. Chest. 2008;133(5):1120-7.
3. Pool R, Gomez H, Kellum JA. Mechanisms of organ dysfunction in sepsis. Crit Care Clin. 2018;34(1):63-80.
4. Donovan AL, Aldrich JM, Gross AK, Barchas DM, Thornton KC, Schell-Chaple HM, Gropper MA, Lipshtutz AKM; University of California, San Francisco Critical Care Innovations Group. Interprofessional care and teamwork in the ICU. Crit Care Med. 2018;46(6):980-90.
5. Halpern NA. Innovative designs for the smart ICU: Part 2: The ICU. Chest. 2014;145(3):646-58.
6. Low XM, Horrigan D, Brewster DJ. The effects of team-training in intensive care medicine: a narrative review. J Crit Care. 2018;48:263-9.
7. Armstrong BA, Betzold R, May AK. Sepsis and Septic Shock Strategies. Surg Clin North Am. 2017;97(6):1339-79.
8. Dinglas VD, Faraone LN, Needham DM. Understanding patient-important outcomes after critical illness: a synthesis of recent qualitative, empirical, and consensus-related studies. Curr Opin Crit Care. 2018;24(5):401-9.
9. Dinglas VD, Chessare CM, Davis WE, Parker A, Friedman LA, Colantuoni E, et al. Perspectives of survivors, families and researchers on key outcomes for research in acute respiratory failure. Thorax. 2018;73(1):7-12.
10. Gaudry S, Messika J, Ricard JD, Guilfo L, Pasquet B, Dubief E, et al. Patient-important outcomes in randomized controlled trials in critically ill patients: a systematic review. Ann Intensive Care. 2017;7(1):28.
11. Agarwal A, Johnston BC, Vernooij RW, Carrasco-Labra A, Brignardello-Petersen R, Neumann I, et al. Authors seldom report the most patient-important outcomes and absolute effect measures in systematic review abstracts. J Clin Epidemiol. 2017;81:3-12.
12. Young K. Doctors’ understanding of rheumatoid disease does not align with patients’ experiences. BMJ. 2013;346:f2901.
13. Richards T, Montori VM, Godlee F, Lapsley P, Paul D. Let the patient revolution begin. BMJ. 2013;346:f12614.
14. Pardo-Hernandez H, Alonso-Coello P. Patient-important outcomes in decision-making: a point of no return. J Clin Epidemiol. 2017;88:4-6.
15. Chrusch CA, Martin CM, Project TQ. Quality improvement in critical care: selection and development of quality indicators. Can Respir J. 2016;2016:2516765.
16. de Grooth HJ, Panieti JJ, Oudemans-van Straaten HM. Should we rely on trials with disease- rather than patient-oriented endpoints? Intensive Care Med. 2018;44(4):464-6.
17. Cavalcanti AB, Zampieri FG, Rosa RG, Azevedo LCP, Veiga VC, Avezum A, Damiani LP, Mardacente A, Kawano-Dourado L, Lisboa T, Junqueira DL, de Barros E Silva PG, Trujulio L, Abreu-Silva EO, Laraeannej LN, Soares AT, Echenique LS, Pereira AJ, Freitas FG, Gebarà DC, Dantas VC, Furtado RH, Milan EP, Golin NA, Cardoso FF, Maia IS, Hoffmann Filho CR, Kormann AP, Amazonas RB, Bocchi de Oliveira MF, Serpa-Neto A, Falavigna M, Lopes RD, Machado FR, Berwanger O; Coalition Covid-19 Brazil I Investigators. Hydroxychloroquine with or without azithromycin in mild-to-moderate COVID-19. N Engl J Med. 2020;383(21):2041-52.

18. Angus DC, Derde L, Al-Beidh F, Annané D, Arabí Y, Beane A, et al. Effect of Hydrocortisone on Mortality and Organ Support in Patients With Severe COVID-19: The REMAP- CAP COVID-19 Corticosteroid Domain Randomized Clinical Trial. JAMA. 2020;324(13):1317-29.

19. Pino C, Bouron I, Ravau F. Outcomes in registered, ongoing randomized controlled trials of patient education. PLoS One. 2012;7(8):e42934.

20. Gandhi GY, Murad MH, Fujiiyoshi A, Mullan RJ, Flynn DN, Elamin MB, et al. Patient-important outcomes in registered diabetes trials. JAMA. 2008;299(21):2543-9.

