

The Role of Self-Awareness, Augmented Artificial Intelligence and Enhanced Leadership Competencies in Developing Future Academic Physicians

Mansour, N. (1)

Rafeh, W. (2)

Afram, G. (3)

Zaatari, G. (4)

(1) Executive Officer/ HR Specialist, Faculty Affairs Office, Faculty of Medicine and Medical Center, American University of Beirut, Lebanon

(2) Imaging Applications Manager, IT Medical Center Processes and Systems-AUBMC, American University of Beirut

(3) Executive Officer, Office of International Programs, American University of Beirut

(4) Professor of Pathology and Laboratory Medicine, Associate Dean for Faculty Affairs, Chairperson, Department of Pathology and Laboratory Medicine, Faculty of Medicine and Medical Center, American University of Beirut

Corresponding author:

Nabil Mansour, CPHRC, MHRM

Executive Officer/ HR Specialist

Faculty Affairs Office, Faculty of Medicine and Medical Center

American University of Beirut,

P.O.Box 11-0236 / Medical Dean's Office

Riad El-Solh / Beirut 1107 2020,

Lebanon

Email: nm08@aub.edu.lb

Received: August 2019; Accepted: September 2019; Published: October 1, 2019.

Citation: Mansour, N.; Rafeh, W.; Afram, G.; Zaatari, G.. The Role of Self-Awareness, Augmented Artificial Intelligence and Enhanced Leadership Competencies in Developing Future Academic Physicians. World Family Medicine. 2019; 17(10): 27-35 DOI: 10.5742/MEWM.2019.93687

Abstract

Providing quality and cost-effective healthcare is a primary objective of healthcare systems globally. Published literature shows that healthcare quality is greatly dependent on the wellbeing of physicians; however, the latter has been scarcely reported among the key performance indicators (KPIs) of healthcare systems and perhaps has not received the needed attention from both healthcare systems and physicians. Recent literature reports that physicians' burnout rates and depression disorders have reached alarming levels that necessitate immediate attention and intervention by the healthcare systems at large. In parallel, there is growing evidence pertaining to the positive impact of developing leadership qualities, self-awareness, and embracing technology on physicians' wellbeing and overall performance. Such educational and training programs help them identify their personal and professional goals and eventually work towards achieving them.

Thus, Leadership Programs for Academic Physicians and Scientists (LeAPS) has been developed at the Faculty of Medicine and Medical Center at the American University of Beirut aiming at improving physicians' wellbeing through developing their self-awareness, augmented/artificial intelligence (AI) and leadership competencies.

Key words: Augmented/Artificial Intelligence, Self-awareness, Leadership, Academic Physician Well-being, Burnout

Introduction

Emotional intelligence was introduced by Goleman (1995) to include five dimensions: self-awareness, self-management, self-motivation, empathy, and social skills. This concept has been amply discussed in the literature, tackling physicians' competencies, partly referred to as interpersonal skills (Patterson et al. 2000, Sexson et al. 2001, Epstein & Hundert 2002, Randall et al. 2006). Emotional intelligence stands out among the supporting competencies that contribute to academic physicians' success in performing their tripartite functions effectively (Daouk-Öyry et al. 2017). On the other hand, Dyrbye et al. (2017), Dhingra et al. (2016), and Dyrbye & Shanafelt (2011) reported that physicians' burnout stems, generally, from work-related factors and inveterate stress at work, and tends to negatively affect their empathy score and their patients' satisfaction; whereas, Scheepers et al. (2015) confirmed the positive relationship between physicians' well-being, patient satisfaction, and other interpersonal facets of patient care. Goleman (1995) suggested that better self-awareness and self-management helps individuals be in better control of their emotions and feelings, and thus develop coping skills to support others rather than avoiding them (Smith 2007). Moreover, Ekman & Krasner (2017) highlighted the presence of an inverse relationship between burnout and empathy, as burnout and stress significantly contribute towards and negatively affect empathy. An empirical study (Daouk-Öyry et al. 2017) revealed – in more than one area – the need for developing leadership, empathy, and many other soft skills among physicians in order to succeed in their academic career. Decety & Meyer (2008) dissected the components and definition of empathy to include sharing emotions without losing oneself in the other's experience, which resembles an introduction to burnout and stress. Ekman & Krasner (2017), Dhingra et al. (2016), Hutchinson (2013), and Orzech et al. (2009) suggested educating and training physicians on certain skills that can help them empathize and avoid burnout. These suggested topics include self-awareness, emotional awareness, communication skills, intensive mindful training on anxiety, self-compassion and attention; and have been reported to enhance physicians' well-being and resilience and reduce depression indicators.

The American University of Beirut Faculty of Medicine and Medical Center (FM-AUBMC) is a non-profit organization that provides education, research, and patient-care services mainly to the people of Lebanon and the Middle East region. It employs 379 academic physicians and scientists (106 females (28%) with a median age of 44 years; 273 males (72%) with a median age of 53 years). In 2010, a new in-house intelligent web-based faculty management information system (FMIS) was introduced (Rahal Alameh & Mansour, 2010), aimed to provide faculty members and leadership with real-time information, services, reports, metrics, and a platform for decision making and collaboration. Later, the features of the system were improved, expanded, and consequently implemented as a University-wide faculty management

information system. FMIS as such, shall be used as a faculty development and mentoring system, whereby junior faculty can define their main interests and what they want to achieve; accordingly, they select the required supporting and core competencies with their key-anchored behaviors and start working to develop their own professional niche, supported by their mentors or dedicated group of peers. Wulf et al. (2018) defined the role of mentor by providing their mentees with training opportunities and assignments that would help them develop their competencies and achieve their own goals.

