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SPECIAL REPORT

CLINICAL EXCELLENCE IN PHYSICAL MEDICINE AND REHABILITATION: EXAMPLES FROM THE PUBLISHED LITERATURE

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Objective: **Advancements in medical knowledge and technology are enabling people to live longer with chronic medical conditions, and creating a need for physiatrists to help maintain and restore function. Clinical excellence in physical medicine and rehabilitation (PM&R) is not well documented in the literature. The aim of this paper is to provide examples of clinical excellence in PM&R as they relate to the definition formulated by the Miller-Coulson Academy of Clinical Excellence (MCACE).**

Methods and results: **A review of the literature revealed 1,686 published articles that were evaluated to determine their relevance to the definition of clinical excellence in PM&R. From these articles, exemplary case reports and research studies were identified for each of the domains of excellence.**

Conclusion: **The application of the definition of clinical excellence to PM&R is more than just an intellectual exercise, as it can help to establish the model to which physicians and trainees may want to aspire.**

Key words: clinical excellence; physical medicine and rehabilitation; physiatry; PM&R, physical and rehabilitation medicine, PRM.

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INTRODUCTION

Physical medicine and rehabilitation (PM&R) is a relatively new discipline in medicine, with origins dating to the 1930s (1). The field gained momentum during World War II, when rehabilitation and pain management were essential to enable soldiers to return to the battlefields or to improve their functional abilities after returning home (1). In the 1940s, residency programs and fellowships were established, after which this content area was incorporated into medical school curricula, giving PM&R an expanded presence and status as a specialty (1). The physical medicine component of PM&R encompasses patient care that is delivered largely in outpatient settings, focusing mainly on musculoskeletal symptoms and pain. Rehabilitation often begins in inpatient hospital units and addresses the optimization of function and recovery after a significant medical event (2). The demand for physiatrists is increasing with the aging population (2, 3), with medical advancements that are enabling people to live longer with chronic medical conditions (3–5), and with the complexity of injuries in both military (6) and civilian contexts (4).

Several international organizations, such as the National Institute for Health and Care Excellence (NICE) (7) and the Cochrane Collaboration (8), continue to synthesize evidence in an attempt to develop clinical guidelines to improve the quality of care delivered to patients. While NICE guidelines often relate to therapeutic options in treating specific diseases and the development of standards for assessing clinicians' performance (7), the Cochrane Collaboration strives to generate reliable summaries of the evidence so as to improve the quality of care for patients and reduce variations in treatment plans (8). These entities produce recommendations across all specialties of medicine, including PM&R. A model for clinical excellence in PM&R has not been well documented in the literature. The quality of care delivery in PM&R is currently sometimes assessed through patient satisfaction metrics (9) and clinical outcomes (10). Describing overarching principles of clinical excellence in any medical field can lead to clinical progress by holding up the ideals for how to optimally care for patients, both by individuals and by teams of providers.

This paper presents published examples, most of which are case reports, which demonstrate the behaviors and skills of physiatrists as they relate to the definition of clinical excellence.

DEFINITION OF CLINICAL EXCELLENCE

Multiple methodological approaches were used to define clinical excellence by the Miller-Coulson Academy of Clinical Excellence (MCACE) (11), an initiative at Johns Hopkins University School of Medicine that was established to recognize and promote clinical excellence for the benefit of the patients served. The product of an iterative process spanning more than one year, the following definition for clinical excellence is used for all MCACE-related initiatives:

- Achieving a level of mastery in 6 areas as they relate to patient care:
  - communication and interpersonal skills

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  - professionalism and humanism
  - diagnostic acumen
  - skillful negotiation of the healthcare system
  - knowledge
  - scholarly approach to clinical practice
- Exhibiting a passion for patient care and modeling clinical excellence.
- Collaborating with investigators to advance science and discovery.

The last 2 components of the definition are particularly relevant for those practicing in academic medical settings, whereas the other domains are applicable to clinicians in any setting.

