ORIGINAL RESEARCH

The Use of Altered Rapid Response Calling Criteria in a Tertiary Referral Facility

Shannon Crouch, RN, MN. [1]
Laurence G Trahair, PhD.[2]
Leanne M Aitken, RN, PhD. [3, 4,]

Author affiliations
1. Intensive Care Outreach Service, Princess Alexandra Hospital. Brisbane, QLD, Australia.
2. School of Medicine, The University of Adelaide, Adelaide, Australia
3. School of Health Sciences, City, University of London, London, United Kingdom
4. School of Nursing and Midwifery & Menzies Health Institute Queensland, Griffith University, Brisbane, Australia

Correspondence:
Shannon Crouch
Intensive Care Unit, Level 3.
Princess Alexandra Hospital.
Woolloongabba, QLD, 4102.
Brisbane, Australia
Tel +61 073176 7598
Email shannon.crouch@health.qld.gov.au

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Abstract:

Purpose: The purpose of this study was to examine the current utilisation of altered rapid response call criteria (ARRCC) at a tertiary hospital.

Methods : A retrospective review of all acute care admissions across 17 months was undertaken using the hospital administration system and electronic medical record to identify patients with ARRCC. In patients with altered criteria, the type of alteration, frequency of rapid response call, cardiac arrest, intensive care admission and death in hospital were identified. Comparisons were made using standard statistical methods.

Results : Total hospital admissions numbered 45,912, with ARRCC used in 768 (1.7%) of these. Patients with an ARRCC during hospital admission were older (68.5 [55.5, 79.0] vs 59.0 [43.0, 72.0] years, $p<0.001$) and had a significantly longer length of hospital stay (6.9 [3.0,16.3] vs 2 [1,5] days, $p<0.001$).

Compared with the total group of patient admissions, patients with ARRCC more frequently triggered a rapid response team (9.0% vs 14.2%, $X^2(1, n=46680) = 23.87$, $p<0.001$), more frequently suffered a cardiac arrest (0.2 vs 0.9%, $X^2(1, n=46678) = 20.34$, $p<0.001$), more frequently died in hospital ($p<0.001$), and less frequently were discharged home ($X^2(1, n=46680) = 43.91$, $p<0.001$).

Conclusion : Patients with an ARRCC stayed longer in hospital and were at increased risk of cardiac arrest and death during hospitalisation. Further exploration of the role of ARRCC in facilitating individualised care to meet the needs and treatment goals of each patient in the acute hospital setting is required.

Keywords: Rapid response systems, early warning score, clinical deterioration.

Introduction

Since the 1990s rapid response teams (RRT) have been described as a strategy within the efferent arm of responding to patients with signs of clinical deterioration in the ward environment.[1] The parameters used to trigger the response of these RRT have also been examined in several studies.[2,10] Links between patient deterioration and alterations in pulse, respiratory rate, blood pressure, level of consciousness and oxygen saturations have been made.[4,5,7] Clinical deterioration may be preventable in many cases and can often be attributed to failure to recognise or appropriately respond quickly to this deterioration.[11] In response to this, the use of 'early warning scores' (EWS) or 'track-and-trigger systems' to identify patients and initiate appropriate response has been widely advocated.[6,7] The validity, reliability and utilisation of these tools have been challenged in the literature, with most recommendations highlighting the need for these tools to be used in conjunction with clinical judgement to appropriately detect the deteriorating patient and escalate care.[3,9,10.] Patients within hospital settings who have pre-existing chronic conditions which impact on their 'normal' baseline observations are one example of when this need for clinical judgment is paramount. In this group of patients generic scoring systems and escalation algorithms may not be appropriate. In an attempt to individualise track and trigger charts for patients, senior clinicians can choose to alter RRT criteria. Limited examination of the utilisation of altered RRT criteria or the outcomes for patients who have criteria altered during an acute care hospital admission has been conducted.

Methods

Study population

The study was undertaken in a 670 bed tertiary care hospital in Australia. At the time of the project there was no available literature or local data to provide guidance on the population of hospital admissions likely to have an altered rapid response calling criteria (ARRCC). During a 17month period (01/05/2015 – 01/09/16) all patients 18 years of age or greater who experienced an acute care admission for at least 24 hours were included. The sub-group of specific interest was those patients who received an ARRCC.