In 2016, the FM-AUBMC acquired EPIC as their new electronic health record (EHR), named AUBHealth and implemented it in November 2018. This implies that physicians will likely be spending more time on computer terminals fulfilling their required clinical work with patients, documenting care plans, and other academic responsibilities. Squiers et al. (2017), as well as Woolhandler & Himmelstein (2014), reported that increasing demand of medical bureaucracy and involving significant clerical and non-clinical related duties and the introduction of electronic health records are among the very work-related factors, which contribute to lower job satisfaction and dissociation among physicians. The work environment with FMIS and AUBHealth will be disruptively changing the workplace; thus, physicians, among other healthcare workers, will have to adapt to these new work conditions and spend more time on training to learn new skills required by this technology, managing and tolerating system errors and other related stressors. According to the survey conducted on users after implementing AUBHealth, out of 664 respondents, 79% believed that it improved the quality of patient care, and out of 730 respondents, 93% were satisfied, 92% felt supported while using the system, and 91% found the system easy to use (AUBHealth, 2019).

The LeAPS Program and Physicians' Wellness

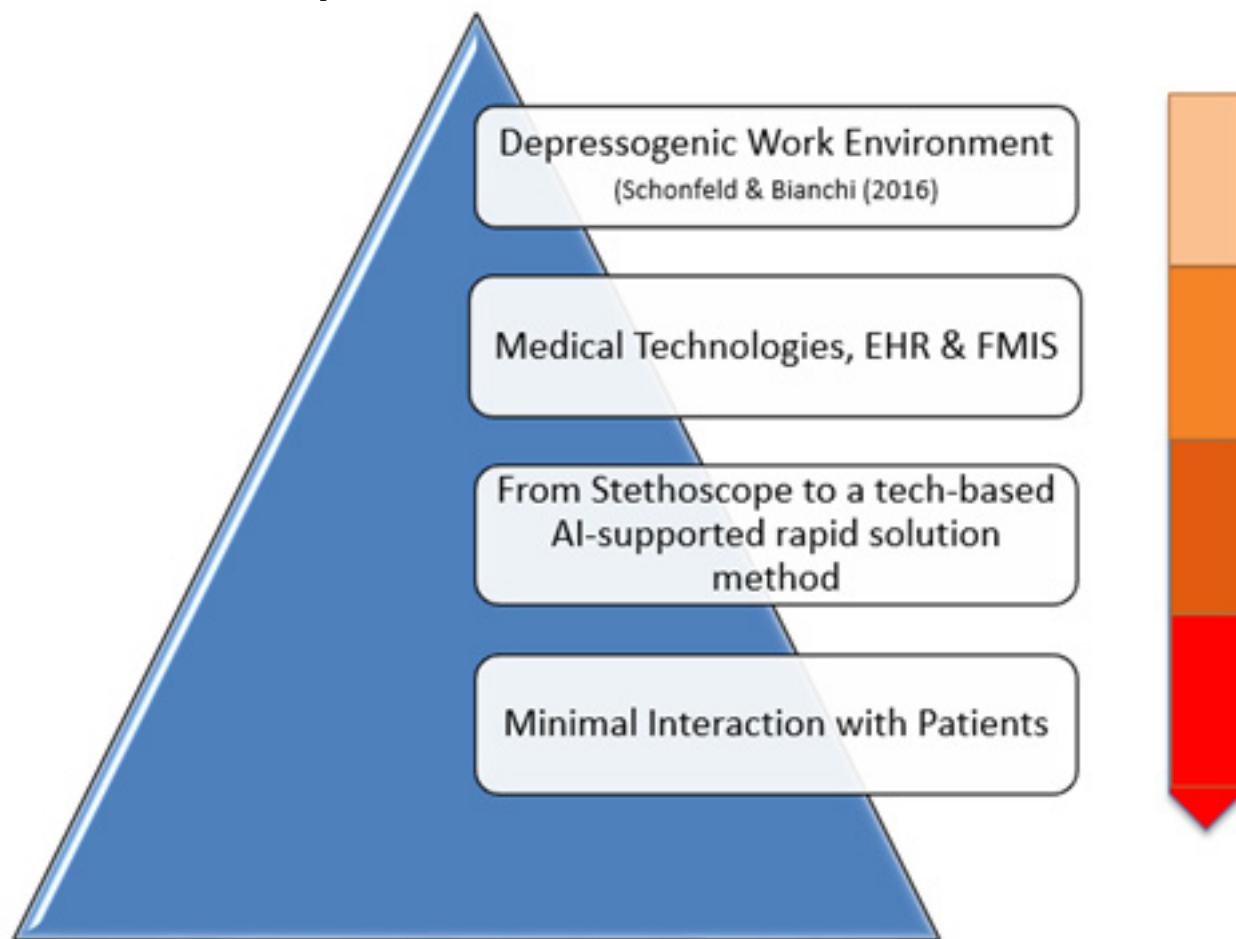
Talih et al. (2016) reported that physicians' burnout related issues have reached alarming levels among healthcare providers with more than 50% of physicians and 43% of medical students reported burnout. Ekman & Krasner (2017) portrayed three situations where physicians resonate the pain that they see and encounter daily; they mentioned that physicians either echo patients' suffering with empathy by providing supportive communication to them, or, conversely, distance themselves and lose own enacted empathy. Accordingly, they suggested using contemplative science and mindfulness training to increase emotional awareness of physicians. Moreover, Shanafelt et al. (2012) stressed the importance of exercise, forming own wellness strategies, identifying and focusing on achieving personal and professional goals and nurturing religious life on own resilience. Developing physicians' empathy appeared as a core competency for academic physicians while defining their multifaceted roles and expectations; these outcomes were presented as a value chain-model that aimed at providing sustainable personal and professional development for physicians, and business outcomes and

return on investment to the institution (Mansour, 2014). According to West et al. (2016), the combined individual-focused and organizational strategies have a positive impact on reducing burnout domain scores, despite the fact that the actual effect has not been explored yet. Rahal Alameh et al. (2015) stressed the importance of institutionalizing the faculty development program to take into consideration the well-being of physicians, while Schonfeld & Bianchi (2016) stressed the importance of making work environments less depressogenic and reducing excessive workload. The figure below summarizes the dilemma of physicians' burnout and the factors contributing to it as reported in the literature.