21. Trujols JL, Portella MJ, Iraurgi I, Campins MJ, Síñol N, de los Cobos JP. Patient-reported outcome measures: are they patient-generated, patient-centred or patient-valued? J Ment Health. 2013;22(6):555-62.

22. Wunsch H, Guerra C, Barnato AE, Angus DC, Li G, Linde-Zwirble WT. Three-year outcomes for Medicare beneficiaries who survive intensive care. JAMA. 2010;303(9):849-56.

23. Blason B, Teixeira C, Haas JS, Cabral CD, Friedman G. Effects of sepsis on morbidity and mortality in critically ill patients 2 years after intensive care unit discharge. Am J Crit Care. 2019;28(6):424-32.

24. Rosa RG, Falavigna M, Robinson CC, Sanchez EC, Kochhar R, Schneider D, Sganzaroli D, Dietrich C, Barbosa MZ, de Souza D, Rech GS, Dos Santos RD, da Silva AP, Santos MM, Dal Lago P, Sharshar T, Bozza FA, Teixeira C. Quality of Life After ICU Study Group Investigators and the BRICNet. Early and late mortality following discharge from the ICU: a multicenter prospective cohort study. Crit Care Med. 2020;48(1):64-72.

25. Prescott HC, Angus DC. Enhancing recovery from sepsis: a review. JAMA. 2018;319(11):62-75.

26. Prince E, Gerensteinth TA, Davydow D, Bienvenu JO. Psychiatric morbidity after critical illness. Crit Care Clin. 2018;34(4):599-608.

27. Oeyen SG, Vandijck DM, Benoit DD, Annemans L, Decruyenaere JM. Quality of life after intensive care: a systematic review of the literature. Crit Care Med. 2010;38(12):2366-400.

28. Wolters AE, Slooter AJC, van der Kooi AW, van Dijk D. Cognitive impairment after intensive care unit admission: a systematic review. Intensive Care Med. 2013;39(3):376-86.

29. Mæhlisen MH, Pasgaard AA, Mortensen RN, Vardinghus-Nielsen H, Torp-Pedersen C, Bøggild H. Perceived stress as a risk factor of unemployment: a register-based cohort study. BMC Public Health. 2018;18(1):728.

30. Waldhauser RK, Joynt Maddox KE, Wasfy JH, Haneuse S, Chen C, Yeh RW. Association of the hospital readmissions reduction program with mortality among medicare beneficiaries hospitalized for heart failure, acute myocardial infarction, and pneumonia. JAMA. 2018;320(24):2542-52.

31. Jencks SF, Williams MV, Coleman EA. Rehospitalizations among patients in the medicare fee-for-service program. N Engl J Med. 2009;360(14):1418-28.

32. Prescott HC. Variation in postsepsis readmission patterns: a cohort study of veterans affairs beneficiaries. Ann Am Thorac Soc. 2017;14(2):230-7.

33. Winters BD, Eberlein M, Leung J, Needham DM, Pronovost PJ, Sevransky JE. Long-term mortality and quality of life in sepsis: a systematic review. Crit Care Med. 2010;38(5):1276-83.

34. Iwashyna TJ, Ely EW, Smith DM, Langa KM. Long-term cognitive impairment and functional disability among survivors of severe sepsis. JAMA. 2010;304(16):1787-94.

35. Nikayin S, Rabiee A, Hashem MD, Huang M, Bienvenu GJ, Turnbull AE, et al. Anxiety symptoms in survivors of critical illness: a systematic review and meta-analysis. Gen Hosp Psychiatry. 2016;42:23-9.

36. Rabiee A, Nikayin S, Hashem MD, Huang M, Dinglas VO, Bienvenu GJ, et al. Depressive symptoms after critical illness: a systematic review and meta-analysis. Crit Care Med. 2016;44(9):1744-53.

37. Rigby C, Rosa RG, da Silva RT, Kochhann R, Migliavacca CB, Robinson CC, et al. Prevalence of post-traumatic stress disorder symptoms in adult critical care survivors: a systematic review and meta-analysis. Crit Care. 2019;23(1):213.

38. Girard TD. Sedation, delirium, and cognitive function after critical illness. Crit Care Clin. 2018;34(4):585-98.

39. Turnball AE, Rabiee A, Davis WE, Nasser MF, Venna VR, Lottih R, et al. Outcome measurement in ICU survivorship research from 1970 to 2013: a scoping review of 425 publications. Crit Care Med. 2016;44(7):1267-77.

40. Williamson PR, Altman DG, Blazeby JM, Clarke M, Devane D, Gargon E, et al. Developing core outcome sets for clinical trials: issues to consider. Trials. 2012;13:132.