Data collection

The electronic medical record was used to identify ARRCC and acute resuscitation plans. A review of 200 individual patient charts was undertaken and compared with the report generated from the electronic medical record to ensure use of the electronic medical record was an accurate method of categorising patients and collecting data for this study. Data extracted included the role of the clinician authorizing the change to criteria and whether there was a time frame associated with the ARRCC. ARRCC were defined as alteration in triggers for activating the rapid response team that deviated from standard hospital criteria which were:

- Heart Rate <40, >140 bpm
- Blood Pressure <90 mmHg
- Fall in Glasgow Coma Scale (GCS) >2 points
- Respiratory rate <8, >36 bpm
- Oxygen Saturations <90%
- Prolonged or repeated seizures
- Cardiac/Respiratory arrest.

Other data extracted using the Performance Explorer Manager (Aginic, Brisbane) included age, gender, hospital admitting unit and ICU admission.

Outcomes

Outcome data including death in hospital, hospital length of stay and discharge destination were also obtained from the electronic medical record.

Ethical approval

Ethical approval was gained from the health service Human Research Ethics Committee. Any identifying data were stored separately to de-identified data. Documentation relating to this study was stored in a secure location and electronic data password protected. Individual patient consent was deemed not necessary.

Statistical Analysis

Data were analysed as absolute values: categorical data are presented as n (%) and continuous data and are presented as median (IQR). Ordinal variables were assessed for normality, and comparison between median values was performed with a Mann-Whitney U-Test as all variables were non-parametric. Comparisons between two groups of categorical variables were made with the Chi-Square test of independence, and the authors have reported the test statistic (i.e. the strength of the association, X^2), along with the degrees of freedom and significance level. When sample size was small (i.e.<10), Fischer's exact test was used to compare groups of categorical variables. All analysis was conducted with SPSS statistics 25.0 (IBM software). A p value <0.05 was considered significant in all analyses.

Results

A total of 45,912 acute care patients were admitted to the study hospital during the 17 month study period. During this time 768 (1.7%) patients had ARRCC identified for them. Patients who required ARRCC were older than those without an ARRCC and remained in hospital longer (Table 1). Patients in the two groups were similar in gender. The majority of patients with ARRCC were admitted to medical units (n= 544, 70.8%) followed by surgical (n=214, 27.9%) and acute non-mental health bed under Psychiatry (n=10, 1.3%).

Table 1: Patient demographics

	Total Admissions n = 45912	With ARRCC n = 768	p Value
Age (years) – median (IQR), range	59.0 (43.0, 72.0), 18 – 107	68.5 (55.5, 79.0), 19 – 97	$p<0.001^{\$}$
Male – n (%)	26900 (58.6%)	436 (56.8%)	
Hospital LOS median (IRQ), range	2 days (1 – 5), 1 – 297*	6.9 days (3.0 –16.3), 1 – 355	$p<0.001^{\$}$
Acute Resuscitation Plan Present	**	204 (26.6%)	

*LOS data in the total admissions group was only available as whole numbers

**At the time of the study no data were available for hospital wide Acute Resuscitation Plans

$ Mann-Whitney U test

chi-square test

Table 2: Hospital Outcomes

	Total Admissions n = 45912	With ARRCC n = 768	p Value #
Rapid Response Team Call – n (%)	4163 (9.0%)	109 (14.2%)	p< 0.001
Intensive Care Admission – n (%)	2436 (5.3%)	29 (3.8%)	p= 0.06
Cardiac Arrest – n (%)	85 (0.2%)	7 (0.9%)	p< 0.001

#chi-square test

Table 3: Discharge Outcomes

	Total Admissions n = 45912	With ARRCC n = 768	p Value #
Home	40107 (86.8%)	604 (78.6%)	p< 0.001
Death in hospital	502 (1.1%)	73 (9.5%)	p< 0.001
Other Care facility.	3882 (8.4%)	75 (9.8%)	p= 0.18

chi-square test

Characteristics of ARRCC in the patients with alterations

There was a total of 825 alterations in the calling criteria for 768 patients, as several patients had multiple criteria altered. In patients who had ARRCC documented, a majority had alterations to only one vital sign (n=728, 94.8%), while 29 (3.8%) had alterations to two vital signs, and 11 (1.4%) had ≥3 vital signs altered. Of these alterations, blood pressure was most common (n=304, 36.8%) followed by oxygen saturations (n=226, 27.4%), heart rate (n=198, 24.0%), and respiratory rate (n=56, 6.8%).

