Medicine and engineering collaboration in urogynecology: a narrative review

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Contributions: (I) Conception and design: All authors; (II) Administrative support: None; (III) Provision of study materials or patients: None; (IV) Collection and assembly of data: None; (V) Data analysis and interpretation: All authors; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

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Objective: Our study aimed at reviewing and discussing advancements in medicine and engineering collaboration (MEC) and its role in the development of urogynecologic practice.

Background: There have been rapid advancements in urogynecology due to a naturally aging population, resulting in an increased demand for a better quality of life. However, further development in this field depends highly on the research and development of new tools and materials. Therefore, interdisciplinary MEC is essential and mandatory in modern medicine, especially in urogynecology. Hence, there is a demand to summarize the current situation of MEC in the field of urogynecology and explore the direction of future efforts.

Methods: We searched for relevant literature on MEC and its application in urogynecology using the PubMed database and Web of Science. The following keywords were used to search in PubMed: (pelvic floor dysfunction) and (medicine-engineering combination) or (artificial intelligence) or (big data) or (Mobile medicine) or (telemedicine platforms) or (digital intelligent diagnostic technology) or (mesh) or (seed cells) or (scaffolds) or (bioactive factor) or (point-of-care testing) or (ultrasound) or (MRI) or (defecography) or (electrophysiological techniques) or (biomechanics) or (vaginal tactile imaging) or (robotic surgery) or (visual navigation system). We included only articles written in English. Two authors independently examined the full text of all articles that were potentially useful in this analysis. In case of disagreements about the selection, a final decision was made through discussion with a third author.

Conclusions: MEC vigorously promotes scientific and technological advancements and innovations in urogynecology, especially in pelvic floor dysfunction management, thus benefiting female patients and society. In the future, an increasing number of MECs should be explored in the field of urogynecology to solve the bottleneck problem, such as the mesh and navigation system. This narrative review provides clinicians with a better understanding of how MEC promotes urogynecologic development and suggests some possible directions for future efforts.

Keywords: Narrative review; urogynecology; pelvic floor dysfunction (PFD); medicine and engineering combination

Received: 02 July 2021; Accepted: 15 October 2021; Published: 25 June 2022.
doi: 10.21037/gpm-21-41
View this article at: https://dx.doi.org/10.21037/gpm-21-41

Introduction

Pelvic floor dysfunction (PFD) is a common disorder in adult females of all ages. It has become one of the top five chronic diseases that threaten human health, with the main clinical manifestations including stress urinary incontinence (SUI), fecal incontinence (FI), pelvic organ prolapse (POP), female sexual dysfunction, and pelvic pain (1). Latest epidemiological surveys show that 40–50% of married females with children in China have different types of PFD of varying severity. In addition, approximately 20% of females will develop POP or SUI by 80 years of age (2). The prevalence of PFD among females in the United States is 25% and that of POP between the age groups of 50 and 79 years is 40%. The number of women with POP in the United States is expected to increase to 50% by 2050 (3).

PFD has been increasingly recognized as a medical and socioeconomic problem, with increasing life expectancy, aging population, and higher demands for improved quality of life. The past decades have witnessed rapid advances in the diagnosis and treatment of PFD, despite controversies. However, as a subspecialty of gynecology, urogynecology remains in its initial stages of development, and there are still many problems that need to be addressed: (I) the etiology and pathogenesis of PFD remain indefinite, and there is a lack of early warning models and indicators for the disease. (II) The theoretical systems of PFD, under the guidance of holistic concepts, need to be further optimized. (III) The current diagnosis and treatment systems are suboptimal, i.e., there is a lack of Chinese versions of imaging-based preoperative assessment tools, making it difficult to promote these tools, and the treatment protocols are often not evidence-based. (IV) Although a variety of surgical procedures have been developed, there is limited follow-up data, and long-term treatment effectiveness lacks support from high-quality pieces of evidence. (V) The recurrence rate is high after surgical treatment, and surgical complications such as mesh exposure, erosion, and pain are difficult to manage. In addition, ideal pelvic floor reconstruction methods and materials need to be further investigated. (VI) The optimal rehabilitation systems and program designs lack high-quality evidence support despite the availability of various rehabilitation methods. (VII) Multidisciplinary collaboration has been conducted, but there are no sufficient competent professionals. Thus, urogynecology still has several areas of improvement. These improvements are highly dependent on the research and development (R&D) of new medical materials, creating new detection and treatment equipment, and finding smarter medical interventions. Therefore, medicine and engineering collaboration (MEC) in urogynecology is essential and mandatory.