41. Dowdy DW, Esl MF, Sedralayan A, Mendez-Tellez PA, Pronovost PJ, Herridge MS, et al. Quality of life in adult survivors of critical illness: a systematic review of the literature. Intensive Care Med. 2005;31(5):611-20.

42. Cameron JI, Chu LM, Matte A, Tomlinson G, Chan I, Thomas C, Friedrich JO, Mehta S, Lamontagne F, Levassure M, Ferguson ND, Adhikari NK, Rudowksi JC, Meggsion H, Skrobik Y, Flannery J, Bayley M, Batt J, dos Santos C, Abbey SE, Tan A, Lo V, Mathur S, Parrotto M, Morris D, Flockhart K, Fan E, Lee CM, Wilcox ME, Ayas N, Choong K, Fowler R, Scales DC, Sniff T, Cuthbertson BH, Rose L, Robles P, Burns S, Cypel M, Singer L, Chaparro C, Chow CW, Keshavjee S, Brodarik L, Hébert P, Slutsky AS, Marshall JC, Cook D, Herridge MS, RECOVER Program Investigators (Phase 1: towards RECOVER); Canadian Critical Care Trials Group, One-year outcomes in caregivers of critically ill patients. N Engl J Med. 2016;374(19):1831-41.

43. van Beuningen I, Bakkhiti-Raiie F, de Keizer NF, Dongelmans DA, van der Schaaf M. Reported burden on informal caregivers of ICU survivors: a literature review. Crit Care. 2016;20:16.20.

44. Ullman AJ, Atiken LM, Rattray J, Kenardy J, Le Brocque R, MacGillivray S, et al. Intensive care diaries to promote recovery for patients and families after critical illness: a Cochrane Systematic Review. Int J Nurs Stud. 2015;52(7):1243-53.

45. Handley MA, Gorukanti A, Cattamanchi A. Strategies for implementing implementation science: a methodological overview. Emerg Med J. 2016;33(9):660-4.

46. Brown SM, Rozenblum R, Aboumrar H, Fagan MB, Milic M, Lee BS, et al. Defining patient and family engagement in the intensive care unit. Am J Resp Crit Care Med. 2018;198(3):310-9.

47. Defining patient and family engagement in the intensive care unit. Am J Resp Crit Care Med. 2018;198(3):310-9.

48. Brown SM, Rozenblum R, Aboumrar H, Fagan MB, Milic M, Lee BS, et al. Defining patient and family engagement in the intensive care unit. Am J Resp Crit Care Med. 2018;198(3):310-9.

49. Defining patient and family engagement in the intensive care unit. Am J Resp Crit Care Med. 2018;198(3):310-9.

50. Defining patient and family engagement in the intensive care unit. Am J Resp Crit Care Med. 2018;198(3):310-9.
53. Needham DM, Sepulveda KA, Dinglas VD, Chessare CM, Friedman LA, Bingham CO 3rd, et al. Core outcome measures for clinical research in acute respiratory failure survivors. An International Modified Delphi Consensus Study. Am J Respir Crit Care Med. 2017;196(9):1122-30.

54. Turnbull AE, Sepulveda KA, Dinglas VD, Chessare CM, Bingham CO 3rd, Needham DM. Core Domains for Clinical Research in Acute Respiratory Failure Survivors: An International Modified Delphi Consensus Study. Crit Care Med. 2017;45(6):1001-10.

55. Hodgson CL, Burrell AJ, Engeler DM, Pellegrino VA, Brodie D, Fan E; International ECMO Network. Core Outcome Measures for Research in Critically Ill Patients Receiving Extracorporeal Membrane Oxygenation for Acute Respiratory or Cardiac Failure: An International, Multidisciplinary, Modified Delphi Consensus Study. Crit Care Med. 2019;47(11):1557-63.

56. Miika M. Seeking Clarity on FDA Medical Apps Oversight. JAMA. 2014;311(18):1847.

57. Frank L, Forsythe L, Ellis L, Schrandt S, Sheridan S, Gerson J, et al. Conceptual and practical foundations of patient engagement in research at the patient-centered outcomes research institute. Qual Life Res. 2015;24(5):1033-41.

58. Eakin MN, Patel Y, Mendez-Tellez P, Dinglas VD, Needham DM, Turnbull AE. Patients’ outcomes after acute respiratory failure: a qualitative study with the PROMIS Framework. Am J Crit Care. 2017;26(6):456-65.