A majority of alterations were documented by a registrar (n=554, 67.2%), followed by resident (n=99, 12.0%), intern (n=89, 10.8%) and consultant (n=64, 7.8%). Data were unavailable in 19 (2.3%) cases due to this not being recorded accurately within the electronic medical record.

Characteristics of patients with ARRCC who had a rapid response team triggered

A total of 109 of the 768 patients with ARRCC had a rapid response team triggered (14.2%). Of these patients, 98 (90.0%) triggered a rapid response team only once, while 5 (4.6%) triggered rapid response teams twice, and 6 (5.5%) had ≥ 3 rapid response teams triggered during their admission.

There were a total of 148 different recorded triggers (in several cases there were multiple triggers for single rapid response team). The most common reason for rapid response team activation was blood pressure (n=50, 33.8%), followed by O_2 saturation (n=33, 22.3%), respiratory rate (n=27, 18.2%), then heart rate (n=18, 12.2%).

The timing of the alteration was compared with respect to the timing of the rapid response call. In 29 (26.9%) patients, the alteration was made prior to the rapid response team being

triggered, in 25 (32.4%) the alteration was made at the time of trigger by the rapid response team and in 43 (39.8%), after the trigger. In 1 case, this was not able to be ascertained from the medical record.

Comparisons between the total admissions and patients with ARRCC

Compared with the total admission group, patients with ARRCC triggered a rapid response team call more frequently (X^2(1, n=46680) = 23.87, p< 0.001), suffered a cardiac arrest more frequently (X^2(1, n=46678) = 20.34, p< 0.001), died in hospital more frequently (Fisher's exact test p< 0.001), and were less frequently discharged home (X^2(1, n=46680) = 43.91, p< 0.001). There was also a trend for patients with ARRCC to require an ICU admission less frequently (X^2(1, n=46680) = 3.53, p= 0.06).

Discussion

Rapid response team calling criteria or triggers are based on physiological parameters which, when abnormal, may predict cardiac arrest.[12-18] To better tailor this system to meet the needs of patients with abnormal baseline physiology such as chronic airways disease or heat failure, alterations may be utilised to adjust triggers for emergency response teams to prevent 'false positive' calls.[19] In this study the utilisation and implications of ARRCC as part of the early warning system to detect clinical deterioration were investigated. In understanding the manner in which ARRCC is utilised in patient care there is opportunity to explore if alternative measures such as goals of care discussions early in hospital admissions may improve care for this patient group.

The most common alterations to calling criteria were in relation to blood pressure, oxygen saturations and heart rate, and in almost all patients only a single physiological criterion was altered. Although this study was not designed to explore reasons behind clinician decision making that prompted an alteration of criteria, this was not an unexpected finding when considering common chronic disease states which may require alterations to criteria to individualise emergency response criteria to a pre-existing abnormal baseline. [20] In the subgroup of patients who had an ARRCC and who subsequently triggered an RRT (n= 109), only 26.9% of alterations were made prior to the RRT trigger. In the remaining 72.2% of patients, alterations were made either by, or after the RRT. These data suggest that while a majority of patients with alterations do not subsequently trigger an RRT, for the patients who do require a RRT review, there is a propensity to make alterations. This high proportion of alterations may be because this represents a subgroup of more unwell patients with abnormal 'baseline' vital signs. This draws attention to the need for clinicians to consider the utilisation of ARRCC in practice. Although not within the scope of this study, ARRCC appears to be one strategy used by clinicians to individualise care; practices and rationale associated with use of ARRCC should be further explored.

