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What should we stop doing in the ICU?

In this article, I highlight that the most important thing intensive care physicians should stop doing is ignoring that they are prone to several cognitive biases. I will first support my statement by looking for conceptual caveats and cognitive bias in routine intensive care unit (ICU) care, and then move to specific patient and structural problems.

Intensive care is an interesting specialty. From all the early excitement in the 1970s, passing through two decades of intensive physiological use at the bedside, intensive care landed on the rough ground of modern randomised controlled trials (RCTs) in the late 1990s and early 2000s. The increasing number of critically ill patients coupled with new monitoring devices and important funding both from governmental and private agencies (including pharmaceutical companies) fostered research. In the early 2000s, the panorama looked promising, with positive trials coming out on a frenetic basis (Bernard 2001; Rivers 2001). Regrettably, the initial enthusiasm was followed by a wave of negative results (Ranieri 2012; PRISM Investigators 2017). Many interventions that seemed promising in the early 2000s were sequentially disproved or proved to be harmful, which has been the basis for the rationale of limiting excesses of interventions and treatments in the critically ill, the so-called "doing less" (Singer 2006).

What are the conceptual caveats in routine ICU care we should stop doing?

This section could be summarised in one sentence: Obtain less (not more) data and reduce treatment exposure considering it part of the disease and not of the healing process. Do so because we are all prone to cognitive bias.

The first part of the sentence brings a concept that is well-known to experts in behavioural science: information overload (Bawden 2008). Excessive information is known to reduce accuracy and increase confidence in the decision-making process (Hall 2007). This association can have disastrous consequences for critically ill patients, worsening the performance of important acute decisions and making physicians less prone to notice their own mistakes.

As the heart might be responsible for generating its own afterload, intensivists are also partially responsible for generating their own *information* overload. Examples include excessive use of haemodynamic monitoring in otherwise stable patients, pleiads of routine laboratory and imaging tests and inputs from several colleagues and healthcare workers (Manor-Shulman 2008). In the eagerness of having a quick diagnosis and treatment, intensivists generate data that will only aggravate the problem. Coupled with the increasing difficulty in accessing patient´s data due to poorly designed electronic health records, this creates an intensivist that has both information overload *and* information anxiety; that is, an individual exposed to too much data and that has trouble trying to access it (even the parts that indeed matter!). This results in a nightmare that is well known by most of us. A vignette is shown in Figure 1.

In the left part of this example, a series of types of cognitive bias occurred, triggered by a spurious elevation in C-reactive protein (CRP) levels that were routinely collected. Due to concerns of an untreated infection, the physician tries to find something that suits his/her keenness to explain the labora-

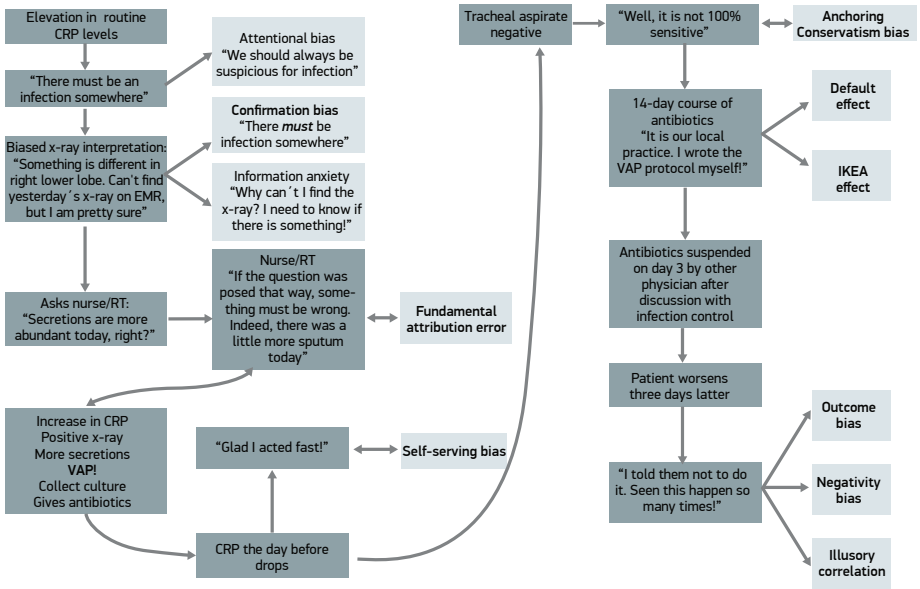

Figure 1. Spurious elevation in CRP levels in a stable patient on mechanical ventilation

