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Change Management Support in Postgraduate Medical Education: A Change for the Better

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Abstract

Curriculum change is inevitably a part of postgraduate medical education (PGME) due to a necessity to rapidly adapt to changes in societal needs, educational philosophy and technological advances. Initiating, adopting as well as sustaining successful change can be very challenging especially in complex and time-constrained environments such as healthcare and PGME. Indeed, research has shown that educational changes do not always lead to the desired adjustments in practice. Surprisingly, implementation processes in healthcare and, more particularly, those in medical education are rarely supported by change management principles despite the scale and implications of curriculum reforms that justify guidance of such implementation processes. Insights from a change management perspective could help to smoothen the transition from theory to practice by guiding implementation processes and provide support in routinizing innovations in standard practice. A thorough description about change from an educational as well as a change management perspective is made, followed by the experiences with introducing change management principles into PGME. Lastly, the potential of change management principles for future changes in medical education, and their practical implications, is presented.

Keywords: change management, postgraduate medical education, curriculum change, readiness for change, innovation

1. Introduction

Change and learning happen throughout our lives as we need to adapt to the world around us [1]. Change and innovation imply progress and improvement from our current state of practice

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to a desired state of practice. Change creates new opportunities as well as new demands on our way of behaving and the goals we need to achieve. This implies that we need to learn to change. Learning in itself brings about change as well when you acquire new capabilities and skills which create new opportunities and choices leading to further growth, and inevitably change [1]. However, change can be challenging as it disturbs an equilibrium before reaching a new, and presumably improved, one [2]. Change is a continuous process, and it is only a matter of time before a new equilibrium is sought.

1.1. Change management in postgraduate medical education

As mentioned above, change or innovation implies progress and improvement. This presumption is clearly reflected in healthcare policy in which innovation is used among others to increase efficiency, reduce costs, raise patient satisfaction, reduce practice variation and improve quality [3, 4]. And of course, with time, innovations become outdated themselves and need to be replaced or adapted [3]. The same trend is seen in education. Medical education needs to adapt to among others technological advances, societal demands and legislation. As a result, new methods of teaching and learning are introduced or current methods are adapted [5–8].

Despite the fact that implementing change is notoriously challenging, support from a change management perspective to support implementation processes in postgraduate medical education (PGME) is still rarely sought [9]. This might be the result of a strong disciplinary divide between management sciences and health or educational sciences. Indeed, when looking at the literature, authors of studies with primary relevance to implementation science typically publish almost exclusively in management literature [10]. This slows the spread of innovation because it stifles the extent to which research evidence for change purposes is sought, exchanged and applied [11, 12]. Attention to change management principles in healthcare and educational settings is also important to avoid the use of inappropriate, ineffective strategies for implementation and hence save time and money [13]. Too little guidance from appropriate change models and implementation strategies could slow down the implementation process, mainly because opportunities for advanced assessment and planning are missed [14–16]. Additionally, change management principles can provide methods to perform formative evaluations of the implementation process; so, change efforts can be optimized, and sustainability of the innovation can be prolonged and potentially promote dissemination of findings to other contexts [17].

1.2. Reading guide

In this chapter, a thorough description about change from an educational as well as a change management perspective is made. Insights from, among others, the diffusion of innovation theory by Rogers [18] as well as the three-stage model of change by Lewin [2] are used to discuss the challenges of change implementation in general. This is followed by an extensive explanation of the factors involved in implementing change in medical education such as complex systems, diverse educational contexts, culture as well as the influence of the medical profession itself. The potential of change management in PGME is discussed based on empirical research [9, 16, 19]. Lastly, practical implications are presented.

2. The challenge of implementing change

For decades, the study of change has been one of the important research topics in the social sciences because implementing change has proven to be difficult and success rates are disappointing [4, 20, 21]. Organizational change is particularly challenging as it requires multiple, usually simultaneous, adjustments in workflow, communication, decision-making and so on. In other words, it requires collective and coordinated behavioral change [4]. Not surprisingly, it is said that more than 50% of organizational change attempts eventually or prematurely fail [4, 21, 22]. There is no reason to believe the numbers are any better for change processes in healthcare organizations [4]. For instance, when looking at the implementation of new treatment methods and guidelines into routine practice, indeed this proves to be a slow and unpredictable process [3, 23]. Many interventions found to be effective in research settings fail to translate into the expected patient care outcomes in real practice [17]. Furthermore, medical innovations tend to be added to the already existing repertoire of diagnostic or therapeutic options rather than replacing them. The latter makes the life cycles of medical innovations relatively long [24].