The majority of ARRCC were ordered by a registrar or consultant, however almost one quarter of alterations were ordered by interns or residents. This finding highlights a potential safety risk in this workflow. Literature suggests that a high proportion of junior medical officers would not escalate the care of a deteriorating patient and would be even less inclined to do so when busy or if the deterioration occurred after hours.[21] This raises a patient safety concern that criteria may be altered to avoid an RRT activation or medical escalation rather than a patient centric focus.[19] It should be noted that during the study it could not be reliably determined if senior medical advice had been sought prior to making this alteration by junior medical officers. Junior

medical officers ordering ARRCC has been previously reported in the limited literature regarding the utilisation of ARRCC.[19]

One of aims of this study was to investigate the timeframes which ARRCCs were reviewed, whether they remained in place or whether, and when, the alterations were cancelled. In the charts reviewed in this study documentation indicating review of criteria could not be identified within the electronic medical record therefore it could not be identified how this review process occurred and how it was communicated at a local level to multidisciplinary clinicians. These findings highlight the importance of clinical governance and workflow procedures to support the care of the deteriorating patient. From both an accountability and patient safety perspective it is imperative that senior medical staff from the primary care team be involved in aspects of decision making regarding clinical deterioration management.[22] It is not unreasonable to assert that this accountability should also extend to oversight of medical emergency call triggers which aligns with research suggesting that attending physicians describe wanting a closer supervisory relationship with junior medical officers.[23]

There is some evidence in the literature that senior physicians felt that triggering rapid response teams resulted in junior medical staff not being adequately exposed to the decision-making process within care of the deteriorating patient that is a requisite part of learning to be an independent physician.[24] Alteration of criteria without senior medical engagement may represent a missed learning opportunity for junior medical officers. It is also worth considering this workflow from a broader team perspective. Shared mental models are crucial for effective and safe patient care. [25] Alterations to calling criteria without senior medical engagement has the potential to disrupt the multidisciplinary team's shared understanding of treatment plans for the patient. Documents such as the Gosport report indicate that the authority gradient between nurses and medical staff is still strong with nursing staff at multiple levels feeling unable or

unwilling to question medical decisions. [26,27] Despite efforts to reduce them, authority gradients still exist within healthcare, both within professions and across disciplines.[28] It is not surprising that authority gradients exist in health care given that many of the health care professions are taught and practiced in largely hierarchical frameworks, both within and between the professions. Consequently, breaking down these frameworks requires a consistent and multi-dimensional approach to create new ways of working.[29] The utilisation of new technologies such as the electronic record that provides clear documentation and ease of access to information such as triggers for escalating care across disciplines is an example of this and highlights the need for clear governance surrounding its use to ensure safe patient care. The effect of these gradients is evident in RRT research revealing a reluctance of both ward nurses and junior medical officers to initiate medical emergency calls or call for more senior help due to fear of being criticised or appearing 'clinically inadequate'.[30] This again highlights the patient safety concern relating to the practice of junior medical staff independently ordering ARRCC.

During the study period a small percentage of acute care patients admitted to hospital l received ARRCC. Patients who received alterations during the study period were older, remained in hospital longer, more frequently triggered an RRT call and died in hospital. These findings may be attributed to the co-morbid state of these patients, although that relationship was not explored in this study. Age, abnormal vital signs, RRT calls later in a hospital admission and presence of a chronic condition have been associated with death in hospital after an RRT activation.[31,32] RRT literature also suggests that up to one third of patients reviewed by rapid response teams require end of life care.[33] There is a potential that alterations in calling criteria may be being implemented in place of goals of care conversations and planning for end of life in this group. From a broader perspective this appears to align with literature suggesting that patients want to be partners in decision making, particularly for those who have a life limiting illness where these conversations should occur in advance of a clinical deterioration.[34,35,36] If

this is the case, previously identified needs for improved end of life planning may potentially have the additional benefit of reducing inappropriate alterations to calling criteria. In promoting this discussion in the context of ARRCC it should be acknowledged that barriers to end of life and limitation of care discussions are a complex and multifaceted challenge. [37]

Limitations

The study was not without limitation. This was a retrospective single-centre study within a tertiary hospital and may not be generalisable to all facilities. Data presented in this study were collected across a 17 month period 2015-2016. Although this is now four years ago there remains limited information outlining the use of ARRCC and therefore this paper contributes to our understanding of how one sub-group of deteriorating patients are managed. Second, although the utilisation of a digital medical record-based screening tool was effective in identifying those patients who had an alteration recorded, the value of this system is dependent on the accuracy of recording by clinicians. It has been noted that it was not within the scope of this study to determine the reason for alteration of criteria, however given the increased risk of rapid response calls and death in this patient group further understanding of the rationale for alteration to criteria may have important patient safety implications.