As modern medicine is based on a pluralistic and multidisciplinary approach, the concept of MEC has been expanded and extended. MEC refers to the integration and collaborative innovation of medicine with science and engineering disciplines, focusing on real-world health care needs from a broader perspective. Furthermore, the rapid advancements in science and technology have further promoted research and applications of MEC [e.g., R&D of drugs and medical devices based on three-dimensional (3D)-printing technology, health monitoring, treatment systems based on artificial intelligence (AI) technology, and the diagnosis and treatment of diseases using electromagnetic and mechanical technology]. Here, we summarize cutting-edge technologies and the best application areas for MEC in urogynecology, in order to explain the importance of interdisciplinary and MEC to the development of urogynecology and point out the possible research direction in the field in the future. We present the following article in accordance with the Narrative Review reporting checklist (available at https://gpm.amegroups.com/article/view/10.21037/gpm-21-41/rc).

Material and methods

We searched for relevant literature on MEC and its application in urogynecology in the PubMed database and Web of Science. The following keywords were used as search strategy in PubMed: (pelvic floor dysfunction) and (medicine-engineering combination) or (artificial intelligence) or (big data) or (Mobile medicine) or (telemedicine platforms) or (digital intelligent diagnostic technology) or (mesh) or (seed cells) or (scaffolds) or (bioactive factor) or (point-of-care testing) or (ultrasound) or (MRI) or (defecography) or (electrophysiological techniques) or (biomechanics) or (vaginal tactile imaging) or (robotic surgery) or (visual navigation system). We only included articles written in English. Two authors independently examined the full text of all articles that were potentially useful in this analysis. In case of disagreements about the selection, a final decision was made through discussion with a third author.

Discussion

Integration of medicine and informatics—creation of pelvic floor-intelligent medicine

Intelligent medicine (internet + healthcare + AI), with AI as the core technology and big data as the basis, highly intellectualizes the human body digitally and allows for providing medical treatment with AI technology. Furthermore, it helps to build a brand-new medical system that interconnects, collaborates, and advances with machines based on the bottom (genes), middle (diseases), and top (diagnosis and surgery) layers of big data (4). The arrival of 5G provides a strong guarantee for realizing smart applications for pelvic floor health care, mainly reflected in the following aspects.

Medical internet of things (IoT) platforms

The IoT is a core technology of smart health care (including pelvic floor smart health care). In the 5G era, a larger number of connections and network traffic will enable more high-tech pelvic floor devices (e.g., wearable pelvic floor functional rehabilitation instruments and intelligent medical products) to access the internet simultaneously. The IoT enables the interconnection of medical equipment inside and outside the hospital. It allows for obtaining real-time and continuous data related to disease and rehabilitation and improves the collection of various data (including information on pelvic floor health care, equipment monitoring and maintenance, and quality assurance tracking) from many urogynecology centers. Further, it allows automatic collection, conversion, storage, transmission, and processing of urogynecologic information, providing high-quality disease monitoring and medical service management. These methods pave the way for further research on health care big data and AI in urogynecology (5). Real-time and safe data transmission and efficient storage on these platforms are problems to be solved in the construction of the pelvic floor IoT platform.