The Leadership Programs for Academic Physicians and Scientists (LeAPS) has been developed at FM-AUBMC aiming at improving physicians' wellbeing through developing their self-awareness, AI, and leadership competencies. Acquiring these competencies is critical for their present and future success, in performing their tripartite roles in medical education, research, and leadership. Accordingly, physicians are expected to be well equipped with the required knowledge, skills, abilities and all other qualities to manage their emotions,

to become more self-aware, and to remain focused in order to achieve their personal and professional goals. According to Mesko et al. (2018), the AI will ultimately become available as a cost-effective, efficient, rapid, and widespread technology to provide an evidence-based and affordable medical practice, and that, by taking over certain tasks from physicians; it is going to improve their doctor-patient relationship, the overall quality care, as well as their job environment and conditions. Miller and Brown (2018), on the other hand, concluded that, while medical students are still being taught using the stethoscope, a tool that was invented in 1816, practicing medicine is composed of series of relative diagnosis, evidence-based and pattern recognition, where machine learning proved to be faster and more accurate in recognizing these patterns, and thus contributing positively to patient care. In addition, Vergheese et al. (2018) reported that AI, and by freeing physicians from overwhelming tasks, "could bring back meaning and purpose in the practice of medicine while providing new levels of efficiency and accuracy", which in turn, give back physicians the power of serving as a real partner in the patient care process. Hence, AI will allow physicians to stop doing the redundant daily routine work, give them the opportunity to improve their

Figure 1: The Dilemma of Physicians' Burnout



doctor-patient relationship and doctor-doctor relationships and patient care, increase efficiency and productivity, and most importantly focus on the important matters that help them achieve their personal and professional goals.

Drucker (2005) emphasized the importance of knowing and cultivating deep understanding of oneself, developing oneself, managing oneself, and placing oneself where one can make the greatest contribution, or in brief to be your own chief executive officer who uses these combinations of strength and self-knowledge to achieve a sustainable excellence. Based on this argument, LeAPS helps each physician who signs-up for the program, understand one's own strengths and weaknesses, discover how does she/he learn and work, discover own values, and where does she/he belong and can contribute. After completing such an exercise, LeAPS will help each physician carve one's personalized plan with clear study plan and learning outcomes that suit their personal and professional goals and objectives. It allows the participant to complete the program at her/his own pace, using the flip e-learning model. Flipping between discussing the plan with an expert, e-learning, and assessing outcomes has been designed to fit physicians' busy schedules. LeAPS as such, is a platform that allows physicians to cultivate deep understanding of oneself, carve individualized plans with clear goals and targets, and provide them with the technical tools that help them overcome challenges and achieve these goals as shown in Figure 2.