Conclusion

Early warning tools and rapid response teams have become common place in the recognition and response to clinical deterioration in the acute hospital setting. [1-10] Descriptions of the practice of altering criteria to trigger rapid response calls are limited. This study found patients with an ARRCC had poorer outcomes than hospitalised patients in general. It was also found that the majority of patients (72.2%) with ARRCC the alteration to the criteria occurred at the

time of or after a rapid response call. Future research surrounding this patient group may add to the effective management of clinical deterioration and potentially improve end of life care within the acute hospital setting.

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References

1. Daffurn K, Lee A, Hillman KM, Bishop GF, Bauman A. Do nurses know when to summon emergency assistance? Intensive Critical Care Nurse 1994; 10:115–20.

2. Berlot G, Pangher A, Petrucci L, et al. Anticipating events of in-hospital cardiac arrest. *European Journal of Emergency Medicine* 2004; 11:24–28

3. Cuthbertson B, Boroujerdi M, McKie L et al. Can physiological variables and early warning scores allow early recognition of the deteriorating patient? *Critical Care Medicine 2007;* 35: 402–9

4. Goldhill DR, McNarry AF, Mandersloot G et al. A physiologically based Early warning score for ward patients: the association between score and outcome. *Anaesthesia 2005;* 60: 547–53

5. Harrison,G. Jacques,T McLaws, M KilbornG. Combinations of early signs of critical illness predict in-hospital death-the SOCCER study. *Resuscitation* 71; 327–334

6. Hillman K, Chen J, Cretikos M et al. Introduction of the medical emergency team (MET) system: a cluster-randomised controlled trial. *Lancet 2005;* 365: 2091–7

7. Lighthall GK, Markar S, Hsiung R. Abnormal vital signs are associated with an increased risk for critical events in US veteran inpatients. *Resuscitation* 2009; 80: 1264–1269

8. Subbe CP, Kruger M, Rutherford P, et al. Validation of a modified Early Warning Score in medical admissions. *QJM* 2001; 94: 521–526

9. Le Lagadec, M. D., & Dwyer, T. Scoping review: The use of early warning systems for the identification of in-hospital patients at risk of deterioration. *Australian Critical Care* 2017; 30, 211-218.

10. Downey, C. L., Tahir, W., Randell, R., Brown, J. M., & Jayne, D. G. Strengths and limitations of early warning scores: A systematic review and narrative synthesis. *International Journal of Nursing Studies* 2017; 76: 106-119.

11. U. Kyriacos, J. Jelsma, S. Jordan. Monitoring vital signs using early warning scoring systems: a review of the literature *Journal of Nursing Management* 2011; 19: 311-330

12. Kause J, Smith G, Prytherch D, et al; Intensive Care Society (UK); Australian and New Zealand Intensive Care Society Clinical Trials Group. A comparison of antecedents to cardiac arrests, deaths and emergency intensive care admissions in Australia and New Zealand, and the United Kingdom — the ACADEMIA study. *Resuscitation* 2004; 62: 275-82.

13. Buist M, Bernard S, Nguyen T,V. et al. Association between clinically abnormal observations and subsequent in-hospital mortality: a prospective study. *Resuscitation* 2004; 62: 137–41.

14. Devita M,A, Bellomo R, Hillman K. et al. Findings of the first consensus conference on medical emergency teams. *Critical Care Medicine* 2006; 34: 2463-78.

15. Hillman K,M, Bristow P,J, Chey T. et al. Antecedents to hospital deaths. *Internal Medicine Journal* 2001; 31: 343–8.

16. Vetro J, Natarajan D,K, Mercer I, et al. Antecedents to cardiac arrests in a hospital equipped with a medical emergency team. *Critical Care and Resuscitation* 2011; 13: 162-6.

17. Sprogis S,K, Currey J, Considine J, et al. Physiological antecedents and ward clinician responses before medical emergency team activation. *Critical Care and Resuscitation* 2017; 19: 50-6.

18. Buist M,D, Moore G,E, Bernard S,A, et al. Effects of a medical emergency team on reduction of incidence of and mortality from unexpected cardiac arrests in hospital: preliminary study. *BMJ* 2002; 324: 387-90.

19. Ganju, A., Kapitola, K., & Chalwin, R. Modifications to predefined rapid response team calling criteria: Prevalence, characteristics and associated outcomes. *Critical Care and Resuscitation 2019; 21*: 32-38

20. Beasley R, Chien J, Douglas J, et al. Thoracic Society of Australia and New Zealand oxygen guidelines for acute oxygen use in adults: “swimming between the flags”. Respirology 2015; 20: 1182–91.