Big data-based urogynecologic care cloud platforms

In the 5G era, urogynecologic care cloud platforms that receive, store, and analyze various basic data of patients automatically match them with disease databases. These databases allow doctors to provide suggestions and receive feedback information from urogynecology centers using data mining, AI, and other techniques that will dramatically optimize the treatment strategies for PFD. These methods will improve patient management and promote rehabilitation of PFD. The main roles of urogynecologic care cloud platforms include data storage and backup. Data from various wearable devices and hospital information systems are uploaded to the cloud platforms in real time, thereby storing and backing up these data promptly and enabling the establishment of specialized medical knowledge bases and expert databases. In addition, through cloud platforms and 5G, urogynecology centers will be able to create an integrated wireless environment (through which medical staff can upload and download data via a wireless network at any time) and create conditions for a mobile office.

In addition, it improves disease analysis and decision-making. Urogynecologic data uploaded to cloud platforms are characterized by high volume, objectivity, and experimentation. When combined with data mining and AI, it allows for application in scenarios such as urogynecologic radiomics, female pelvic floor health management, and PFD prediction (6). These cloud platforms facilitate quick comparisons between rehabilitation of patients with PFD and postoperative follow-up data with their historical data. This allows doctors to identify characteristic relationships easily, infer possible relationships between a specific disease and its treatments, and develop reasonable treatment and nursing plans based on the dynamic and effective prediction of disease course, thereby improving medical quality and promoting better pelvic floor health in females.

Finally, it improves data sharing. A urogynecologic center can improve data sharing and interaction with other departments and even other medical centers through cloud platforms, allowing patients to check their consultation data anytime. These cloud platforms enable medical resources to be spread across different geographical areas, encourage cooperation among urogynecologists, promote the interconnection and sharing of professional information within these co-operations, and develop and integrate a homogeneous treatment protocol, resulting in standardized development of urogynecology (7). At present, pelvic floor-related medical big data is basically in a zero basic state. With the intensification of population aging and a sharp increase in the prevalence of PFD, the establishment of pelvic floor-related medical big data is imperative.

Mobile medicine and telemedicine platforms

5G has greatly improved and enhanced the existing environment by allowing high-volume real-time transmission of high-definition audio, video, and other data. It surpasses traditional wired connections of medical equipment, facilitating remote consultation, remote monitoring, remote surgery, remote teaching, implementation of family-based rehabilitation models, PFD full-course management, and other relevant functions, empowering urogynecology to enter a wireless, remote, and intelligent era (8). In addition, it provides several medical applications such as mobile patient rounds and mobile imaging, which will substantially increase the efficiency of PFD management. Doctors can access the medical records and clinical examination results of patients from anywhere, and consultations can be performed at any time. Thus, mobile medicine and telemedicine can be achieved (9). Of course, some joint medical units can realize remote consultation and remote teaching of gynecological pelvic floor medicine, but a family rehabilitation model and PFD whole-process chronic disease management system are yet to be established, which is also the direction of smart pelvic floor in the future.

Digital intelligent diagnostic and treatment technology

Digital intelligent diagnostic and treatment technology is a novel technology that combines modern medicine with digitalized and intelligent high-tech technology to form a multidisciplinary and multi-knowledge domain. As a product of deep MEC, it covers areas including 3D visualization (10), 3D printing (11), molecular fluorescence imaging (12), mixed reality (13), photoacoustic imaging (14), AI-radiomics (15), and multimodal real-time surgical navigation (16). It plays key roles in disease diagnosis, preoperative planning, intraoperative navigation, outcome prediction, and efficacy assessment in patients with PFD. Based on medical big data application scenarios, AI-based diagnosis and treatment systems integrate modules, including identifying early warnings for PFD, assisting disease diagnosis, supplying intelligent differential diagnosis, and different treatment protocols, greatly promoting the intelligent management of PFD. AI-based pelvic floor rehabilitation management systems and AI-based postoperative follow-up systems will dramatically optimize PFD management strategies, save human resources and financial resources, and promote the efficient development of urogynecology. Many biomechanical modeling methods can be used. For instance, finite element analysis (FEA) helps to explore the pathogenesis of PFD by simulating the mechanical behavior of the pelvic floor. A dynamic simulation model can analyze the mechanical changes in pelvic floor-supporting structures before and after surgery by simulating the intraoperative organ position, lesions of varying severity, and changes in the pelvic floor organs. These methods help optimize the surgical plan, increase the success rate of surgery, and minimize recurrence rate. At present, the application of digital diagnosis and treatment technology in the direction of the pelvic floor is relatively limited. In the 5G era, more intelligent algorithms and models will be developed in the near future to promote the successful practice of precision medicine in urogynecology.