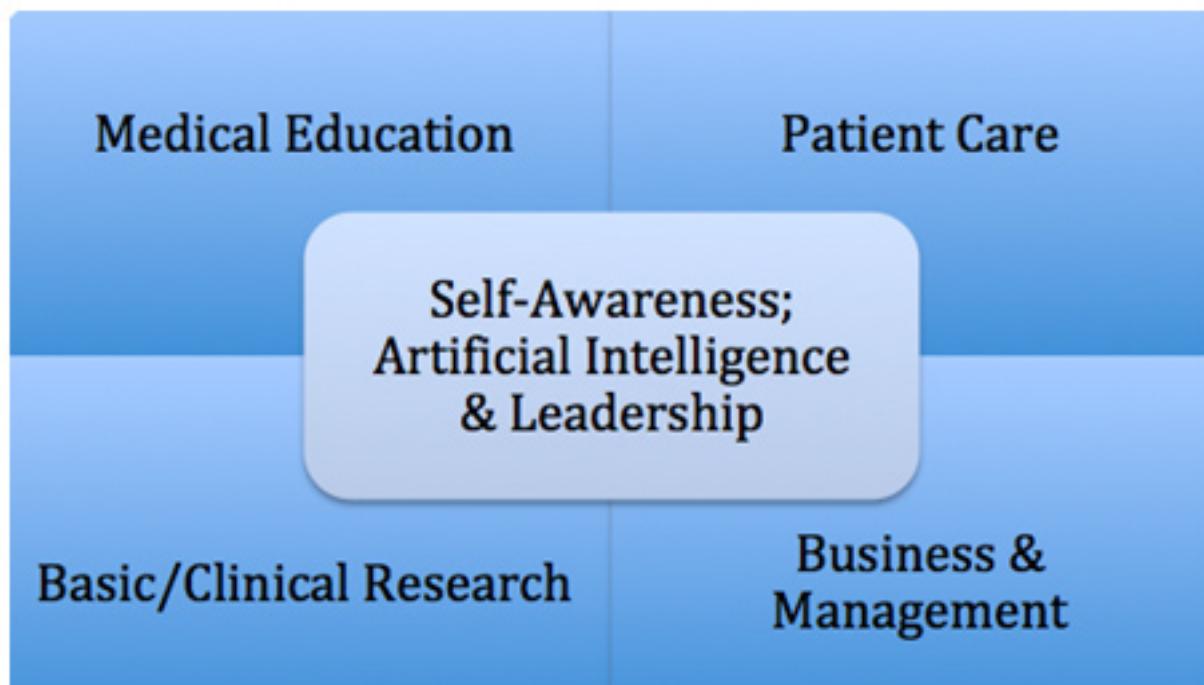
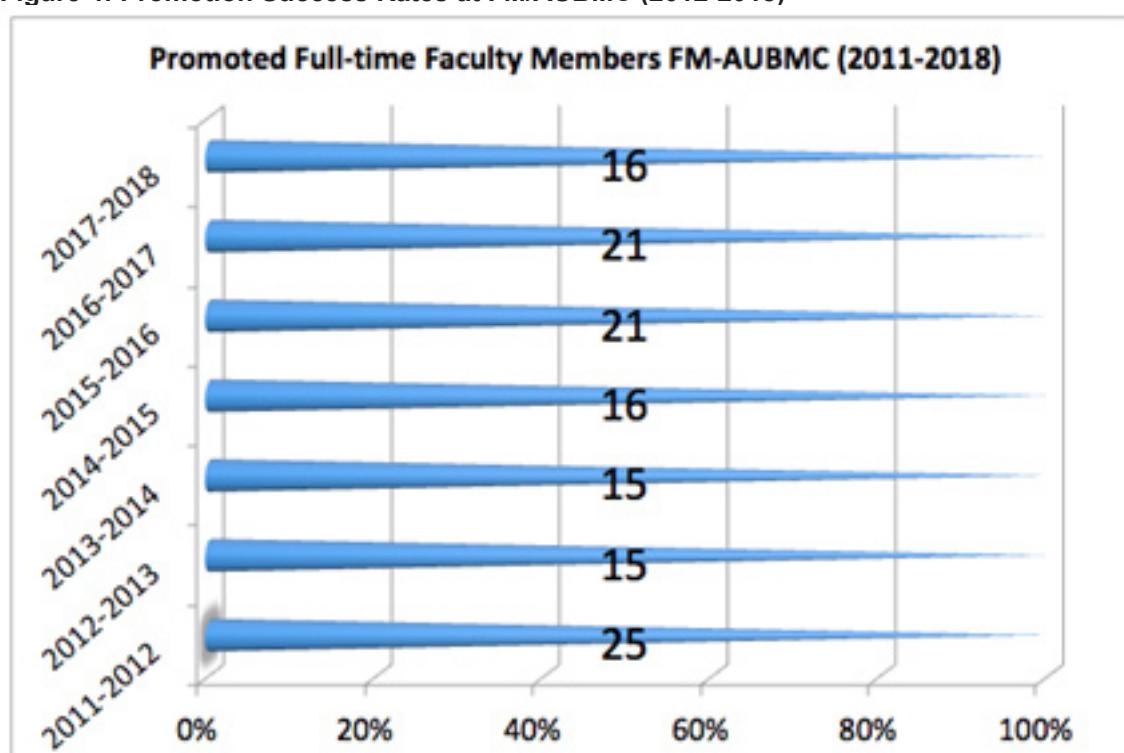
LeAPS consists of two groups of competencies: core competencies which entail targeting building the self-awareness, artificial intelligence, and leadership capabilities among participants; in addition to role-specific competencies targeting specific roles that suit a physician's specific plans and include: a. medical education, b. patient-care, c. management, d. clinical research, and e. basic/translational research. Once physicians select their academic tracks, they meet with the expert to help them set their personal and professional specific goals and design the program that fits best their ability to achieve their respective targets. Bhatia (2018) mentioned that AI, has the ability to analyze big information in seconds and quickly correlate it against patterns; these will be transforming the way patient care is currently delivered through augmenting physicians' capabilities and productivity. In the same venue, Leventhal (2017) reported that more than 84% of healthcare surveyed executives believe that AI will drastically change the way they manage and deal with customers, while 72% of them reported that they are already using virtual assistants to create better customer interactions. Landi (2018), on the other hand, reported that many forward-thinking leaders in healthcare business foresee that AI augmented physicians will be able to provide better patient-care outcomes at a lower cost. AI will not replace physicians; but augmented with AI, physicians will streamline their workflow and support their intelligent decision making much faster (Ahmed, 2018). If AI or Machine Learning is embedded into the clinical processes and seamlessly embraced by physicians, then, the perceived benefits will be realized. A typical workday of a radiologist operating in a tertiary healthcare center

starts with a large number of requests from several units, especially the CCU, ICU, NICU, EU, etc... The majority of these requests, if not all - are labeled "urgent". Using an AI algorithm to smartly filter such an overwhelming worklist, results in classifying these exams for example in two categories - positive or negative - by continuously analyzing the produced images in the background, thus prioritizing the reading worklist for the busy radiologist. The radiologist would then be able to tackle the positive cases first then direct his or her attention to the less urgent negative cases. This AI-supported workflow increases the radiologist' efficiency, decreases reporting turnaround time, and decreases burnout through empowering the radiologist in making him/her in control of the worklist as well as through setting personalized reading priorities. On the other end, the referring/requesting physician receives the results faster; primarily the positive cases among them. All these factors combined together, reduce physicians' stress at both requesting and reporting ends. Nevertheless, what are the competencies required for future physicians? Azar (2018) mentioned that physicians have no other alternative but to learn how to work with AI technologies, and that AI will not be replacing physicians, but will be replacing those who are unable to work with AI.