2.1. Adopting change

In his diffusion of innovation theory, Rogers argues people tend to adopt changes at varying rates. Adoption of an innovation is an individual process detailing the series of stages one undergoes from first hearing about a change to finally adopting it. Rogers identifies five adopter categories, or classification of members of a social system, on the basis of their innovativeness. Innovativeness is the extent to which an individual is relatively early in adopting new ideas. Their relative speeds can be plotted as a normal distribution, showing the incidence of people adopting an innovation at various points in time [18]. The normal curve (**Figure 1**) is used to delineate five different categories of adopters according to where they fall under the curve: innovators (2.5%), early adopters (13.5%), early majority (34%), late majority (34%) and laggards (16%) [18]. These five categories of adopters have the following characteristics [18]:

- *Innovators* are the first to adopt an innovation. They are eager to try new ideas and willing to accept a setback when an idea proves unsuccessful. Others might consider the innovator to be daring, and it is the hazardous risk-taking that is of salient value to this type of individual.

- *Early adopters* seem to have the greatest degree of opinion leadership. They provide advice and information sought by other adopters. The early adopter is usually respected by his or her peers and has a reputation for successful and discrete use of new ideas.

- *Early majority* adopt new ideas just before the average member of a social system. They deliberate some time before completely adopting a new idea. Seldom leading, early majority adopters willingly follow in adopting innovations.

- *Late majority* are skeptical. Their adoption may be borne out of economic necessity and in response to increasing social pressure. They are cautious about innovations and are reluctant to adopt until most others in their social system do so first.
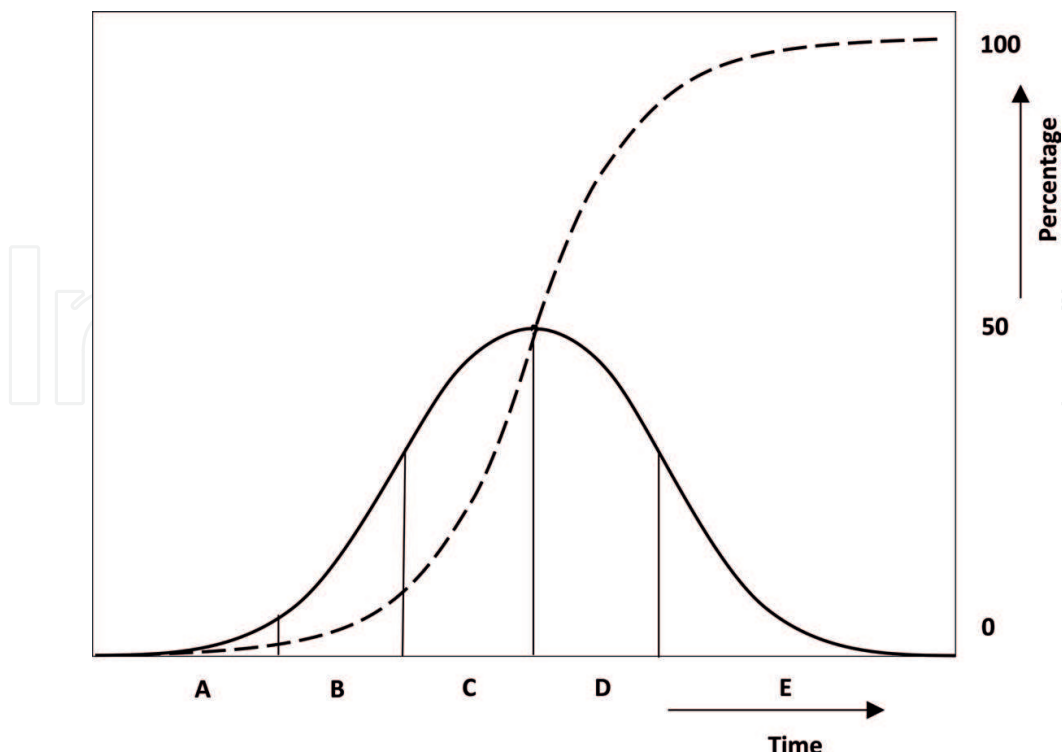
Figure 1. Diffusion of innovation. The figure shows the normal curve (black line) representing the different adopter types identified by Rogers and the S-curve (dashed line) showing the cumulative percentage, or prevalence, of people adopting an innovation at various points in time. Adopter categories: (A) innovators, (B) early adopters, (C) early majority, (D) late majority and (E) laggards.

- *Laggards* are traditionalists and possess almost no opinion leadership. Innovation finally adopted by a laggard may already be rendered obsolete by more recent ideas already in use by innovators.

In addition to the characteristics of the adopters, the perceived characteristics of an innovation are also considered to affect its adoption and diffusion. Whereas adoption refers to an individual process, diffusion signifies a group phenomenon. Diffusion suggests how an innovation spreads and can be plotted as an S-curve showing the cumulative percentage, or prevalence, of people adopting an innovation at various points in time (**Figure 1**). Rogers identifies five innovation attributes as being important for rapid diffusion [18]:

1. Relative advantage, that is, the degree to which the innovation is perceived to have significant advantages over current practice such as higher productivity, efficiency and lower costs.