Integration of medicine with material science, physics, and other disciplines: R&D of medical materials for PFD management

R&D of medical materials for PFD management involves multiple disciplines, including medical sciences, biology, material science, and physics. Currently, materials used for pelvic floor reconstruction can be categorized into autologous tissues and implantable meshes (17). Autologous tissues have good histocompatibility, but the high recurrence rate limits their clinical application. Thus, implantable meshes are more popular in the clinical setting. According to the nature of the materials, implantable meshes can be divided into biomeshes, synthetic meshes (artificial meshes), and composite meshes (with both biomeshes and synthetic meshes). Biomesh is mainly derived from decellularized porcine dermis, bovine pericardium, bovine peritoneum, porcine small intestine, or other tissues, which are decellularized to preserve their extracellular matrix, allowing them to repair and strengthen the pelvic floor fascia (18). However, they may degrade when used in patients with POP, leading to a lower cure rate than that with synthetic meshes, limiting their clinical application.

Although synthetic meshes are less prone to degradation and can provide adequate, continuous, and stable mechanical support, the incidence of mesh erosion, exposure, contracture, and pain is 10% and the reoperation rate can reach up to 30% (19). Remarkably, the US FDA issued two public health notifications and safety communications regarding complications arising from transvaginal mesh implants in 2008 and 2011; some transvaginal mesh products for POP were withdrawn from the market (20). The past few years have had rapid advancements in tissue engineering, which has become another important research direction for pelvic floor repair materials. As a combination of biology, medicine, and material engineering, tissue engineering enables the growth of in vitro cultured autologous cells on biological or biodegradable synthetic scaffolds and uses cytokines to promote their proliferation. When the scaffolds degrade *in vivo*, the implanted cells can form sufficiently strong connective tissues for therapeutic purposes. Thus, seed cells, scaffolding materials, and cytokines are the three essential elements of tissue engineering (21).

Seed cells

Currently, seed cells mainly include: (I) fibroblasts, which are the most common cells in connective tissue. In the resting or mature state, fibroblasts exist in the form of fibrocytes. Some authors believe that fibroblasts are a subtype of stem cells (22); (II) myeloid-derived suppressor cells (MDSCs), which are satellite cells located between the myeloid membrane and the basal lamina of adult muscle fibers and have multi-directional differentiation potential. MDSCs have been widely used as donor seed cells for cell therapy and tissue engineering for the treatment of myocardial infarction and urinary incontinence. However, MDSCs have been used as seed cells to treat PFD in animal models, but their values in human clinical practice remain unclear (23); and (III) mesenchymal stem cells (MSCs), which are adult stem cells of stromal origin that have been successfully isolated from bone marrow, adipose tissue, umbilical cord, endometrium, or other tissues. Currently, bone marrow-derived MSCs (BMSCs) and adipose tissue-derived MSCs (ADSCs) are widely used (24).

Scaffolds

An ideal scaffold should have the following properties: (I) good biocompatibility, avoiding immune rejection and inflammatory reactions; (II) good degradability, which ensures that the degradation rate is compatible with that of tissue cells and is non-toxic; (III) large contact area and high porosity, ensuring cell attachment and implantation; and d) ability to guide cell migration and proliferation.