LeAPS program, which started in 2012 as a faculty development initiative aiming at developing physicians' business skills (Rahal Alameh et al. 2014), has evolved into a technology and research-based type that supports physicians in achieving their goals. Similarly, recent interventions that targeted clinicians working in ICU reported positive outcomes in this regard (Seaman et al. 2018). Ever since its establishment in 2012, coupled with individualized mentoring and guidance efforts by the faculty affairs office, faculty members have achieved 100% success rate in faculty promotions (Figure 3; Faculty Affairs Office, 2018).

Using the latest IT technologies, LeAPS goals go beyond helping physicians achieve academic promotions; it is rather expected to have positive outcomes on reducing physicians' burnout, to increase awareness of their areas of strength, weaknesses, and blind spots, and to equip them with the required core and role-specific competencies to succeed and achieve results at personal and professional levels. Wulf et al. (2018) reported that "a missing link in the development of individual faculty members is a tool to trigger structured reflection in competency-based domains relevant to growth as an academician".

There are arguments on restructuring medical curricula around AI modules - and with the inclusion of AI - to augment practicing physicians and prepare the future ones to be able to succeed amidst ever-evolving roles. Ramachandran (no date) said that "we need to change the way we think about how to approach a patient's problem and shift the diagnostic and treatment process from an Oslerian/Hippocratic/dogmatic approach with archaic instruments like the stethoscope to a tech-based AI-supported rapid solution method". Azar (2018) mentioned that the skills required for admitting medical students

Figure 2: LeAPS Structure**Figure 3: LeAPS Core and Role-Specific Competencies****Figure 4: Promotion Success Rates at FM/AUBMC (2012-2018)**

have changed from biology and chemistry competencies, into mathematics and physics, to the “clinical skills” as family medicine for instance, is far more than accurate diagnosis and often involves the issues not taught in medical school. There is a repeating cycle where emphasis on holistic medicine and clinical medicine alternate in focus, as focus on one area tends to deplete the other. Hence, AI ought to be interwoven in the fabric of LeAPS program as a means of dynamically developing skills of academic physicians to help them replace their simple diagnostic tools with AI-supported solutions.

Introducing AUBHealth and training physicians on embracing it, is simply a good start to approach the ultimate integration of AI into the healthcare domain. Introducing AI-supported technologies will be the next big leap towards the disruptive change in healthcare industry; it is all about empowering trained physicians to make smarter and faster decisions leading to cost-effective and better outcomes. Ahmed (2018) quoted B. Anderson “I think one of the biggest contributions deep learning / artificial intelligence will realistically make to me as a Radiologist in the near future is not directly helping with image interpretation, but in bringing the relevant information out of the clinical information system (CIS) / electronic medical record (EMR) and presenting it to me in a meaningful way to better inform my clinical judgment”

Augmented artificial intelligence and how it practically works?

The physician defines the challenges disrupting their own workflow and consuming time and energy. Here comes the role of AI to find solutions and enhance a specific time-consuming process. A good recent example reported by Ahmed (2018) is the tuberculosis screening program at Dubai Healthcare Authority (DHCA). For instance, busy radiologists are facing the daily challenge of reading around 5000 chest x-rays aimed to specifically diagnose or rule out tuberculosis (TB), which ends up being costly and results in physicians' burnout. DHCA funded an AI project (Ahmed, 2018) to develop a TB screening algorithm that is currently used across 20 healthcare centers. The outcomes were encouraging; image analysis and reporting became much faster. At the same time, physicians freed their time focusing on quality and more advanced procedures, significantly improving their turnaround times for validating imaging reports, positively influencing patient satisfaction scores, and reducing cost. Practically, how does LeAPS work in order to prepare academic physicians acquire new skills and be AI augmented?

A physician who has declared their own primary goal and showed interest in developing or in becoming an AI expert or in building an AI model, will be assigned a mentor or a group of experts who are technically savvy with this area. They will help the concerned physician build the technical competency and expertise in this domain, and provide her or him with the training opportunities to be able to build or help in building such a model with assigning measurable outcomes to monitor their own progress down the line.

Assessing physician's progress occurs using the achievements and development level of required competencies and their relevant key-anchored behaviors to ensure that the concerned physician is on the right track to achieve their own goals.