CRP C-reactive protein EMR electronic medical record RT respiratory therapist VAP ventilator-associated pneumonia

Table 1

Practice	Comment	Cognitive bias involved	Suggestion	Reference
		ICU STRUCTURE		
ICUs built in improvised spaces with old-fashioned architecture	There is no place for old-fashioned windowless ballroom ICUs in modern practice. Natural light deprivation is a real issue.	Conservatism; default effect.	New ICUs should be designed to improve patients and staff wellbeing. This includes windows, places to interact with staff (cafeterias), proper resting rooms, family meeting rooms, etc.	Caruso 2014; Mroczek 2005
Keep families outside the ICU	Family engagement may reduce delirium and improve outcomes.	Conservatism; default effect; hostile attribution bias.	Adopt liberal visitation policy while coping with staff´s own demand for privacy.	Soares 2017
Keep pets outside the ICU	There are few plausible reasons to keep pets outside the ICU. There are many potential benefits for patients and staff.	Conservatism; default effect; "not invented here" bias.	Adopt a more liberal pet visitation policy in ICUs.	Hosey 2018
Ignore staff´s own health	Burnout is endemic in practitioners. Ignoring staff burnout can harm staff and patients.	Identifiable victim effect; Ostrich effect.	Recognise the problem. Attempt to treat burnout as an organisational problem and *not* an individual issue.	Ricou 2018
		DAILY CARE		
Daily chest x-rays	Increases radiation exposure. May worsen several biases due to poor method sensitivity/specificity.	Conservatism; default effect.	Switch to on-demand methods such as ultrasound (if available) or more selective x-ray prescription.	Resnick 2017
Daily full set of exams	May produce noise without clear benefit. May increase need for transfusions.	Conservatism; default effect; bandwagon effect.	Adopt a minimal daily set of tests; add tests as indicated.	Zimmerman 1997
Widespread contact precautions	May be useful for Gram-positive bacteria but data lacking for multidrug-resistant Gram-negative. Widespread use can increase adverse events at patient level.	Conservatism; default effect; continued influence effect.	Join randomised controlled trials on contact precautions. Consider local study.	Furuya 2018
Aggressive antibiotic use after infection suspicions in stable patients	For stable ICU patients, a wait-and-see approach may result in better outcomes than an aggressive strategy.	Conservatism; default effect; continued influence effect; Semmelweis reflex.	Adopt more conservative triggers to start antibiotics in stable patients.	Melsen 2013
Long pre-established courses of antibiotics	Shorter courses of antibiotics are probably safe, reduce costs and antibiotic exposure.	Conservatism; default effect; Bandwagon effect; Semmelweis reflex.	Consider strategies to reduce length of antibiotic courses.	Klompas 2017; Sawyer 2015
Alveolar recruitment for ARDS	Increased mortality in large RCT.	"Not invented here" bias; Semmelweis reflex.	Apply evidence as it stands.	Cavalcanti 2017
Aggressive hypothermia protocols	Failed to improve outcomes in most scenarios.	Semmelweis reflex.	Consider switching to normothermia protocols.	Shaefi 2016
Aggressive glycaemic control protocols	Associated with more adverse events, no benefit for clear majority of patients.	Semmelweis reflex.	Adopt more liberal glycaemic control.	Finfer 2009
Early aggressive nutrition protocols	While no clear harm can be attributed, it may derive attention from more pressing problems.	Semmelweis reflex.	Adopt timely introduction of nutrition to the most severely ill patients.	Casaer 2011
Proton pump inhibitors prophylaxis for upper gastrointestinal bleeding	May not be useful and may increase complications.	Conservatism; Semmelweis reflex.	Probably not necessary. Large RCT recently completed.	Krag 2016
Early goal therapy for sepsis	Large bulk of evidence suggesting it may increase costs due to more ICU admissions without clear mortality benefit.	Semmelweis reflex.	Focus on early diagnosis and source control in septic patients (preferably outside the ICU).	PRISM Investigators 2017
Use fluid bolus to treat every conceivable abnormality (oliguria, hypotension, tachycardia, reduction in consciousness levels, etc.)	Fluid creep is a major issue. Fluids should be considered drugs with very low therapeutic range.	Law of the instrument ("Give a small boy a hammer, and he will find that everything he encounters needs pounding", Maslow 1966); conservatism; Semmelweis reflex.	Reduce fluid creep starting with maintenance fluids and reducing unnecessary dilutions. Adopt early negative fluid balance whenever possible.	Van Regenmortel 2018
Attempt to correct physiological abnormalities	Physiology can be bent to fit one´s desire for adequacy. There is no single or correct physiological parameter in critically ill patients.	Conservatism; default effect; continued influence effect.	Aim for physiological targets only in the absence of hard evidence.	Reade 2009; 2013

tory finding and somehow slack his fear of negligence. Secure physicians would probably ignore (or would not even have ordered) CRP levels and would choose a "wait-and-see" approach (Hranjec 2012). However, some physicians would embark on a destructive cycle of cognitive bias aiming at confirming their hypothesis. A similar scenario is conceivable for an apparently stable patient, who presents with an elevated lactate level, low central venous oxygen saturation etc. The problem, therefore, is the attempt to contextualise excessive information inside an otherwise unremarkable situation.