2. Compatibility, that is, the degree to which the innovation is perceived as being consistent with past practices, current values and existing needs of potential adopters.

3. Complexity, that is, the degree to which the innovation can be readily understood and easily implemented.

4. Trialability, that is, the degree to which the innovation may be experimented with or tried out, within certain limits, before actually adopting the innovation.

5. Observability, that is, the degree to which the use and benefits of the innovation are visible to others and as a consequence can act as a stimulus for uptake by others.

However, it is important to realize that adoption of an innovation does not mean exact replication. In the process of adoption and implementation of an innovation, it can be adapted or reinvented. Reinvention is defined as the degree to which an innovation is changed or modified in the process of its adoption and implementation. Reinvention is a key principle in Diffusion of Innovation. The success of an innovation depends on how well it evolves to meet the needs of more and more risk-averse individuals. For instance, reinvention is likely to occur in the case of complex innovations or when an innovation has multiple applications. Alternatively, reinvention can also occur when adopters lack sufficient knowledge about the innovation or when the innovation is an abstract concept leading to uncertainties. The concept of reinvention is important because it tells us that continuous improvement of an innovation is the key to its diffusion [18].

3. Implementation of change in medical education

In the last decade, the most prominent change PGME faced was the introduction of competency based medical education (CBME). This innovation is driven by, among others, changes in healthcare needs and expectations of the public [25, 26] as well as a need to show a greater accountability to society [27]. Increasingly, medicine is being asked to be receptive as well as reactive to societal needs and be conscious about the outcomes of their educational programs [26, 27]. Not surprisingly, competency-based frameworks are designed to be outcome-oriented: they focus on competencies needed by trainees at the end of their training in order to meet the healthcare needs of society [26]. To reach this goal, CBME introduced a broader definition of competencies [26] as well as requirements for teaching and assessment strategies [25]. For instance, in the case of CanMEDS, this means trainees also need to become a competent 'leader,' 'collaborator' and 'scholar.'

The introduction of an outcome-based framework led to a cascade of changes such as the development of so-called entrustable professional activities (EPAs [28]) and increased use of portfolios. For the purpose of constructing competency-based PGME, activities that constitute elements of professional work may be specified to a limited number of EPAs. EPAs are 'those activities that together constitute the mass of critical elements that operationally define a profession.' EPAs should be considered as units of work that have been specified with a number of conditions to be met in order to receive a statement of awarded responsibility (STAR) [28]. For instance, obstetric EPAs include technical activities such as preforming a cesarean section as well as more generic ones such as delivering bad news. A STAR for a specific EPA marks to what extend a trainee is entrusted to carry out this activity independently [28]. CBME and EPAs emphasized the role of assessment and created a need to properly organize assessment information. To support competency development in PGME, the use of portfolios is increased to manage the large volume of assessment data collected. The uptake of portfolios was further driven by their potential to promote a trainee's active engagement in and responsibility for learning as well as endorsement of regulatory bodies [29].

Altogether, these changes in PGME ask for a paradigm shift [25, 26] from a focus solely on reaching medical expertise to a focus on becoming a medical expert as well as acquiring other competencies for trainees to successfully address the roles they have in meeting societal needs.

In other words, the theoretical changes require behavioral changes of individuals, in this case medical specialists and trainees. In practice, this means purposeful deliberate activity from supervising medical specialists to ensure proper use of feedback and reflection on learning [29].

However, implementing change is easier said than done especially in time-constrained environments such as healthcare and PGME. Challenges in the implementation process of CBME lead back to generic models for CBME that are not always specifically outlined. This results in a lack of clarity about its content, meaning and relevance [5, 30, 31]. Furthermore, the implementation of CBME frameworks is further complicated by a lack of support from educationalists who can help with understanding the educational concepts and relating them to the clinical work place [14, 25]. From an educationalist's point of view, learning objectives must be specified and there is a tendency to split each of these objectives in more detail. Indeed, this has been done in the Accreditation Council of Graduate Medical Education (ACGME) and CanMEDS frameworks. In practice, however, medical specialists have no problem stating which professional activities need to be carried out adequately by their trainees at which moment in time but they have trouble valuing these activities as competencies [28].

Additionally, innovation in medical education must compete with other goals of healthcare such as efficiency and coverage. When translating this to the introduction of outcome-based learning, this raises questions such as 'how can we ensure more direct observation of the trainee during busy consultation hours?'; 'how do we deal with uncertain timings of transitions?' and 'how do we ensure faculty development?' [32]. In the complex dynamics of a teaching hospital, clinical service and medical education are interrelated. This means that changes in medical education change the context of clinical service and vice versa [33].