Tissue-engineered bio-scaffolds applied in PFD management include synthetic scaffolds and natural biological scaffolds (25). Synthetic scaffolds: these materials mainly include synthetic polymers such as polylactic acid, polyglycolic acid, and poly (lactic-co-glycolic) acid, which are naturally non-toxic. Their by-products include lactic acid and glycolic acid, which are metabolized. These scaffolds have been successfully applied for urethral tissue regeneration and bladder replacement. Polycaprolactone is another synthetic polymer derived from hydroxyalkanoic acid. The FDA has approved it for clinical use due to its excellent biocompatibility, low immunogenicity, and good hydrolysis biodegradability under physiological conditions (26). Natural biological scaffolds: these are usually divided into three categories: proteins (e.g., collagen, silk protein, gelatin, fibronectin, and keratin), polysaccharides (e.g., hyaluronic acid, cellulose, glucose, alginate, chondroitin, and chitin chitosan derivatives), and tissue-derived biomaterials (27).

Bioactive factors

The common bioactive factors associated with PFD include estrogen and growth factors such as basic fibroblast growth factor, epidermal growth factor, and transforming growth factor β (28). These bioactive factors may induce differentiation and enhance the regenerative process by activating stem cells.

The above three elements of tissue engineering can achieve tissue fabrication using *in vivo* and *in vitro* techniques. These fabrication technologies are complex and challenging. For example, the scaffolds must have proper and refined density, porosity, thickness, weaving methods, and good mechanical properties. The in vitro culture of cells is often time-consuming, difficult, and expensive. In addition, mesh construction is time-consuming, and it is difficult to precisely regulate the distribution and number of cells (29). 3D printing technology enables good control of scaffold fabrication and cell distribution and has become a highly researched topic in tissue engineering. Compared with other tissue fabrication methods, 3D printing has the advantages of being highly precise, cost-effective, simple, and controllable. There are many methods of 3D printing, including extrusion-based, inkjet-based, stereolithography, and laser-assisted bioprinting, which can seed layers of different cells onto the scaffolds (30). Clinically, 3D printing of meshes can provide personalized meshes for POP surgeries, offering a new direction for R&D related to pelvic floor MEC and pelvic floor reconstruction material.

Integration of medicine with engineering—R&D of pelvic floor diagnosis and treatment equipment and technologies

Diagnosis

(I) Point-of-care testing (POCT) is an *in vitro* detection method that can obtain detection results instantly at the sampling site by utilizing portable analytical instruments and supporting reagents (31). Sophisticated basic medical research methods (e.g., various "omics") should be used to identify PFD biomarkers and develop MEC-based POCT testing methods and devices suitable for PFD, as there is no effective serological screening and diagnostic indicator for the early diagnosis of PFD to achieve early, rapid, and efficient screening and diagnosis of PFD.

(II) Ultrasound: pelvic floor ultrasound is a simple, non-invasive, and radiation-free imaging modality that has been widely performed for PFD diagnosis and assessment. The continuous advances in 3D/four-dimensional (4D) pelvic floor ultrasound have made it more beneficial than conventional pelvic floor ultrasound in terms of clarity, resolution, and dynamics. It not only evaluates various pelvic floor parameters both at rest and during the Valsalva maneuver but also serves as the most effective indicator for evaluating treatment response (32). Future developments and ultrasound technology and equipment upgrades will further increase pelvic floor-related ultrasound data accuracy and comprehensiveness, which will greatly facilitate the early diagnosis and efficacy monitoring of PFD.

(III) Magnetic resonance imaging (MRI): two-dimensional (2D) MRI is widely used to evaluate levator ani muscle injury and rectal prolapse, but its application has been limited by factors such as layer thickness and angle. Accordingly, three-dimensional (3D) MRI is increasingly being used in the diagnosis of PFD. 3D MRI does not have the same limitations as 2D MRI and can perform complete measurements as 3D models. This technique can provide information more intuitively and offers more realistic measurement results. In addition, dynamic MRI can more accurately detect occult PFD and allow earlier diagnosis of the disease (33).