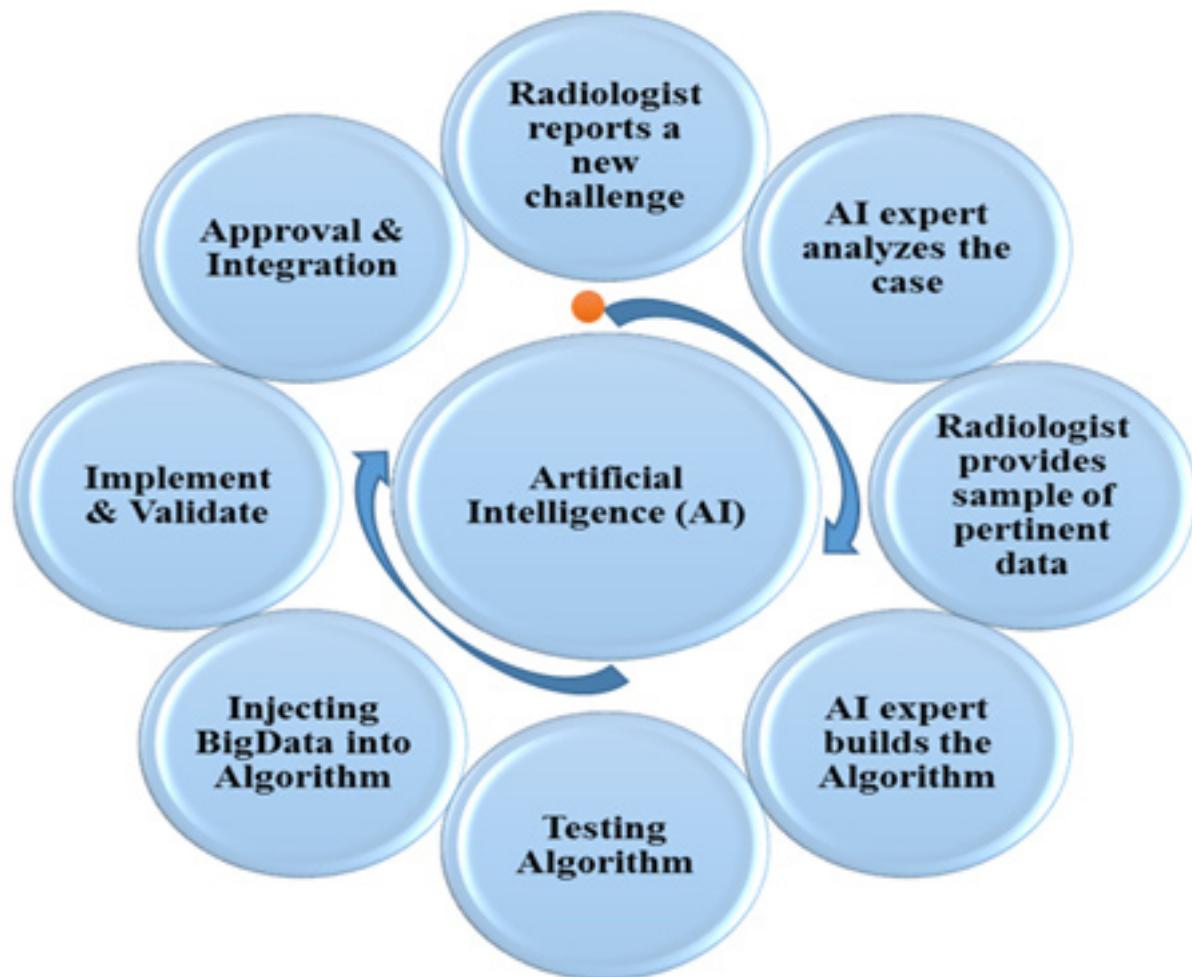
Artificial Intelligence is neither an on-shelf type of product, nor a software concept that people can acquire and use, but rather a complex process that requires full collaboration between the subject matter and the AI experts. People fear AI due to their speculations about its role in disrupting the workplaces and redefining their roles in society. However, implementing LeAPS pedagogical framework through “anchoring measurements to current and desired future behavior allows for tactical faculty development” (Wulf et al. 2018) helps paving the way for physicians to be AI technically savvy and ready to implement or participate in implementing AI projects, achieve their own goals and promote their careers. The role of LeAPS in this sense is fundamental in augmenting and training physicians on the new set of skills required, including full understanding of the AI models, their roles in facilitating the workflows, improving efficiency, and reducing their stress and burnout. The following example will clarify the relationship between the subject matter experts and AI experts, and sets an example of how an AI algorithm can be built.

The physician (radiologist in this case) defines the challenge disturbing own workflow, consuming time, energy, and leading to burnout. The AI expert collaborates with the physician to document and develop an algorithm based on deep learning concept, as a sample model, that upon augmenting with big-data, becomes ready to recognize patterns, analyze images, and generate reports for the radiologist's final validation. The testing phase is the most critical phase for the radiologist to validate and approve algorithm outcomes based on comparing those results with those interpreted and analyzed by other radiologists; a concept known as double-blind reading methodology. Then come the verification and approval phases prior to launching and integrating the augmented AI solution either with EHR or PACS systems.

Conclusion

The digital era with its innovative technologies has started influencing all business domains, including the healthcare industry. It is anticipated that preparing physicians, among other healthcare workers, through building augmented AI, leadership, and self-awareness capabilities would place them in a better position to be in control of their personal and professional experiences, prepare them to embrace AI and latest technologies, increase self-awareness, and consequently, reduce burnout. Institutional intervention and physician's buy-in have to go hand-in-hand to embrace disruptive technologies, improve patient care, reduce burnout, and achieve business outcomes. The proposed LeAPS model represents a non-traditional technology and research-based institutional initiative that aims at helping physicians acquire certain competencies

Figure 5: Artificial Intelligence Model for Medical Imaging Services



that are critical for their success in their tripartite roles in medical education, research, and leadership. LeAPS as such, is a platform that allows physicians to cultivate deep understanding of oneself, carve individualized plans with clear goals and targets, and provide them with the technical tools that help them overcome challenges and achieve these goals by assuming the role of own chief executive officer and be in full control of their own success. Finally, embracing AI aims at coping with the innovative technologies to improve workflow processes, increase productivity, implement cost-effective healthcare strategy, and reduce physicians' burnout. The institution, however, needs to maintain its focus on promoting and facilitating people's communication, especially among physicians and healthcare workers. The institution's support for exchange of ideas, discussions, and collaboration will undoubtedly alleviate stress and depressogenic environment and physicians' burnout. Institutional leadership, as such is expected to focus on deploying AI to cultivate a professional and conducive environment that simultaneously promotes physicians' productivity and all other aspects of their well-being.