3.1. Complex organizations

Due to this intricate balance between the different goals of a teaching hospital, complexity theory has recently gained attention in educational research. Complexity theory approaches an organization as a set of subsystems. These subsystems are connected to each other and have to be analyzed in the context of, and in relation to, other systems rather than in isolation [33–35]. In teaching hospitals, PGME and clinical service are so tightly embedded that changes to one of these systsems immediately have an effect on the other. This frequently leads to friction between systems [33–35]. For instance, CBME has led to the introduction of flexible training programs that can no longer be modeled around clinical service [34]. The early departure of a highly talented trainee competent enough to speed up his/her progression through the training program, may have workforce implications and impact on healthcare as trainee schedules are disrupted [32].

Complex systems also have fuzzy boundaries, meaning that these systems are not always clearly defined [33, 34]. People working in these systems might have several roles in multiple systems as well. For example, a gynecologist performing a cesarean section delivers patient care, educates a trainee and acts as a manager in the operating room. Additionally, complex systems often behave in a nonlinear way. This means that change in one system can lead to unintentional, unpredicted and disproportional effects and outcomes in another system. This makes complex systems sensitive to small changes [3, 33, 34]. As a result, the implementation process cannot be completely preprogrammed [3] and needs to be adaptable.

3.2. Implementation in different educational contexts

Competency-based frameworks are introduced in many areas of the world [5–8, 25]. As a result, these theoretical frameworks need to be translated to many different contexts. Starting of small, even within one country, implementing the same innovation at different teaching sites can be challenging. For instance, program objectives are usually centrally set but must be achieved at local teaching sites. As a result, these individual teaching sites must adapt to meet these objectives [29], which might not always be possible due to their local context such as the lack of certain treatment facilities. Diversity in curriculum structures across teaching sites such as longitudinal programs versus rotation-based programs could also bring forward other needs when implementing the same change [29].

Organizational characteristics of the teaching site itself, such as their size, might influence the implementation process as well. For instance, in the Netherlands, larger academic medical teaching centers tend to be less receptive for change compared to the smaller nonacademic teaching hospital [16]. Departments are usually smaller in nonacademic teaching hospitals, which might lead to more efficient communication and decision-making processes [14]. Possibly, it might also cause team members to feel a stronger sense of a shared responsibility for educational change [14], thus promoting teamwork when implementing change [16]. Additionally, the primary focus in academic medical teaching hospitals tends to be more on pursuing an active career in research rather than an active career in medical education [36–39]. Potentially, this could impede gaining sufficient support and shared efforts to implement educational change [16].

Innovation can also be translated to another educational context. Initially, competency frameworks were developed for postgraduate medical education, but they are increasingly translated to undergraduate medical education as well. This requires the competencies to be related to the another professional environment in which they must be achieved [28].

In the case of competency-based frameworks, they are developed in different countries [40, 41] and are being used to guide the design of medical curricula all over the world [5, 25, 27, 30]. Due to the differences in health and educational systems, some elements of these frameworks might be variously executable in different countries. As a result, minor adjustments to the framework might be necessary in order for it to fit into other contexts [42]. In this case, every country has the freedom to make these adjustments. However, it becomes more complex when you intend to implement a curriculum that is intended to be applied across borders, such as a pan-European curriculum in PGME [42]. In that case, you set a certain standard that needs to be met by all countries involved. As a consequence, such a curriculum must respect local practice variation while providing a standard set of outcomes, duration and subjects of training. One way of achieving that would be to create a mandatory core for all trainees as well as complementary electives. The latter allows variation between both personal and local needs and infrastructure [42].

3.3. The influence of organizational culture on curriculum change

Not surprisingly, within these different educational settings, the influence of culture is widely acknowledged to be important for innovation [43–47]. Organizational culture is defined as a set of beliefs, values and assumptions that are shared by members of an organization [48]. Organizational members rely on these values and beliefs to guide their decisions and behaviors

[44, 48]. Organizational culture can differ between countries and between organizations within countries, and it can even vary between departments within the same organization. Therefore, being aware of or even assessing the culture of these individual departments is essential for the successful implementation of change [44].

The competing values framework developed by Quinn et al. [49] explores competing demands within an organization on two axes. Organizations are classified according to whether they value flexibility or control in organizational structuring and whether they adopt an internal or external focus toward the environment. This leads to the four possible culture types, that is, 'human relations,' 'open systems,' 'internal process' and 'rational goal' (**Table 1**) [43, 49]:

- Human relations emphasizes flexibility and internal focus and stresses cohesion, human resource development and morale.

- Open relations emphasizes flexibility and external focus and stresses innovation, readiness and development.

- Internal process emphasizes control and internal focus and stresses stability, communication and control.

- Rational goal emphasizes control and external focus and stresses efficiency, goal setting and productivity.