(IV) Defecography (DFG): DFG is currently an important test for PFD diagnosis. X-ray DFG is widely used in clinical practice as the "gold standard" for diagnosing PFDs. However, its application is limited in female patients of reproductive age because of the inability to observe the structure and movement of muscles and their surrounding organs and soft tissues because of its radiation, complicated operation, and poor soft-tissue visualization (34). In recent years, dynamic magnetic resonance (MR) DFG has played a key role in the diagnosis and treatment of PFD. It can be used to observe the structural abnormalities of the anus, rectum, and pelvis (e.g., bladder prolapse, uterine prolapse, uterine fibroids, and sacral cysts) and the morphologies and movement status of the pelvic floor muscles (including the rectus pubis and levator ani); in addition, it can detect pelvic floor defects, injuries, and other diseases, especially constipation and fecal incontinence (FI) caused by complex PFD. However, MR DFG is performed in the supine position, which does not follow the anatomical position of the PFM. As a result, MR DFG has a lower detection rate than X-ray DFG for many PFDs (35). In addition, MR DFG is quite time-consuming and patients often cannot maintain the defecation process for a long period. This makes it difficult to obtain satisfactory results due to artifacts in scanning and imaging. Echodefecography serves as a good diagnostic aid for outlet obstructive constipation and has been increasingly adopted in clinical practice. Echodefecography is a simple, radiation-free, minimally invasive, and well-tolerated technique that demonstrates many benefits, such as short imaging time and less pain. It also allows for multi-directional 3D imaging and thus can distinguish the pelvic floor and perianal muscle groups as well as organs (bladder, vagina, uterus, etc.) around the rectum and anal canal, which is particularly useful for learning the relationships between the rectal and anal canal and the abovementioned organs (36).

(V) Electrophysiological techniques: electrophysiological indicators for assessing the pelvic floor primarily include dynamic vaginal pressure, pelvic floor muscle strength, pelvic floor muscle endurance, and A3 reflex (37). Pelvic floor electrophysiological tests can detect pelvic floor abnormalities at an early stage, providing a basis for early detection and prevention. However, the value of electrophysiological technology for the diagnosis and rehabilitation of PFD must be verified in studies with larger sample sizes. In addition, the normal thresholds for electrophysiological indicators in Chinese populations require further investigation.

(VI) Biomechanical testing: biomechanical changes are major contributors to the pathogenesis of PFD. Biomechanical parameters have been obtained from mechanical stretch tests performed on the pelvic floor in *ex vivo* tissues with advancements in biomechanics in urogynecology. However, the occurrence and progression of POP follow a "holistic theory", and the effects of force on the pelvic floor in the *in vivo* tissues are temporal. As a result, the *ex vivo* data have many limitations and cannot accurately reflect the actual clinical events. Finite element models of female pelvic floor tissues can be developed using medical imaging and computer software technology. These technologies can simulate the complex tissues and their biomechanical changes in the pelvic floor and enable systematic observations, to elucidate the pathogenesis of PFD and provide mechanical performance data of the pelvic floor muscles (38). FEA can help physicians develop more effective individualized surgical plans for patients, optimize the biological properties of the implanted mesh, supplying preventive strategies for PFD based on the results of individual data analysis (39). Currently, the application of FEA in PFD is still under investigation and has many limitations. However, with the development of MEC and the adoption of new technologies, FEA may reflect real-world events more accurately and thus can eventually be widely used in obstetrics and gynecology.

(VII) Vaginal tactile imaging (VTI): in a multidisciplinary assessment of PFD, traditional POP-Q scoring methods, 3D pelvic floor ultrasound technologies, and pelvic floor MRI are helpful in staging and guiding the treatment; however, they cannot determine the elasticity of vaginal tissue. VTI can objectively and quantitatively assess the elasticity of vaginal tissues and has become an emerging examination tool in clinical settings as a visualization technique. As it can provide objective images, VTI may replace traditional finger palpation in the future (40). However, the value of VTI needs to be further verified in studies with large sample sizes. Tactile imaging technology is expected to be further applied in the screening or diagnosis of various PFDs as a more convenient and accurate assessment tool.