Notwithstanding these research-reported favorable outcomes, there are certain limitations that ought to be considered before replication. Among these is the need for further in-depth assessment of the outcome which should be compared to a control group where standardization of its

learning outcome and material contents were considered to be able to, identify the degree of contribution of each component to the program's success.

Finally, no one has spoken on the importance of physicians' self-awareness better than McLeod (2003, p. 2135) addressing his fellow physician-colleagues: "often there is a need to reexamine our life priorities, set limits at work, admit vulnerability, share our emotional lives, and appreciate the small things in our daily life that give us meaning and purpose."

References

1. Ahmed, A. (January 2018). Health Imaging Augmented Intelligence: The Next Frontier. Agfa Healthcare. <https://www.healthcareitnews.com/news/augmented-intelligence-next-frontier-health-imaging>. Retrieved on October 29, 2018.
2. Ahmed, A. (March 2018). Health Imaging Augmented Intelligence: The Next Frontier. Agfa Healthcare. <https://20urhr2fv6851nsk28rdz11-wpengine.netdna-ssl.com/int/wp-content/uploads/sites/3/2018/02/Agfa-WhitePaper-Value-based-AI-Dubai.pdf>. Retrieved on October 29, 2018.
3. American University of Beirut Medical Center. <http://www.aub.edu.lb/fm/fao/fd/pages/purpose.aspx>. Retrieved on December 20, 2013.

4. AUBHealth (2016). American University of Beirut Medical Center. <http://www.aubmc.org.lb/Pages/American-University-of-Beirut-Medical-Center-Leads-a-New-Era-in-Patient-Care-with-Epic-Electronic-Health-Record-System.aspx>. Retrieved on October 28, 2018.
5. AUBHealth (2019). American University of Beirut Medical Center. (unpublished report).
6. Azar, D. (September 2018). Innovation-Medicine: A novel track in medical education at the University of Illinois College of Medicine. AAHCI MENA Regional Conference: "Transformation of Medical Education in the New Era". September 27-29, 2018. American University of Beirut.
7. Bhatia, T. (2018). Artificial Intelligence In HR – The Future Of Work Is Already Here!. <https://empxtrack.com/blog/artificial-intelligence-in-hr/>. Retrieved on October 29, 2018.
8. Daouk-Öyry, L., Zaatari, G., Sahakian, T., Rahal Alameh, B., & Mansour, N. (2017). Developing a competency framework for academic physicians. *Medical teacher*, 39(3), 269-277.
9. Davis, J. (2018). Physician, Heal Thyself. *Physician Leadership Journal*, 5(1), 26-29. Retrieved from <https://search-proquest-com.ezproxy.aub.edu.lb/docview/1978598333?accountid=8555>
10. Decety, J., & Meyer, M. (2008). From emotion resonance to empathic understanding: A social developmental neuroscience account. *Development and psychopathology*, 20(4), 1053-1080.
11. Dhingra, M., Tewari, R., & Li, M. (2016). Resilience training in medical school: the solution to doctor burnout?
12. Dierckx de Casterlé, B., Willemse, A. N., Verschueren, M., & Milisen, K. (2008). Impact of clinical leadership development on the clinical leader, nursing team and care-giving process: a case study. *Journal of Nursing Management*, 16(6), 753-763.
13. Drucker, P. F. (2005). Managing oneself. *Harvard Business Review*, 83(1), 100-109.
14. Dyrbye, L. N., & Shanafelt, T. D. (2011). Physician burnout: a potential threat to successful health care reform. *Jama*, 305(19), 2009-2010.
15. Dyrbye, L. N., Shanafelt, T. D., Sinsky, C. A., Cipriano, P. F., Bhatt, J., Ommaya, A., ... & Meyers, D. (2017). Burnout among health care professionals: A call to explore and address this under-recognized threat to safe, high-quality care. NAM (National Academy of Medicine) Perspective.
16. Ekman, E. & Krasner, M. (2017). Empathy in medicine: Neuroscience, education and challenges, *Medical Teacher*, 39:2, 164-173, DOI: 10.1080/0142159X.2016.1248925
17. Epstein, R. M., & Hundert, E. M. (2002). Defining and assessing professional competence. *Jama*, 287(2), 226-235.
18. Faculty Affairs Office, Faculty of Medicine, American University of Beirut (2018). Unpublished report.
19. Goleman, D. OnePercentBetter (publisher). (December 2015). Emotional Intelligence. Retrieved from: <https://youtu.be/n6MRsGwyMuQ>
20. Hutchinson, M., & Hurley, J. (2013). Exploring leadership capability and emotional intelligence as moderators of workplace bullying. *Journal of Nursing Management*, 21(3), 553-562.
21. Jack, K., & Smith, A. (2007). Promoting self-awareness in nurses to improve nursing practice. *Nursing standard*, 21(32).
22. Landi, H. (October 2018). Healthcare Leaders on Unlocking the Value of Disruption: "Digital Innovation Needs to be a Strategic Priority". *Healthcare Informatics*. <https://www.healthcare-informatics.com/article/innovation/healthcare-leaders-unlocking-value-disruption-digital-innovation-needs-be>. Retrieved on October 29, 2018
23. Mansour, N. (2018). Establishing a competency-based leadership program for academic physicians and scientists. Faculty of Medicine and Medical Center, American University of Beirut. (unpublished report).
24. Mansour, N. (2014). A systematic approach for establishing a competency-based mentorship program for academic physicians. Retrieved from American University of Beirut Library Catalog. (APJ Pj:1793, Jafet/ASC).
25. McLeod, M. E. (2003). The caring physician: a journey in self-exploration and self-care. *The American journal of gastroenterology*, 98(10), 2135-2138.
26. Meskó, B., Hetényi, G., & Győrffy, Z. (2018). Will artificial intelligence solve the human resource crisis in healthcare?. *BMC health services research*, 18(1), 545.
27. Miller, D. D., & Brown, E. W. (2018). Artificial intelligence in medical practice: the question to the answer?. *The American journal of medicine*, 131(2), 129-133.
28. Oliva, A., Pasha, R., Conant, R. (no date). Amplifying intelligence to put patients over paperwork: implementing artificial intelligence (AI) and virtual tools in the examining room. Nuance. https://25ad4f829d1902bbecfd-26d8892507868171132ab49155989078.ssl.cf2.rackcdn.com/Nuance_WP_03052018.pdf?submissionGuid=e8bfb176-3b22-4764-9107-c622edc3044b. Retrieved on October 29, 2018.
29. Orzech, K. M., Shapiro, S. L., Brown, K. W., & McKay, M. (2009). Intensive mindfulness training-related changes in cognitive and emotional experience. *The Journal of Positive Psychology*, 4(3), 212-222.
30. Patterson, F., Ferguson, E., Lane, P., Farrell, K., Martlew, J., & Wells, A. (2000). A competency model for general practice: implications for selection, training, and development. *Br J Gen Pract*, 50(452), 188-193.
31. Rahal Alameh, B. & Mansour, N. (2010). Introducing the Faculty Management Information System (FMIS) to the Faculty of Medicine and Medical Center (FM/AUBMC) and the American University of Beirut (AUB). Faculty of Medicine and Medical Center, American University of Beirut. (unpublished document). (Unpublished manuscript and program framework).
32. Rahal Alameh, B., Mansour, N., & Zaatari, G. (2015). Towards Developing A Sustainable Faculty Development Program. *Lebanese Medical Journal*, 63(4), 213.
33. Rajiv, L. (August 2017). Artificial Intelligence: The Next Frontier in Health IT?. *Healthcare Informatics*. <https://www.healthcare-informatics.com/article/analytics/artificial-intelligence-next-frontier-health-it-part-1>. Retrieved on October 29, 2018.
34. Ramachandran, M. (September 2018). Preparing future doctors for AI: What new skills are needed? AAHCI MENA Regional Conference: "Transformation of Medical Education in the New Era". September 27-29, 2018. American University of Beirut.