All four culture types can be presented in a single organization, although some values are likely to be dominant [49]. However, emphasis on one organizational culture type can lead to narrowness and an inability to adapt to a changing environment [49]. When translating this to medical education, flexible medical schools (culture-type 'human relations' and/or 'open systems') tend to respond more positively to change than those featuring control-driven policies (culture-type 'rational goal' and/or 'internal process') [45]. A certain level of risk-taking, flexible policies, strong leadership, teamwork and strict hierarchy are some of the positive effects of organizational culture on curriculum change [45]. More specifically, risk-taking and flexible policies stimulated the introduction of innovative ideas and transdisciplinary teamwork is thought to be advantageous for integrated curricula, whereas strict hierarchy is believed to have a positive impact on the coordination of complex change [45].

3.4. Changing the behavior of medical doctors: a challenge in itself

So far, we have discussed the current use of change management in medical education, implementing change in complex systems and different contexts as well as the influence of culture on change. But what do we know about the adopters, that is, the trainees and medical specialists

	Internal	External
Flexibility	Human relations	Open systems
Control	Internal process	Rational goal

The competing values framework developed by Quinn et al. [49] explores competing demands within an organization on two axes. This leads to the four possible culture types, that is, 'human relations,' 'open systems,' 'internal process' and 'rational goal,' represented in this 2 × 2 table.

Table 1. Adapted from the competing values framework developed by Quinn et al. [49].

confronted with curriculum change? Generally speaking, you could state that all organizational change starts with individual behavior change. Many theories of individual change have been published, but little research has been done to gain understanding of the dynamic interplay between individuals and the organization within which they work, and how the interplay influences individual or organizational behavior change [17]. Behavioral change is difficult, not only because it involves learning and implementing new knowledge but also, maybe even more important, it involves unlearning of old habits [50].

Lewin [2] states that behavior of individuals is the result of a balance between change drivers and restraining forces, leading to a quasi-stationary equilibrium (**Figure 2**) [2, 22]. Examples of change drivers are strong leadership, social demands or political forces, whereas examples of restraining forces are poor leadership, change fatigue or lack of time [2]. Lewin developed a linear three-stage model of change, starting with unfreezing of the status quo, followed by a change or transition leading to refreezing, that is, a new equilibrium. In the unfreezing phase, you need to create a state of 'readiness to change' in order to successfully start implementing the proposed change in the moving or transition phase. In the refreezing phase, the change must be adapted as the new way of practice and needs to sustain in order to create a new equilibrium [2]. In this model, change is seen as an isolated step in the process of transitioning from one stable equilibrium to the next. During this transition, efficiency or performance can decline due to, for instance, unfamiliarity with the new way of working or frustration as a result of that. Werther [51] calls this the learning curve of change (**Figure 2**). **Figure 2** combines the three-stage model of change of Lewin with the learning curve of Werther [22, 51].
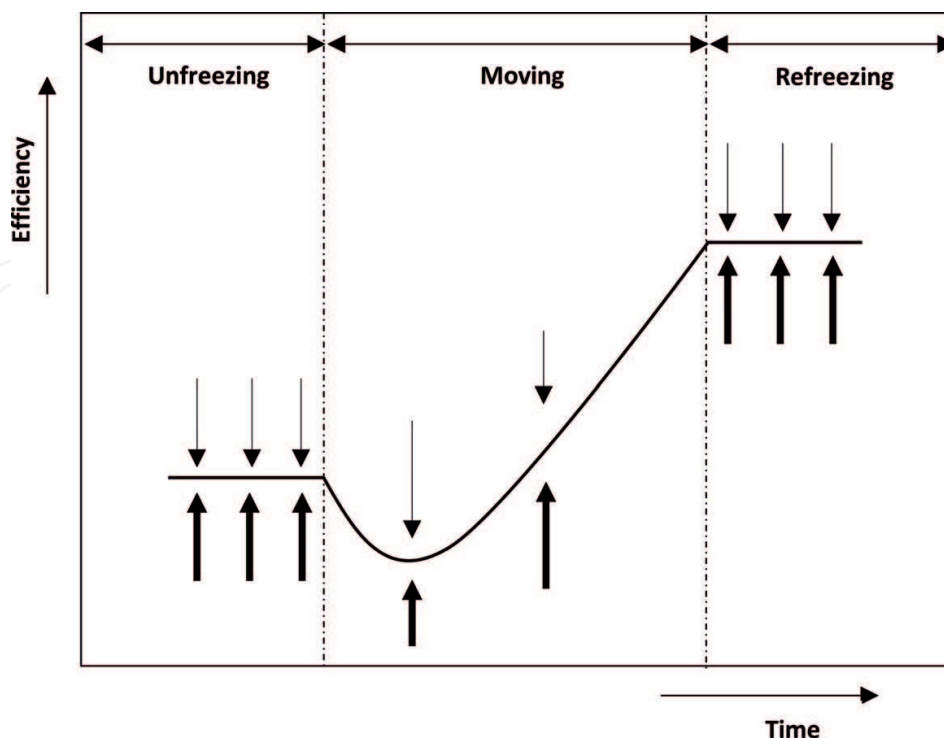

Figure 2. Three-stage model of change of Lewin. Three-stage model of change by Lewin [2], i.e. unfreezing, moving and refreezing. Thick black arrows facing upwards: change drivers. Thin black arrows facing downwards: restraining forces. The black line represents the learning curve of change by Werther and Davis [51].

