EDITORIAL

Implementing change is a science

La implementación del cambio es una ciencia

This issue of Medicina Intensiva presents two interesting observational studies describing current practices in mechanical ventilation (MV). We will focus on how these types of studies offer insight into current practices and how they serve to understand how we adopt evidence-based practices (EBP).

Frutos-Vivar et al.[1] describe the practice of MV discontinuation in Spain across 18 years (4 cohorts, last in 2016). Amongst the findings, we see the expected disappearance of synchronized intermittent mandatory ventilation as a method to wean.[2] However, we see the preferred methods to test readiness to liberate from MV are T-piece and a gradual decrease of pressure support (PS). This is in contrast with current recommendations of using a PS of 5–8 cmH$_2$O.[3] Plotnikow et al.[4] describe the process of MV in Argentina in a large multicentric 3-month observational study. This report shows evidence of widespread adoption of lung-protective strategies for all patients and through the ventilation timeline. The majority of patients spent their time on volume control continuous mandatory ventilation, and most had plateau pressure measurements (90%), more than in other recent cohorts.[5] Similar to the Spanish cohort, the strategy chosen to test readiness to liberate from MV (T-piece) was discordant with the most recent MV liberation guidelines.[3]

In both studies, we see adoption and divergence from EBPs. These studies provide a view into how evidence, literature, and trends permeate into practice. Why is this relevant? From the academic standpoint, the ultimate goal of research is to improve patient care. However, knowledge of an EBP does not guarantee it will reach the patient. It is estimated that it takes 17 years for an EBP to become incorporated into routine clinical practice and only a fraction of EBPs reach widespread clinical use.[6] Some interventions can be adopted rapidly[7] while others remain underutilized.[5] Why do we adopt some evidence and diverge from others? The emerging field of implementation science (IS) provides tools to investigate this question. One of these tools is the Consolidated Framework for Implementation Research (CFIR)[8] (Table 1), a conceptual framework consisting of 37 constructs within 5 domains designed to aid in the implementation of EBPs.[8] The CFIR can be used pre-implementation to guide a formative evaluation to identify barriers and facilitators, during implementation to monitor progress, and post-implementation to explore what factors impacted the use of an EBP.[8] The use of a framework allows both implementation researchers and individuals responsible for quality improvement in healthcare to understand the context in which an EBP is being underutilized. Depending on the context, certain barriers to implementation may be more frequent.

We often think of two CFIR domains as the main drivers of implementation: *Individuals Involved* (e.g. clinician knowledge) and *Inner Setting* (e.g. ICU structure, resources).[9] We often focus our academic discussions on the strength of the evidence and recommendations (CFIR construct: *Evidence Strength and Quality*). In the case of PS or T-piece for MV liberation, this is a conditional recommendation with moderate certainty in evidence[3]; a salient point, as this may impact the degree of personal belief about an intervention, which often serves as a precursor of behavior (Construct: *Knowledge and beliefs about the Intervention*). Frutos-Vivar et al. highlight the fit between intervention and workflow (Construct: *Compatibility*), where the use of modes that favor synchrony (such as PS) may be a reason why the practice migrated towards a decreasing PS maneuver.

Using an IS framework prompts systematic consideration of other domains which may impact the implementation of EBPs. For example, the *Outer Setting* (e.g. economic, political), Plotnikow et al hypothesize that a nationwide limitation of resources could have contributed to their results. Or in the case of Frutos-Vivar et al. where they found geographic heterogeneity in implementation of liberation practices; that is, regardless of having identical patient characteristics, no patient would get the same liberation strategy. These findings need further examination as they have relevance for patient care at a national level. Not only do conceptual frameworks aid to uncover barriers and facilitators systemically, but this knowledge also serves to

Table 1 Consolidated Framework for Implementation Research (CFIR).

