Intensive Care Med (2019) 45:1443–1446
https://doi.org/10.1007/s00134-019-05694-y

LESS IS MORE IN ICU

De-implementing low value care in critically ill patients: a call for action—less is more

Henry T. Stelfox[1,2,3,4*], Annette M. Bourgault[5,6] and Daniel J. Niven[1,2,3,4]

Keywords: De-implementation, Intensive care units, Critical care, Information science, Health services research, Quality of health care

"More care is not always better [1]." As clinicians we are tasked with caring for patients while doing no harm. The pursuit of our mission has historically been driven by iteratively implementing new innovations designed to improve healthcare. Patients have benefited from this approach; however, an unintended consequence has been an increased number of clinical practices, some of which are low-value. A low-value practice is a practice for "which evidence suggests it confers no or very little benefit for patients, or the risk of harm exceeds probable benefit, or, more broadly, the added costs of the intervention do not provide proportional added benefits [2]". The use of low-value practices compromises healthcare by increasing the complexity of care, exposing patients to unnecessary risks and adverse events, misallocating valuable resources, and potentially delaying treatment for other patients [3, 4]. These challenges are increasingly recognized in the care of critically ill patients whose management is often resource intensive.

Reducing low-value care should be integrated into evidence-based practice and facilitated by implementation science. However, data suggest that reducing use of an engrained clinical practice is more difficult than increasing the use of a new effective practice [5, 6]. Clinicians subjectively assign value to clinical practices and experience cognitive biases (e.g., recall bias—the last patient I treated did well) both of which create psychological barriers that require active unlearning [7]. This is especially likely within intensive care units (ICU) wherein owing to high risk of patient death, the physiologic and technophilic nature of critical care clinicians, the interdisciplinary care that permits multiple opinions to influence decision-making, and the visceral approach of 'doing everything' may provide a unique barrier to reducing low-value care [8]. For example, the use of pulmonary artery catheters in critically ill patients did not decrease until several randomized clinical trials (RCTs) reported a lack of efficacy [9, 10]. Perhaps more illustrative is the negligible change in glycemic control practices following NICE-SUGAR that reported tight glycemic control to increase 90-day mortality [5]. Additional studies evaluating changes in low-value care are summarized in Table 1. Although these studies do not permit distillation of a 'one size fits all' approach, it is increasingly clear that to reduce low-value care in critical care, initiatives need robust, objective methods that systematically consider and adapt to available evidence, actively work to change clinician behaviour, and build upon implementation science.

Compared to conventional implementation science, where many conceptual models and frameworks exist to facilitate implementation, few models have been proposed to facilitate de-implementation (also described as de-adoption) [11]. Norton et al. proposed a five-level model that includes the level of evidence defining a practice as low-value, whether the practice is harmful or ineffective, the de-implementation intervention goal (reduce, replace, remove, restrict), specific barriers and facilitators, and the intervention target (patient, clinician, etc.) [12]. Niven et al. used data from a scoping review to adapt a contemporary implementation science model to

*Correspondence: tstelfox@ucalgary.ca
[1] Department of Critical Care Medicine, Cumming School of Medicine, McCaig Tower, University of Calgary, 3134 Hospital Drive NW, Calgary, AB T2N 5A1, Canada
Full author information is available at the end of the article

Springer

Table 1 Example studies that have examined or facilitated the de-implementation of low-value care among critically ill adults

Low-value clinical critical care practice	Studies examining de-implementation of low-value practice	De-implementation mechanism	Main result
Passive diffusion of knowledge			
Daily chest radiographs among mechanically ventilated patients	Gershengorn et al. [19]	Passive diffusion of RCT evidence	3% relative decrease in daily chest radiograph following updated guidelines in 2011
Inhaled nitric oxide for ARDS	Munshi et al. [20]	Passive diffusion of RCT evidence	No significant decrease in use of inhaled nitric oxide between 2008–2013
Pulmonary artery catheter	Wiener et al. [10]	Passive diffusion of RCT evidence	65% relative decrease in PAC utilization between 1993 and 2004
	Koo et al. [9]	Passive diffusion of RCT evidence	60% relative decrease in PAC utilization between 2002 and 2006
	Gershengorn and Wunsch [21]	Passive diffusion of RCT evidence	43% relative decrease in PAC utilization between 2002 and 2006
Tight glycemic control	Niven et al. [5]	Passive diffusion of RCT evidence	No significant decrease in tight glycemic control following publication of NICE-SUGAR
Active interventions			
Albumin for fluid resuscitation	Lyu et al. [15]	Multi-component de-implementation intervention: (1) audit/feedback; (2) financial disincentives; (3) guideline update; (4) order process change	42% relative decrease in albumin utilization 2011–2014; $2.5 M cost savings
Drotrecogin alfa for severe sepsis	Kahn and Le [14]	Multiple: (1) passive diffusion of RCT evidence and guidelines; (2) financial disincentives; (3) market withdrawal of drotrecogin alfa	Prior to market withdrawal (2011), the end of a technology add-on payment was associated with greatest reduction in use of drotrecogin alfa
Urinary catheters	Menegueti et al. [22]	Multi-faceted interdisciplinary approach: (1) education; (2) checklists	Decrease from 14.9 to 1.1 catheter-associated urinary tract infections per 1000 catheter-days, over a 12-year period, 2005–2016.