However, the linear approach of Lewin seems not completely transferable to behavioral change in medical practice. Research has shown that medical doctors find it difficult to adopt new practices and have problems completely unlearning their old routines [50]. First, this might be due to the fact the many of the behaviors shown by medical doctors are deeply rooted habitual reflexes [52]. During their many years of training, starting at medical school, they have been exposed to countless guidelines or norms of practice behavior in both formal and informal ways. Moreover, repetitive assessment of these values, attitudes and skills by means of observation or drills are an integral part of their training. Together, this explains the strong anchoring of habits in medical doctors [52]. Second, medical doctors are generally highly ethical and professional and motivated by multiple interests such as their own interest, the patient's interest, and the interest of society. They must balance these with a professional ethos that demands, among other things, accountability and competence. As a result, the impact of change on clinical outcomes is important in the adoption of innovation [52]. Furthermore, the medical profession has a very prominent professional autonomy, and research in this field has shown that the profession tends to resist external pressures that either try to increase the control of medical practice [53] or try to influence the implementation processes [9, 19].

When confronted with practice change, medical doctors go through a process of trail-and-error while unlearning, developing their own method of implementation and building comfort with the new practice. Usually, they also develop personalized contingency theories based on patient characteristics that help them to decide in which case they should rely on the new practice rather than the old and vice versa [50]. For instance, medical doctors find it difficult to solely base their practice change on literature and rely on discussion with their colleagues on how to incorporate new guidelines into daily practice [50]. Additionally, the quality of evidence behind the new guidelines is an important factor in determining whether medical doctors will use this evidence to support their unlearning. So, in practice, the unlearning process of medical doctors is less fluent as might be suggested by the linear model of Lewin. Already mentioned earlier, medical innovations tend to be added to the already existing repertoire of diagnostic or therapeutic options rather than replacing them [24]. Additionally, the adaption of new practice introduces further change as medical doctors are discussing, self-reflecting and evaluating the new practice with their colleagues. You could say that the medical profession is in a continuous stage of change [6, 50].

4. Readiness for change

In such a dynamic and constantly changing environment, it is important to know whether the people involved are psychologically and behaviorally prepared to implement the proposed change [54]. Therefore, one of the potentially beneficial change management strategies for PGME could be the assessment of organizational readiness for change (ORC) [9]. Organizational readiness for change reflects the degree to which members of an organization are collectively primed, motivated and capable to adopt and execute a particular change initiative to purposefully alter the status quo [55]. It is believed that organizational readiness for change is a critical precursor for successful implementation of complex change initiatives in healthcare settings

[21, 54]. When change leaders establish insufficient readiness, a range of predictable and undesirable outcomes could occur: change efforts make a false start from which it might or might not recover, change efforts stall as resistance grows, or the change fails altogether [54].

Change readiness is a comprehensive, multifaceted construct as it comprises both psychological and structural factors that together determine the degree of readiness present [54, 55]. Psychological factors reflect the extent to which the members of the organization are cognitively and emotionally inclined to implement the proposed change [55]. For instance, 'collective efficacy' reflects the shared belief in a team's conjoint capabilities to organize and execute the right actions to successfully implement change, whereas 'appropriateness' reflects the belief a change is correct for the situation being addressed [55]. These beliefs relate to the amount of effort that team members are willing to put into a change process, that is, when change seems unreachable, possible obstacles seem harder to encounter and change efforts are low [4, 56]. Structural factors reflect the extent to which the circumstances under which the change is occurring enhance or inhibit the implementation of the proposed change [55]. Examples are whether or not a team's skills and abilities align with the actions that need to be taken and the presence of both a tangible environment (e.g., funding) and an intangible environment (e.g., culture) to support change [55]. When looking at organizational readiness, it is important to stress the collective nature of this construct. Implementing complex change initiatives in healthcare settings requires collective action of those involved, each of whom contributes their share to the implementation process [54]. When ORC is high, the staff involved are more dedicated to contribute to the proposed change process and more persistent in the event of setbacks. Conversely, when ORC is low, the staff involved are more likely to consider change as undesirable and may avoid or even resist participation [4, 54, 55, 57, 58]. Team members will commit to a change because they either want to, have to or ought to. Regardless of its reason, this form of commitment will lead to behavioral compliance. Some, however, might show resistance, either active or passive, and fail to comply [59]. Actions to create readiness include among others establishing a sense of urgency, empowering your team members and creating an appealing vision for the future as well as fostering a sense of confidence that this can be realized [9, 21, 54]. Change readiness can be assessed at several stages of the change process, that is, before or during change, as a way to diagnose any possible or current hurdles in the implementation process in order to facilitate any corrective interventions. Additionally, readiness can be assessed repeatedly to explore the effects of these interventions [9].