Treatment

Robotic surgery

Although many surgical procedures have been developed to treat POP, their roles remain controversial. Sacrocolpopexy is considered the gold standard treatment for POP (41). However, this procedure is technically challenging, especially for the exposure of the presacral region. In addition, various complications, such as vascular injury, urinary tract injury, and difficult defecation, may occur. These problems limit the effectiveness of the procedure. The search for a more minimally invasive procedure is underway. In recent years, robotic surgery has overcome the limitations of traditional minimally invasive surgical procedures. For instance, it can offer an image magnified up to 10–15 times and provide more flexible “wrist joints”, making it possible to perform more complex surgical operations more precisely. Thus, more complex surgeries are being performed robotically (42). The proportion of robotic surgery in PFD treatment is small, but is expected to drastically increase in the coming years, and this has great prospects in promoting precision medicine in the surgical treatment of PFD.

Visual navigation system

Imaging navigation was initially developed for stereotactic neurosurgery. With the widespread use of CT technology in clinical practice in the 1970s, imaging navigation has also entered a stage of rapid development. Currently, it is widely used in neurosurgery, orthopedics, otorhinolaryngology head and neck surgery, and oral and maxillofacial surgery (43). The imaging navigation system uses specially designed computer software to reconstruct the preoperative CT or MRI scans in three dimensions. The operator can observe the actual positions of the surgical instruments to complete a complex and precise surgery, using the three-dimensional images displayed on the computer monitor, by precisely locating surgical instruments in the operative field using the intraoperative positioning system (44). Imaging navigation systems are particularly valuable for pelvic floor surgery because of their complex anatomy and difficult exposure. They can effectively reduce intraoperative vascular injury, bladder injury, and other surgical complications. Unfortunately, only few studies have described the application of imaging navigation systems in pelvic floor surgery, which may be a new direction in MEC.

In summary, urogynecology remains a flourishing and controversial subspecialty both in China and abroad. MEC embraces a new era of innovation. 5G, IoT, and AI are increasingly being integrated into medicine, and this calls for new technical revolutions in traditional health care. The same opportunities and strengths apply equally to urogynaecology. MEC will further promote the integration of urogynecology with many other disciplines in the future, including applying MEC achievements in teaching, scientific research, clinical practice in urogynecology, and the training and establishment of multidisciplinary teams. The R&D of new techniques and equipment promotes further etiological research, diagnosis, treatment, and prevention techniques of PFD. The existing MEC in urogynecology is far from sufficient, and there is an increasing demand for a tighter connection between medicine and engineering, such as reconstruction material development, and wearable device R&D use in diagnosis and rehabilitation of PFD. MEC is believed to vigorously promote scientific and technological advancements and innovations in urogynecology, especially in PFD management, thus benefiting female patients and the society.

Acknowledgments

We would like to thank Editage (www.editage.cn) for the English language editing.

Funding: This work was supported by the National Key Research and Development Program of the Ministry of Science and Technology of China (13th Five-Year Plan) (grant No. 2020YFC2005603); the Science and Technology Department of Sichuan Province, Key Research and Development Project (grant No. 2020YFS0206), and the National Key Research and Development Program of the Ministry of Science and Technology of China (grant No. 2021YFC2009100).

Footnote

Reporting Checklist: The authors have completed the Narrative Review reporting checklist. Available at https://gpm.amegroups.com/article/view/10.21037/gpm-21-41/rc

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://gpm.amegroups.com/article/view/10.21037/gpm-21-41/coif). XN serves as an unpaid Executive Editor-in-Chief of *Gynecology and Pelvic Medicine*. The other authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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doi: 10.21037/gpm-21-41
Cite this article as: Hu Q, Wang T, Chen Y, Wei D, Cui T, Mei L, Zhang L, Niu X. Medicine and engineering collaboration in urogynecology: a narrative review. Gynecol Pelvic Med 2022;5:13.