Topic	Description
I. Intervention characteristics	
A Intervention Source	Perception of stakeholders about whether the intervention is externally or internally developed.
B Evidence Strength & Quality	Stakeholders' perceptions of the quality and validity of evidence supporting the intervention and outcomes.
D Adaptability	The degree to which an intervention can be adapted, tailored, refined, or reinvented to meet local needs.
E Trialability	The ability to test the intervention on a small scale in the organization and to be able to reverse course if needed.
F Complexity	Perceived difficulty of implementation.
G Design Quality and Packaging	Perceived excellence in how the intervention is bundled, presented, and assembled.
H Cost	Costs of the intervention and costs associated with implementing that intervention.
II. Outer setting	
A Patient Needs & Resources	The extent to which patient needs, barriers and facilitators to meet those needs are known and prioritized.
B Cosmopolitanism	The degree to which an organization is networked with other external organizations.
C Peer Pressure	Competitive pressure to implement an intervention.
D External Policy & Incentives	Policy and regulations, external mandates, guidelines, pay-for-performance, public or benchmark reporting...
III. Inner setting	
A Structural Characteristics	The social architecture, age, maturity, and size of an organization.
B Networks & Communications	Social networks and the nature and quality of formal and informal communications within an organization.
C Culture	Norms, values, and basic assumptions of a given organization.
D Implementation Climate	The capacity for change, receptivity to an intervention, and extent of support/expectations of the organization.
1 Tension for Change	The degree to which stakeholders perceive the current situation as intolerable or needing change.
2 Compatibility	The fit between the intervention and how the intervention fits with existing workflows and systems.
3 Relative Priority	Individuals' shared perception of the importance of the implementation within the organization.
4 Organizational Incentives & Rewards	Extrinsic incentives such as goal-sharing awards, performance reviews, promotions, increased stature or respect...
5 Goals and Feedback	The degree to which goals are communicated, acted upon, and fed back to staff.
6 Learning Climate	The climate generates a safe and effective learning environment.
E Readiness for Implementation	Tangible and immediate indicators of organizational commitment to its decision to implement an intervention.
1 Leadership Engagement	Commitment, involvement, and accountability of leaders and managers with the implementation.
2 Available Resources	The level of resources dedicated for implementation and ongoing operations.
3 Access to knowledge and information	Ease of access to digestible information and knowledge about the intervention, how to incorporate it into work.
IV. Characteristics of individuals	
A Knowledge & Beliefs about the interventions	Individuals' attitudes toward and the value placed on the intervention.
B Self-efficacy	Individual believe in their capabilities to execute courses of action to achieve implementation goals.
C Individual Stage of Change	Characterization of the phase an individual as they progress toward skilled, and sustained use of the intervention.

Table 1 (*Continued*)

Topic	Description
D Individual Identification with Organization	How individuals perceive the organization and their relationship and degree of commitment with that organization.
E Other Personal Attributes	Other personal traits such as tolerance of ambiguity, intellectual ability, motivation, values, competence...
V. Process	
A Planning	The degree to which a scheme or method of behavior and tasks for implementing an intervention are developed.
B Engaging	Attracting and involving appropriate individuals in the implementation and use of the intervention.
1 Opinion Leaders	Individuals who have a formal or informal influence on the attitudes and beliefs of others.
2 Formally appointed internal implementation leaders	Individuals who have been formally appointed with responsibility for implementing an intervention.
3 Champions	Individuals who dedicate themselves to supporting, marketing, and 'driving through' an implementation.
4 External Change Agents	Individuals who are affiliated with an outside entity who formally influences or facilitates intervention decisions.
C Executing	Carrying out or accomplishing the implementation according to plan.
D Reflecting & Evaluating	Feedback about the progress and quality of implementation. Personal and team debriefing about progress.

Table adapted from Damschroder et al.[8]

inform intervention design and selection of implementation strategies[10] to increase the use of EBPs.[9]

How should the principles and methods of IS be operationalized to improve the care of the studied patients? With over 100 conceptual models to help understand barriers and facilitators,[11] the implementation process, and aid in the evaluation of implementation, there is no single model or framework that will fit all EBP evaluations. Working knowledge of several widely used frameworks will help determine which framework is best for a specific evaluation and/or context. While a recent review of IS studies in critical care settings found the most commonly reported strategies used were educational meetings, auditing and feedback, development of tools, and input from local opinion leaders,[12] implementation strategies should be selected to target local barriers and facilitators. Implementing and sustaining change in any practice is not simple. Many of the resources and organizational structures may not be present at all institutions. However, familiarization with IS frameworks, implementation strategies, and implementation outcomes[13] offers a pathway to improve the efficiency and chances of implementation success. Studies just as these[1,4] help us understand our practice and map out interventions to implement interventions that will hopefully improve the lives of our patients and caregivers.

Authors' contribution

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Conflict of interest

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