35. Ramachandran, M. (no date). Interview to Doctorpreneurs.com <http://www.doctorpreneurs.com/manoj-ramachandran-co-founder-viz-ai/>. Retrieved on October 29, 2018.
36. Randall, R., Davies, H., Patterson, F., & Farrell, K. (2006). Selecting doctors for postgraduate training in paediatrics using a competency based assessment centre. Archives of disease in childhood, 91(5), 444-448.
37. Sagin, T. <http://www.namss.org/Portals/0/State%20Associations%20/Colorado%20F%20P%20P%20E%20OPPE%20Best%20Practices.pdf>. Retrieved on June 6, 2018)
38. Scheepers, R. A., Boerebach, B. C., Arah, O. A., Heineman, M. J., & Lombarts, K. M. (2015). A systematic review of the impact of physicians' occupational well-being on the quality of patient care. International journal of behavioral medicine, 22(6), 683-698.
39. Seaman, J.B., Cohen, T.R., & White, D.B. (2018). Reducing the stress on clinicians working in the ICU. JAMA. Published online October 24, 2018. Doi:10.100/jama.2018.14285.
40. Squiers, J. J., Lobdell, K. W., Fann, J. I., & DiMaio, J. M. (2017). Physician burnout: are we treating the symptoms instead of the disease? The Annals of thoracic surgery, 104(4), 1117-1122.
41. Schonfeld, I. S., & Bianchi, R. (2016). Burnout and depression: two entities or one?. Journal of Clinical Psychology, 72(1), 22-37.
42. Sexson, S., Sargent, J., Zima, B., Beresin, E., Cuffe, S., Drell, M., & Sylvester, C. (2001). Sample core competencies in child and adolescent psychiatry training. Academic Psychiatry, 25(4), 201-213.
43. Talih, F., Warakian, R., Ajaltouni, J., & Tamim, H. (2016). Correlates of depression and burnout among residents in a Lebanese academic medical center: a cross-sectional study. Academic Psychiatry, 40(1), 38-45.
44. The Lancet (2017). Suicide among health-care workers: time to act. Lancet (London, England), 389(10064), 2.
45. The Lancet. (2009). Physician, heal thyself. Lancet (London, England), 374 (1714), 21.
46. Verghese, A., Shah, N. H., & Harrington, R. A. (2018). What this computer needs is a physician: humanism and artificial intelligence. Jama, 319(1), 19-20.
47. Wallace, J. E., Lemaire, J. B., & Ghali, W. A. (2009). Physician wellness: a missing quality indicator. The Lancet, 374(9702), 1714-1721.
48. West, C. P., Dyrbye, L. N., Erwin, P. J., & Shanafelt, T. D. (2016). Interventions to prevent and reduce physician burnout: a systematic review and meta-analysis. The Lancet, 388(10057), 2272-2281.
49. Woolhandler, S., & Himmelstein, D. U. (2014). Administrative work consumes one-sixth of US physicians' working hours and lowers their career satisfaction. International Journal of Health Services, 44(4), 635-642.
50. Wulf, K. L., Hurtubise, L., Brod, H., & Binkley, P. F. (2018). The CARE Inventory: A Self-Reflective, Behavior-Based Instrument to Guide Professional Development and Mentorship of Academic Faculty. MedEdPORTAL: the journal of teaching and learning resources, 14.