METHODS FOR IDENTIFICATION AND SELECTION OF CASES TO BE HIGHLIGHTED

A literature search was conducted with the assistance of a medical informationist. The search encompassed PubMed and Scopus, with the parameters including 1960 through July 2014, English, and human. Initially, a broad search was applied using the terms "clinical excellence", "physical medicine and rehabilitation" and "physiatry". The search parameters were then narrowed and limited to case reports. Further searches replaced the term "clinical excellence" with each of the domains of clinical excellence listed above (e.g. communication and interpersonal skills). Using these parameters and keywords, 1,697 published case reports and studies were identified. The titles, abstracts and summaries were used to sift through the published papers. Articles that appeared relevant to excellence in PM&R were evaluated in order to fully understand the care that was delivered. In addition, the references in each article were examined, adding another 264 abstracts for review. The review of these sources yielded many articles (at least 10) for each domain of clinical excellence as they related to PM&R. In addition, searches of NICE and the Cochrane Library were conducted in order to discover appropriate articles to be cited in this paper addressing clinical excellence in PM&R.

APPLICATION OF THE DEFINITION OF CLINICAL EXCELLENCE TO PHYSICAL MEDICINE AND REHABILITATION PRACTICE

To illustrate how mastery in each of these domains is exemplified in PM&R, the authors arrived at decisions by consensus about which reports from the literature would be highlighted. Each case or study demonstrates how mastery of a particular domain of clinical excellence enables clinicians to provide the best possible care for patients, while providing an example that can be replicated by others.

Communication and interpersonal skills

In PM&R, many patients have complex medical conditions involving lifelong care that require an extensive coordinated interdisciplinary team approach. This team often consists of multiple rehabilitation healthcare professionals, including physiatrists, physical therapists, occupational therapists, and nurses, as well as healthcare professionals from other disciplines of medicine (2, 12, 13). Physiatrists are paramount as a central component in the coordination of the interdisciplinary approach throughout the continuum of care for the patient (14). The patient and care-givers also are thoroughly involved in the development of the medical and rehabilitation plans and treatment decisions (2, 12–17). Skilled physiatrists use effective communication to help prepare patients (and their care-givers) emotionally and psychologically for the rehabilitation process (18). All team members involved in the care of the patient must work together to establish appropriate and adaptable goals of care (13, 19) Seamless collaboration between different healthcare providers is necessary (20), and highly functioning interdisciplinary teams can have a positive influence on survival (3, 19, 21). In a survey in an inpatient rehabilitation setting, members of the rehabilitation team cited collegiality as the most important quality in the physiatrists with whom they interact (22).

Mr M, a 32-year-old medic with the United States Army, sustained a multitude of catastrophic injuries, including cerebral infarctions, traumatic brain injury, bilateral below-knee amputations, lung hematomas, spinal cord injuries resulting from an L4 burst fracture, and various other fractures, including those of the facial bones (6). His medical and surgical care was initiated in Afghanistan, continued in Germany, and then back in the USA, where a physiatrist took over in a US Department of Veterans Affairs (VA) Hospital Polytrauma Systems of Care. Polytrauma hospitals have the resources to care for active duty and veterans who have sustained multiple severe injuries, including brain injury, limb loss, impaired vision, hearing loss and psychological problems (23). In order to ensure optimal care for the patient, multiple methods were implemented to ensure smooth transitions, which included video teleconferences with the prior healthcare providers overseas. In addition, video teleconferences were conducted with the patient's family. Team members met with the patient upon arrival to express their commitment to providing the best possible care. Due to the vast array of injuries sustained and the complexity of rehabilitation care required, it was essential that a single individual, his physiatrist, ensured that Mr M's care was coordinated and systematic. As progress evolved, Mr M was transferred to other VA sites that had specialized rehabilitation facilities, before eventually moving on to outpatient rehabilitation. During this time, Mr M's needs were addressed with specialized equipment to allow him to transition from hospital to home life. This case exemplifies the importance and success of communication and collaboration within a rehabilitation department, with consulting specialists, as well as with different institutions across the continuum of care. In addition, through Mr M.'s recovery, the family and patient were kept well-informed and involved in all rehabilitation decisions.