21. Rotella, J. A., Yu, W., Ferguson, J., & Jones, D. Factors influencing escalation of care by junior medical officers. Anaesthesia and Intensive Care 2014;42: 723-729.

22. Sethi, S. S., & Chalwin, R. Governance of rapid response teams in Australia and New Zealand. *Anaesthesia and Intensive Care 2018; 46*: 304-309.

23. Loo, L., Puri, N., Kim, D. I., Kawayeh, A., Baz, S., & Hegstad, D. "page me if you need me": The hidden curriculum of attending-resident communication. *Journal of Graduate Medical Education* 2012; 4: 340

24. Benin, A. L., Borgstrom, C. P., Jenq, G. Y., Roumanis, S. A., & Horwitz, L. I. Defining impact of a rapid response team: Qualitative study with nurses, physicians and hospital administrators. *BMJ Quality & Safety* 2012; 21: 391-398.

25. O'connor, P., O'dea, A., Lydon, S.et al.). A mixed-methods study of the causes and impact of poor teamwork between junior doctors and nurses. *International Journal for Quality in Health Care: Journal of the International Society for Quality in Health Care* 2016;28: 339-345.

26. Darbyshire, P., & Thompson, D. Gosport must be a tipping point for professional hierarchies in healthcare-an essay by Philip Darbyshire and David Thompson. *BMJ (Clinical Research Ed.*) 2018; 363.

27. Darbyshire, P., & Ion, R. The lessons of gosport for nursing education. *Nurse Education Today* 2018; 70: 130-135.

28. Green, B., Oeppen, R. S., Smith, D. W., & Brennan, P. A. Challenging hierarchy in healthcare teams – ways to flatten gradients to improve teamwork and patient care. *British Journal of Oral and Maxillofacial Surgery* 2017; 55: 449-453.

29. Cosby, K. S., & Croskerry, P. (2004). Profiles in patient safety: authority gradients in medical error. *Academic emergency medicine*, *11*(12), 1341-1345.

30. Chua, W. L., Legido-Quigley, H., Jones, D., Hassan, N. B., Tee, A., & Liaw, S. Y. A call for better doctor-nurse collaboration: A qualitative study of the experiences of junior doctors and nurses in escalating care for deteriorating ward patients. *Australian Critical Care* 2020; 33:54-61.

31. Shappell, C., Snyder, A., Edelson, D. P., Churpek, M. M., & American Heart Association's Get with The Guidelines-Resuscitation Investigators. Predictors of in-hospital mortality after rapid response team calls in a 274 hospital nationwide sample. *Critical Care Medicine 2018; 46*: 1041-

32. Cardona-Morrell, M., Chapman, A., Turner, R. M., Lewis, E., Gallego-Luxan, B., Parr, M., & Hillman, K. Pre-existing risk factors for in-hospital death among older patients could be used to initiate end-of-life discussions rather than rapid response system calls: A case-control study. *Resuscitation 2016; 109*; 76-80.

33. Coombs, M., Nelson, K., Psirides, A., Suter, N., & Pedersen, A. Characteristics and dying trajectories of adult hospital patients from acute care wards who die following review by the rapid response team. *Anaesthesia and Intensive Care* 2016; 44: 262-269.

34. Lazenby, S., Edwards, A., Samuriwo, R., Riley, S., Murray, M. A., & Carson-Stevens, A. End-of-life care decisions for haemodialysis patients – 'We only tend to have that discussion with them when they start deteriorating'. *Health Expectations* 2017; 20: 260-273.

35. Schulz, V. M., Crombeen, A. M., Marshall, D., Shadd, J., LaDonna, K. A., & Lingard, L. Beyond simple planning: Existential dimensions of conversations with patients at risk of dying from heart failure. *Journal of Pain and Symptom Management* 2017; 54: 637-644.

36. Schonfeld, T. L., Stevens, E. A., Lampman, M. A., & Lyons, W. L. Assessing challenges in end-of-life conversations with elderly patients with multiple morbidities. *American Journal of Hospice and Palliative Medicine* 2012: 29: 260-267.

37. Smith, C. A. Physicians' end-of-life conversations: Have we arrived? *American Journal of Medical Quality* 2019 34: 94-95.