RCT randomized controlled trial, *ARDS* acute respiratory distress syndrome

propose a model for facilitating de-implementation [13]. In addition to suggesting users adapt typical steps in a behaviour change cycle to de-implementation, this model emphasizes early stakeholder engagement, and objective identification and prioritization of low-value practices. Active behavioural change interventions in critical care have resulted in a reduction in low-value care. An extreme example is the market withdrawal of drotrecogin alfa following the PROWESS-SHOCK trial that demonstrated no survival benefit and increased bleeding risk [14]. A less extreme example is the de-implementation intervention used to reduce albumin for fluid resuscitation [15]. A multi-faceted intervention consisting of audit-and-feedback, financial incentives, guidelines, and order process changes resulted in significant decreases in albumin utilization and an estimated cost savings of nearly 2.5 million USD.

The care of critically ill patients provides additional considerations for de-implementation. Critically ill patients typically receive care from a wide variety of interprofessional teams, which implies that interprofessional de-implementation efforts may be the most beneficial. For example, would initiatives to de-implement low-value medications be more effective if coordinated across those who prescribe (i.e., physicians, nurse practitioners, physician assistants), those who advise prescribers (i.e., pharmacists) and those who administer medications (i.e., bedside nurses) [16]. Evidence beyond the ICU suggests that engaging patients through direct education, shared decision-making, and media campaigns may be effective strategies for reducing low-value care. This may not be feasible for critically ill patients; however, it does raise questions regarding the role of patients and/or their surrogate decision-makers in avoiding exposure to low-value care. Finally, consideration should be given to how de-implementation can be incorporated into increasingly complex healthcare systems. Intensive care units are at the forefront of learning healthcare systems because of their organizational structures, focus on quality improvement, and advanced state of clinical information systems. Can de-implementation be incorporated as a natural by-product of healthcare's evolution towards learning healthcare systems?

Low-value care represents an important challenge to the quality of care we provide critically ill patients. It is common, embedded within our established clinical practices, changes over time and has potentially important impacts on patient care, patient health and costs. To complicate matters current financial incentives in research and clinical care are primarily designed to encourage "more care". Science has demonstrated that passive diffusion of knowledge is ineffective in changing care practices. Rather, we need structured approaches that include periodic evaluations of our care practices, the science underpinning those practices and implementation science methods tailored to local contexts. Conversely, by being mindful of what practices we implement into care and our confidence in the science underpinning them (i.e., ideally reproducible studies at low risk of bias), we can reduce the frequency with which we need to de-implement low-value care practices that were once thought to be high-value [17]. Not only does oscillating between implementation and de-implementation adversely affect patient care, it risks disengaging clinicians from quality improvement—a risk we cannot afford. Historically we have focused on what else we can do to help our patients. Now is the time to recognize that "more care is not always better" and to ensure that the practices we implement are intended to be high-value and to stop doing things that we have learned are low-value [1, 2, 18].

Author details
[1] Department of Critical Care Medicine, Cumming School of Medicine, McCaig Tower, University of Calgary, 3134 Hospital Drive NW, Calgary, AB T2N 5A1, Canada. [2] Department of Community Health Sciences, Cumming School of Medicine, University of Calgary, Calgary, Canada. [3] O'Brien Institute for Public Health, Cumming School of Medicine, University of Calgary, Calgary, Canada. [4] Alberta Health Services, Alberta, Canada. [5] College of Nursing, Academic Health Sciences Center, University of Central Florida, Orlando, FL, USA. [6] Orlando Health, Orlando, FL, USA.