Professionalism and humanism

The foundation of rehabilitation revolves around a humanistic approach to patient care. It emphasizes the focus on the

individual who has the condition or disease, rather than the pathology itself (3, 15, 24), and the ways to most effectively manage these conditions with the utmost compassion (15, 24). At its core, physiatry is focused on achieving maximal functionality and improved quality of life (14). A healing provider who is warm, personable, involved, empathetic, and caring will understand how the patient's emotional state will affect the treatment plans, healing and coping (16, 24). Patients presenting to PM&R often have experienced life-altering events that require physicians who can validate the patients as people and help them to find meaning in their lives (4, 13, 16, 24–26).

A 61-year-old woman was admitted to the hospital for severe bilateral leg pain resulting in frequent falls (27). The patient had an extensive medical history that included leukocystoclastic vasculitis, osteoarthritis of the knees, diabetes mellitus, chronic renal insufficiency, hypercholesterolemia, chronic hepatitis B infection, recurrent varicella zoster, right heart failure, peripheral vascular disease, bilateral lower extremity ischemic pain at rest, and depression. Her pain was being managed with sustained-release morphine, a fentanyl patch, and amitriptyline. In the absence of acute medical findings, the plan was set for quick discharge following a physiatrist consult for gait evaluation. Through comprehensive questioning by the physiatrist about the patient's pain and how it relates to her overall functional status and well-being, the patient revealed that she was suicidal and that she had a specific plan. The discharge was cancelled, the pain management plan was altered, and psychiatry was consulted. More effective pain control induced hope, the patient was no longer deemed a threat to herself, and she was discharged home. This physiatrist demonstrated professionalism through the holistic approach to the patient's need, and was empathic in learning about how her physical ailments were affecting her quality of life. This excellent care may have saved the patient's life.

Diagnostic acumen

Physiatrists have a unique and broad knowledge, with expertise that relates to the overall level of functioning and quality of life of their patients. Thorough assessment and accurate diagnosis are crucial prior to implementing a rehabilitation plan (19, 28). Diagnostic errors may result in inappropriate treatment plans or delays in initiating optimal therapies that may contribute to prolonged impairment or further injuries (21, 28). A 73-year-old man with a past medical history significant for untreated herpes zoster in the right T12 dermatome, followed by post-herpetic neuralgia, presented to his doctor with an abdominal bulge (29). An extensive work-up did not reveal any internal or abdominal wall structural abnormalities. The abdominal bulge enlarged and developed into an abdominal pseudohernia. Subsequently, the patient developed a 40° right convex scoliosis, postural instability, and a gait disturbance. Electromyographic evaluation by a physiatrist demonstrated abnormal spontaneous activities at rest and decreased motor unit recruitment in the right T12 myotome, which probably contributed to his scoliosis and gait disturbance. Based on this physiatrist's diagnosis, a rehabilitation program, which included pain relief, trunk stability, muscle re-education, muscle strengthening, and gait exercises, was tailored to the patient's specific needs. This plan, predicated on the correct diagnosis of the abdominal pseudohernia caused by herpes zoster, enabled the patient to recover with significant functional improvement.

Skillful negotiation of the healthcare system

Physiatrists must be familiar with acute medical care, the rehabilitation process, and the agencies that advocate for patients and assist with their reintegration into the community (18). Patients undergoing complex treatment plans initiated by physiatrists often require advocacy and integration of multiple healthcare providers, government agencies, and diverse resources. Securing such care may require overcoming numerous obstacles, and clinically excellent physiatrists are skilled at operating within the intricacies of the healthcare system (2). Proficiencies possessed by physiatrists include assessing community resources, holding family meetings, coordinating team communications, and understanding state and federal regulations regarding rehabilitation and disability (18). They act as advocates for their patients (12). The prolonged involvement that physiatrists have with patients gives them the ideal vantage point to understand what patients need at the different stages of recovery (13, 14, 16).

A 57-year-old man, with a past medical history significant for bilateral transradial and transtibial amputations and bilateral total hip arthroplasties secondary to sepsis, underwent bilateral hand transplantation using thigh skin grafts (30). After 6 weeks, the patient was cleared to begin a rehabilitation program. At this time, the patient was severely deconditioned due to the strict bed rest that had facilitated his wound healing. A specialized rehabilitation program was adapted based upon his weight-bearing restrictions. As well, the lower limb prostheses had to be custom-fit due to the open-thigh skin grafts. Several assistive devices were utilized in a progressive manner to assist in the rehabilitation of his activity limitations. Iterative and repetitive assessments, with the adjustment of the resources needed from many sources, were performed skillfully, and the care team effectively assisted the patient to a favorable outcome.