4.1. Readiness for change in postgraduate medical education

In the last decade, the attention for ORC increased, leading to the development of multiple instruments to assess ORC in healthcare. Generally, these instruments tend to focus on the implementation of new guidelines or new practices [57, 60]. In undergraduate medical education, several instruments were developed as well [9, 61, 62]. However, in postgraduate medical education, only one instrument to assess ORC exists, that is, Specialty Training's Organizational Readiness for curriculum Change (STORC) [9]. STORC was designed to measure readiness for change in clinical teaching teams, that is, a hospital-based educational team within one department, such as radiology or gynecology, consisting of a program director, clinical staff members and trainees. STORC was developed specifically for this setting as it was

expected that the use of the former instruments would not take into account the unique properties of PGME [9]. In teaching hospitals, PGME is completely integrated into clinical service, that is, patient care, teaching and learning are interconnected to each other and cannot be seen separately [63]. Therefore, any adjustments made to the educational system will influence clinical service and could have consequences for, e.g., working schedules, funding and learning experiences [9, 63]. Furthermore, instruments developed for undergraduate medical education focus on medical faculties, to the neglect of students, with long-lasting hierarchical structures, leading to a more diverse set of pressures to change [9, 61]. Additionally, trainees have a far more active role in implementing curricula than medical students [14, 64] and work in smaller clinical teaching teams that tend to have a more volatile composition than medical faculties [9].

Through an international Delphi procedure, the applicability of a questionnaire to assess ORC in PGME was determined. The preliminary questionnaire was based on existing instruments derived from business and healthcare settings [9]. In two Delphi rounds, the 41 expert panelists (trainees and medical specialists from four different countries) determined the most important and applicable items and subscales to assess ORC in PGME. This Delphi procedure was followed by confirmatory factor analysis validating the clustering of items within the 10 subscales (**Table 2**) [19].

The final subscale consists out of 43 items divided into 10 subscales [19]. Together, they represent both psychological and structural factors as well as most of the core components of ORC

Subscales STORC [9, 19]	Topic(s) covered
Pressure to change	Which sources exert pressure to implement a particular change in residency training and to what extent?
Appropriateness	Is the innovation in residency training appropriate for the situation being addressed?
Necessity to change	Is there a significant difference between the current state and the desired state of residency training?
Management support and leadership	Is the educational board (hospital level) committed to and support the change initiative?
Staff culture	Do clinical staff members cooperate and share responsibilities and are they willing to innovate?
The formal leader	Does the program director accept responsibility and have the authority to lead the implementation of a particular change?
Involvement	How is the quality of change communication?
Project resources	Which recourses are available to implement a particular change in residency training and to what extent?
Clarity of mission and goals	Are team members aware of the mission and goals of the change?
The implementation plan	Is there an implementation plan that among others describes tasks, timelines and an evaluation plan?

Subscales and topics covered by the questionnaire specialty training's organizational readiness for curriculum change (STORC). The questionnaire covers all core components of organizational readiness for change described in literature [9, 19].

Table 2. Subscales and topics covered by the questionnaire STORC (adapted from Bank [16]).

described in literature (**Table 2**) [9, 19]. Since ORC is measured on various subscales and presented as such, its strength lies in analyzing these subscales. The latter makes it possible for educational leaders to identify and anticipate on hurdles in the implementation process at an early stage, or more ideally, prior to change. Subsequently, change efforts could be optimized by targeted interventions aimed at facilitating successful curriculum change. The effect of these interventions could be measured by repeated administration of STORC [9].

During the development of STORC [9, 19], it became apparent that external pressures, such as hospital boards accreditation bodies and the ministry of health were not represented in the final version of STORC despite the fact that CBME is top-down driven [9, 19]. Possibly, external pressures are not experienced on a daily basis, explaining the exclusion of these pressures in STORC. Alternatively, hospitals are not organized according to the habitual management practices, leading to a different set of (recognized) pressures [19, 65]. Alternatively, as mentioned earlier, medical doctors have a very prominent professional autonomy which might make them less receptive to external pressure [19].

After its development, STORC was used to assess ORC in PGME in the Netherlands, in order to understand how clinical teaching teams deal with curriculum change such as the introduction of CBME. The level of ORC is measured at the individual level but aggregated to team levels in the analysis. By looking at the team's 'state' of readiness for change, insights were gathered regarding leadership roles, teamwork, shared commitment, perceived support and behavioral reactions to change [16].

When comparing the different subscales of STORC, one important trend can be seen (**Table 3**). The subscale 'formal leader,' consisting of items regarding whether the program director has the authority to lead and accepts responsibility for the success of the change process, scored higher than the other scales. High scores were also given on the subscale 'staff culture,' which includes items about teamwork and clinical staff's receptiveness to changes, as well as on the subscale 'appropriateness.' At the other end, the subscales 'management support and leadership,' 'project recourses' and 'implementation plan' had the lowest scores [16].