Publisher's Note

Received: 7 June 2019 Accepted: 11 July 2019
Published online: 8 August 2019

References

1. Cassel CK, Guest JA (2012) Choosing wisely: helping physicians and patients make smart decisions about their care. JAMA 307:1801–1802
2. Elshaug AG, Rosenthal MB, Lavis JN, Brownlee S, Schmidt H, Nagpal S, Littlejohns P, Srivastava D, Tunis S, Saini V (2017) Levers for addressing medical underuse and overuse: achieving high-value health care. Lancet 390:191–202
3. Badgery-Parker T, Pearson S-A, Dunn S, Elshaug AG (2019) Measuring hospital-acquired complications associated with low-value care. JAMA Intern Med 179:499–505
4. Korenstein D, Chimonas S, Barrow B, Keyhani S, Troy A, Lipitz-Snyderman A (2018) Development of a conceptual map of negative consequences for patients of overuse of medical tests and treatments. JAMA Intern Med 178:1401–1407
5. Niven DJ, Rubenfeld GD, Kramer AA, Stelfox HT (2015) Effect of published scientific evidence on glycemic control in adult intensive care units. JAMA Intern Med 175:801–809
6. Montini T, Graham ID (2015) "Entrenched practices and other biases": unpacking the historical, economic, professional, and social resistance to de-implementation. Implement Sci 10:24
7. Helfrich CD, Rose AJ, Hartmann CW, van Bodegom-Vos L, Graham ID, Wood SJ, Majerczyk BR, Good CB, Pogach LM, Ball SL, Au DH, Aron DC (2018) How the dual process model of human cognition can inform efforts to de-implement ineffective and harmful clinical practices: a

preliminary model of unlearning and substitution. J Eval Clin Pract 24:198–205
8. Sauro K, Bagshaw SM, Niven D, Soo A, Brundin-Mather R, Parsons Leigh J, Cook DJ, Stelfox HT (2019) Barriers and facilitators to adopting high value practices and de-adopting low value practices in Canadian intensive care units: a multimethod study. BMJ Open 9:e024159–e024159
9. Koo KK, Sun JC, Zhou Q, Guyatt G, Cook DJ, Walter SD, Meade MO (2011) Pulmonary artery catheters: evolving rates and reasons for use. Crit Care Med 39:1613–1618
10. Wiener RS, Welch HG (2007) Trends in the use of the pulmonary artery catheter in the United States, 1993–2004. JAMA 298:423–429
11. Upvall MJ, Bourgault AM (2018) De-implementation: a concept analysis. Nurs Forum 53:376–382
12. Norton WE, Chambers DA, Kramer BS (2019) Conceptualizing de-implementation in cancer care delivery. J Clin Oncol 37:93–96
13. Niven DJ, Mrklas KJ, Holodinsky JK, Straus SE, Hemmelgarn BR, Jeffs LP, Stelfox HT (2015) Towards understanding the de-adoption of low-value clinical practices: a scoping review. BMC Med 13:255
14. Kahn JM, Le TQ (2016) Adoption and de-adoption of drotrecogin alfa for severe sepsis in the United States. J Crit Care 32:114–119
15. Lyu PF, Hockenberry JM, Gaydos LM, Howard DH, Buchman TG, Murphy DJ (2016) Impact of a sequential intervention on albumin utilization in critical care. Crit Care Med 44:1307–1313
16. Stelfox HT, Brundin-Mather R, Soo A, Parsons Leigh J, Niven DJ, Fiest KM, Doig CJ, Zuege DJ, Kushner B, Clement F, Straus SE, Cook DJ, Bagshaw SM, Sauro KM (2019) A multicentre controlled pre-post trial of an implementation science intervention to improve venous thromboembolism prophylaxis in critically ill patients. Intensive Care Med 45:211–222
17. Niven DJ, McCormick TJ, Straus SE, Hemmelgarn BR, Jeffs L, Barnes TRM, Stelfox HT (2018) Reproducibility of clinical research in critical care: a scoping review. BMC Med 16:26
18. Bourgault AM, Upvall MJ (2019) De-implementation of tradition-based practices in critical care: a qualitative study. Int J Nurs Pract 25:1–9
19. Gershengorn HB, Wunsch H, Scales DC, Rubenfeld GD (2018) Trends in use of daily chest radiographs among US adults receiving mechanical ventilation. JAMA Netw Open 1:e181119
20. Munshi L, Gershengorn HB, Fan E, Wunsch H, Ferguson ND, Stukel TA, Rubenfeld GD (2017) Adjuvants to mechanical ventilation for acute respiratory failure. adoption, de-adoption, and factors associated with selection. Ann Am Thorac Soc 14:94–102
21. Gershengorn HB, Wunsch H (2013) Understanding changes in established practice: pulmonary artery catheter use in critically ill patients. Crit Care Med 41:2667–2676
22. Menegueti MG, Ciol MA, Bellissimo-Rodrigues F, Auxiliadora-Martins M, Gaspar GG, Canini S, Basile-Filho A, Laus AM (2019) Long-term prevention of catheter-associated urinary tract infections among critically ill patients through the implementation of an educational program and a daily checklist for maintenance of indwelling urinary catheters: a quasi-experimental study. Medicine (Baltimore) 98:e14417