Knowledge

The field of PM&R is extremely broad. Much knowledge is necessary to generate comprehensive assessments about overall functional abilities and well-being of patients (2, 18). Knowledge and general competence are felt to be fundamentally important qualities exhibited in PM&R, as judged by physiatrists themselves (22). In surveying residency program directors, it was determined that medical knowledge was a key proficiency that was noted to differentiate some of the strongest residents (31). The foundation of practising excellent medicine is the lifelong acquisition of knowledge and the application of that wisdom to the care of the individual being treated (12).

A 60-year-old man underwent an aortic aneurysm repair (32). Numerous complications included a spinal artery infarct and bowel ischemia that required the resection of 60 cm of

small bowel. Four months postoperatively, the patient was transferred to a spinal cord injury rehabilitation center, where his recovery progressed in somewhat of a staccato fashion. Approximately 14 months after surgery, the patient developed delirium. The initial work-up did not identify any metabolic, infectious, medication, iatrogenic, allergic, or endocrine sources. Medications were altered without success. Upon thinking about malabsorption that could result from a shortened gut, it was determined that the patient had vitamin B12 deficiency. The symptoms and laboratory changes associated with vitamin B12 deficiency may have been partially concealed by the patient's spinal cord injury and folate supplementation. The patient's delirium resolved 3 weeks after initiating cyanocobalamin injections. Due to the physiatrist's excellent knowledge and clinical reasoning, the patient's source of delirium was determined and effectively treated.

Scholarly approach to clinical practice

Some have criticized physiatrists for the lower production and slower dissemination of scientific research compared to the other fields of medicine (12, 25, 33, 34). To this end, there have been calls to expand the dissemination of discovery in order to allow growth of the profession and to optimize patient care (25, 35). Research is vital for addressing key clinical problems that are most germane to patients, families and healthcare providers (34–36). The effective incorporation of evidence-based medicine into clinical practice results in better patient care (35, 37). The Cochrane Collaboration continues to generate high-quality, user-friendly, readable summaries of the evidence; many of these reviews are focused on clinical scenarios common to PM&R (34). Below are 2 examples where scholarly approaches to clinical practice were applied by physiatrists. The first example consisted of developing evidence-based guidelines to direct clinical practice. The second example involved clinical physiatrists contributing impactfully as members of a team conducting research.

Due to a lack of consistency of care for stroke survivors, Teasell reviewed the literature to determine optimal guidelines for stroke rehabilitation (37). Early assessment, with frequent re-evaluations, and early access to interdisciplinary rehabilitation improved clinical outcomes. Furthermore, high-intensity therapy acutely coupled with therapy in an outpatient setting following discharge was found to be most effective. The continued care needs to be multifaceted and should include various resources, such as support systems, counseling, and secondary prevention of recurrent stroke. These guidelines were developed based on an in-depth review of the literature to provide clinicians with a set of standards to apply to patient care.

Based on clinical experience and research, Needham determined that physically inactive patients in the intensive care unit (ICU) were experiencing numerous pulmonary and neuromuscular complications (38). A research study was conducted to challenge the standard of ICU care (bed-rest) and to evaluate a novel approach. This new protocol consisted of activity level as tolerated with an emphasis on early ambulation (even while on mechanical ventilation), benzodiazepines only as needed, guidelines for physical and occupational therapy, and guidelines on when to consult a physiatrist or neurologist. The results demonstrated a reduction in patients receiving narcotics, increased alertness, and decreased delirium. Physiatrists received more consultations and the number of patients participating in physical and occupational therapy increased. Overall, early rehabilitation in the ICU increased functional mobility and decreased the length of stay.