It may be stated that simply collecting *less* data is a childish suggestion and that all efforts should be made to use *more* data to improve treatment. I beg to disagree. A probabilistic interpretation of data is well suited in complex scenarios when we are accustomed to information (this applies to most Bayesian inference done in medicine); however, when data is new, time is short, and a decision is crucial, approaches that minimise choices based on less data may outperform complex models (Hardman 2003). This applies to many busy strained ICUs around the world.

Now let´s move to the right part of Figure 1. Damage has been done and our patient with a spurious irrelevant CRP elevation now has a ventilator-associated pneumonia (VAP) diagnosis. VAP has a doubtful attributable mortality but appears to be associated with prolonged mechanical ventilation and, obviously, higher costs (Melsen 2013). A VAP diagnosis leads to serious developments, such as antibiotic exposure, family distress ("Now, above all, he has a pneumonia!") and even administrative issues (billing and benchmarking). Cognitive bias will not stop there. Despite evidence that guiding antibiotic time using CRP and/or procalcitonin levels are appropriate (de Jong 2016), the physician may now choose to embrace a conservative approach and apply a whole two-week course of antibiotics (the *default effect*). The same physician that relied on CRP to diagnose VAP is now shaky to stop antibiotics when CRP drops. However, if CRP dares to rise again in the following 48 hours, it is inevitable that concerns about "treatment failure" will arise and the circle of overtreatment will prevail. If physicians would consider that treatment is *part* of the disease and not an indissociable part of recovery, maybe the pros and cons would favour the first. In fact, using our infection vignette as an example, it is estimated that up to 20% of all patients receiving antibiotics will develop a serious adverse reaction (Tamma 2017). Maybe net benefit would be negative in our vignette?

> "In the eagerness of having a quick diagnosis and treatment, intensivists generate data that will only aggravate the problem"

The right side of the figure continues with a well-known sequence of cognitive biases that preclude proper patient management. The physician becomes emotionally tied to the diagnosis, knotted to the VAP protocol he wrote for the ICU (the "IKEA effect", Norton 2012) and will fail to see evidence contrary to his hypothesis. If antibiotics are withdrawn in the next days by other physician and the patient eventually worsens, this will only further close the book on cognitive bias. While I used VAP for this example, the reader might find it suitable for many haemodynamic interventions (including the fluid bolus-diuretics conundrum, cardiac output measurements, etc).

Moving to the patient level

After the vignette, I hope that the reader considers that a more pragmatic approach to intensive care may be desirable. The cornerstone is transposing one of the Orwellian rules of writing to the ICU: "If it is possible to cut a word out, always cut it out" (Orwell 2013). Let´s replace "word" for "treatment" or "practice" and see what we can do. Examples are shown in Table 1.

For each intervention, procedure and treatment shown in Table 1, one cognitive bias will have to be overthrown. This is not an easy process, since most of the teaching in medicine is indeed based on passing bias and abstract concepts from generation to generation. It is commonplace to hear that we should aim to keep a patient "normovolaemic", "well-nourished", etc., while it remains underappreciated that these terms are closer to a linguistic trick than to a medical practice. The first step to embrace a modern ICU is understanding that much of what we did and believed was part of habit and not science. This is the very reason why conservatism, Semmelweis reflex (Leary and Wilson 1991) and default effect are the most frequent cognitive bias shown in Table 1.

In the dawn of civilization in ancient Eridu, architects were more interested in rebuilding structures from scratch than preserving previous buildings. The Eridu fortress was rebuilt eleven times. As Paul Kriwaczek stated, ancient Eridu habitants were impatient with what was old and receptive to the new (Kriwaczek 2012). Intensive care should remember its roots but allow the new to be built upon its ground. ■

Abbreviations

CRP C-reactive protein
ICU intensive care unit
VAP ventilator-associated pneumonia

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For full references, please email editorial@icu-management.org or visit https://iii.hm/o2a