These results clearly designate the program director as the leader of educational change. This is in line with change literature that shows implementation is accelerated in the presence of leaders that function as role models and entrepreneurs [14]. Strong leadership will also help clinical team members to adjust habits and routines [15]. High scores on the subscale 'staff culture' show that clinical staff members do feel and share a sense of responsibility for the

Highest scoring subscales of STORC	Lowest scoring subscales of STORC
Formal leader	Management support and leadership
Staff culture	Implementation plan
Appropriateness	Project resources

Results of the assessment of readiness for change in clinical teaching teams in the Netherlands. The table shows the subscales of STORC that had the highest and lowest scores throughout the sample of respondents, that is, program directors, clinical staff members and trainees.

Table 3. Subscales of questionnaire STORC showing the highest and lowest scores [16].

improvement of training which is in line with the philosophy of CBME [40]. High scores on the subscale 'appropriateness' suggest CBME indeed seems to meet the needs in PGME and is therefore accepted as an appropriate innovation [16].

The lowest scores were seen on the subscales 'management support and leadership,' 'project recourses' and 'implementation plan,' all representing components related to change management. In the light of the limited attention to change management principles in medical education, this was not surprising and puts emphasis on the absence of descriptions of tasks and timelines, and the shortage of evaluation cycles, training facilities and financial resources [16].

In sum, clinical teaching teams appear to comply with the implementation of curriculum change if the proposed change is seen as a correct innovation. In that case, program directors receive and take the responsibility for the job that needs to be done, but they lack a fully equipped toolbox of change management principles to actually implement change as efficiently as possible [16].

5. Practical implications

To come back to the adopter categories of Rogers [18], many would expect that you should focus on targeting the late majority and laggards to speed up diffusion of innovation. However, they are also the hardest to convince and will probably not even consider changing until the idea has become well accepted by a solid majority of the target audience. It is much easier to reach and convince innovators or early adopters. Rogers calls them the 'critical mass.' Once 15% of the population has adopted a new idea, it has the critical mass to spread on its own momentum. This is named the tipping point. Furthermore, people in these categories are considered to be leaders and are well respected, so their peers will be more likely to pick up the new behavior [18].

Looking at the literature on how medical doctors deal with practice change gives valuable insights on how to introduce educational change as well. Medical doctors tend to discuss the information presented to them among each other and subsequently translate this into their own practice. Furthermore, they weigh the evidence and consequences for patient outcomes [50]. This particular process of translating theory into practice by solely the profession itself underscores the professional autonomy a medical doctor has. When correlating this to the diffusion of innovation theory of Rogers [18] and the five innovation attributes he describes, the trialability of an educational innovation is particularly important to consider. Trialability implies a certain degree of freedom to experiment with the innovation when implementing it, which clearly relates to the professional autonomy medical doctors experience when implementing clinical practice change. That said, trialability might also lead to a certain degree of reinvention if allowed without a purposeful amount of structure. Reinvention could be valuable to simplify a complex innovation to a local context. However, it could also result in

suboptimal implementation of change such as we have seen with the implementation of the seven roles of CanMEDS. The abstract description of these roles led to a lack of clarity about their content, meaning and relevance in clinical practice [5, 30, 31, 66]. Subsequently, adequate implementation was hampered [14, 25].

There is no single solution which will trigger or ensure adequate educational innovation, as the interaction between the innovation and the context of its introduction is necessarily complex and variable [3]. Achieving a sufficient level of ORC in itself does not guarantee the implementation of a complex change will result in the anticipated success [54]. Therefore, a multifaceted approach is essential such as combining the assessment of ORC prior to change [9, 19], with ensuring adequate innovation attributes [18] and being receptive to the specific characteristics of behavioral change by medical doctors [9, 19, 50].

6. Conclusion

Attention to change management support in postgraduate medical education is a change for the better. It could help guide implementation processes, optimize change efforts, avoid the use of ineffective strategies, save time and money, prolong sustainability of change and potentially promote the dissemination of findings in other contexts. However, a 'one size fits all' approach probably does not work as the interaction between the innovation and the organizational context, including the influence of culture, can vary. Therefore, a multifaceted approach is advised combining multiple change management principles as well as insight from behavioral change in medical practice. As educational objectives continue to change and curriculum standards continue to evolve, change is a continuous process that requires the people involved to learn to change and to change to learn.

Abbreviations

CBME   Competency based medical education.

PGME   Postgraduate medical education.

STORC   Specialty Trainings' Organizational Readiness for curriculum Change.

ORC   Organizational readiness for change.

EPA   Entrustable professional activity.

STAR   Statement of awarded responsibility.

ACGME   Accreditation Council of Graduate Medical Education.

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