Exhibiting a passion for patient care and modeling clinical excellence in PM&R

In treating patients who have often endured significant physical and/or psychological losses, exemplary physiatrists are skilled at forging longitudinal relationships with patients that are built on a foundation of listening, kindness and empathy (24). Passion can be contagious. Seeing a physiatrist who is enthusiastic and full of excitement can bolster other members of the healthcare team and boost the morale of patients who may be struggling.

Throughout her career, Dr Gabriella Molnar-Swafford (1926–2011) exhibited a passion for pediatric rehabilitation, which led her to be a founder of the field of pediatric PM&R (personal communication: Phyllis J. Anderson[1]). She was an advocate for children with physical disabilities to ensure the highest quality of care. Due to her contributions, she was awarded the Frank Krusen Lifetime Achievement Award, a prestigious honor from the American Association of PM&R. The award acknowledges excellence in medical education, clinical practice, and scientific activities (personal communication: Phyllis J. Anderson[1]). Since her passing, several awards and research grants have been set up in her name to recognize physicians who have followed her example of excellence in the care of children with disabilities (39). Dr Molnar-Swafford's passion for children with disabilities is inspirational.

The current workforce in PM&R is thought to be inadequate to support the needs of patients, especially with the aging of the population. In order to attract the best and brightest medical students, there is a need to create great interest in PM&R as a professional calling (12). In general, positive role models are known to influence students' career choices (40), and a survey conducted by Galacia showed that over 75% of PM&R residents acknowledged that a role model positively affected their decision to enter the field of physiatry (41). Exposing trainees to excellent role models in PM&R may be the way to expand the workforce (42).

Interface with researchers to advance discovery

The art of medicine is clearly evident in physiatry, and advancing the scientific foundation is also a priority (25). Rehabilitation research may be difficult to conduct because of difficulties in selecting appropriate controls (2), a low volume of similarly

[1]Executive Director, Foundation for PM&R. Gabriella E. Molnar-Swafford, MD pediatric PM&R research fund, 17 July 2014.

affected subjects, and the challenges associated with categorizing research participants (43). In addition, clinically relevant outcomes in physiatry are affected by many factors, such as social, psychological, and environmental factors, all of which contribute to the progress of the individual (25). Furthermore, treatment plans require individualization as opposed to the standardized management that is expected, if not required, from high quality trials (43, 44). There has been a steady increase in the quantity of scientific works in PM&R that will further improve the standard of care provided to patients (25, 34).

Collinger et al. (45) has been working on advancements associated with a brain–computer interface (BCI). BCIs transmit signals from the cerebral cortex to a computer, which can then be utilized by assistive devices (such as prosthetic limbs), to enhance motor function. The BCI evolved through collaboration between neurophysiologists and biomedical engineers. Initially, animal models were used for research advancement. As development progressed, negotiations with government agencies ensued, partnerships between research professionals and clinicians expanded, and the initial innovations were translated to humans with disabilities. The BCI has progressed over many years and is producing novel ways for patients to improve functioning and quality of life. This article also serves as a reminder that studying the impact of new technology is critical.

CONCLUSION

Examples of clinical excellence in PM&R were found throughout the literature. This specialty focuses on improving the functional abilities of patients in order to help them achieve the highest quality of life. Physiatrists often encounter patients who have experienced substantial losses requiring interdisciplinary, lifelong, adapting treatment plans. In order to ensure maximal outcomes, physiatrists are expected to coordinate patients' care and healing (19). The domains of clinical excellence, described by the MCACE, apply very well to PM&R.

In this expanding series of papers that highlights cases of exemplary care from the literature (46–48), it may be worth stating that a different team of researchers writing a similar manuscript may have chosen examples distinct from those presented in this article. This is not a methodological weakness, but instead is a known expectation in more subjective and qualitative works. In contrast to the Cochrane Collaboration and NICE, which primarily utilize clinical trials for their recommendations, this review paper relied heavily on case reports. In contrast to the valuable evidence-based medicine guidelines generated by these other 2 organizations, the examples highlighted in this paper emphasize personal experience that individuals and teams can have in the provision of clinically excellent patient care.

The examples presented in this article may trigger a physiatrist's memory to recall a situation in which they were clinically excellent. This introspection can serve to remind us all of the success that can result when one is committed to excellence and the *adjacent possible* (49).

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